T

PRESIDENT'S SECRETARIAT
(LIBRARY)

Accn. No....C.3479.... Class No....032....

The book should be returned on or before the date last stamped below.

ENCYCLOPÆDIA BRITANNICA.

EIGHTH EDITION.

THE

ENCYCLOPÆDIA BRITANNICA,

OR

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE.

EIGHTH EDITION.

WITH EXTENSIVE IMPROVEMENTS AND ADDITIONS;
AND NUMEROUS ENGRAVINGS.

VOLUME XXI.

ADAM AND CHARLES BLACK, EDINBURGH.
MDCCCLX.

[*The Proprietors of this Work give notice that they reserve the right of Translating it.*]

NEILL AND CO., PRINTERS, EDINBURGH.

ENCYCLOPÆDIA BRITANNICA.

T.

T
||
Tabernacle.

T, or t, the twentieth letter and sixteenth consonant of the English alphabet; the sound of which is formed by a strong expulsion of the breath through the mouth, upon a sudden drawing back of the tongue from the fore-part of the palate, with the lips at the same time open. Its use, like that of all mute articulations, is to modify the utterance of the vocal sounds which precede or succeed it. The proper sound of *t* is expressed in most words beginning or ending with that letter; as in *take, tell, hot, put. Ti* before a vowel has the sound of *si*, or rather of *shi*, as in *creation*, except when *s* precedes, as in *question;* and derivatives from words ending in *ty*, as *mighty, mightier. Th* has two sounds; the one soft, as *thou, father;* the other hard, as *thing, think.* The sound is soft in these words, *then, thence*, and *there*, with their derivatives and compounds; and in the words *that, this, thus, thy, they, though;* and in all words in which *th* comes between two vowels, as *whether, rather;* and between *r* and a vowel, as *burthen.* In English, Latin, Greek, and various other languages, the letter *t* is interchangeable with *c, d, p, s*, and *l*, and in French the final *t* is frequently dropped. For the various forms of this letter see ALPHABET; and for its employment to express different words and phrases see ABBREVIATIONS.

TABASCO. See MEXICO.

TABERNACLE (אֹהֶל מוֹעֵד, *tent of assembly.*) The Septuagint almost constantly uses the phrase σκηνὴ τοῦ μαρτυρίου, and in Kings viii., σκήνωμα τοῦ μαρτυρίου. The Vulgate has tabernaculum fœderis, *tent of the covenant.* With this rendering agrees Luther's *Stiftshütte.* The Chaldee and Syrian translators have מִשְׁכַּן זִמְנָא, *tent of festival.* We may distinguish in the Old Testament three sacred tabernacles:—1, The *Ante-Sinaitic*, which was probably the dwelling of Moses, and was placed by the camp of the Israelites in the desert, for the transaction of public business. (Exodus xxxiii.) 2, The Ante-Sinaitic tabernacle, which had served for the transaction of public business probably from the beginning of the Exodus, was superseded by the *Sinaitic:* this was constructed by Bezaleel and Aholiab as a portable mansion-house, guild-hall, and cathedral, and set up on the first day of the first month in the second year after leaving Egypt. Of this alone we have accurate descriptions, and it is called the tabernacle *par excellence.* A detailed description of it will be found in Exodus xxv. to xxvii., and xxxv. to xxxvii. 3, The *Davidic* tabernacle was erected by David in Jerusalem for the reception of the ark (2 Sam. vi. 12), while the old tabernacle remained to the days of Solomon at Gibeon, together with the brazen altar, as the place where sacrifices were offered (1 Chron. xvi. 39, and 2 Chron. i. 3.)

Tabernacles, Feast of
||
Tabor.

TABERNACLES, *Feast of.* See FEAST.

TABLE BAY, an inlet of the Atlantic, near the southern extremity of Africa, in Cape Colony, S. Lat. 33. 53., E. Long., 18. 24. It opens towards the north, and is well sheltered on all other sides. On its south shore stands Cape Town, the capital of the colony. Table Bay is 6 miles wide at its entrance, and is capable of accommodating the largest fleets. It derives its name from Table Mountain, which rises first over Cape Town. This mountain is 3500 feet high, and perfectly level at the top, with almost perpendicular sides on the east and west. It is called Table Mountain on account of this peculiar shape. Its formation is entirely primitive.

TABOR, a fortified town of Bohemia, on a steep hill above the Luschnitz, 48 miles S.S.E. of Prague. It is an old-fashioned town, and has many picturesque castellated houses, one of which has a balcony overlooking the market-place, from which Ziski, the Hussite leader, used to address his followers. There are here a ruined castle, a town-hall, and two fine churches. Cloth and paper are manufactured; and argentiferous lead is obtained in the vicinity. The castle was originally built in 774, destroyed in 1268, but restored in 1420, when the Hussites under Ziska took possession of the town. They strongly fortified the place, and gave it the scriptural name of Tabor, from whence they were sometimes called Taborites. There are in the vicinity a hill which they called Horeb, and a pond which they named the Jordan. Pop. 4485.

TABOR, *Mount.* See PALESTINE.

Tabriz ‖ Tacitus.

TABRIZ, or TABREEZ, a town of Persia, capital of Azerbijan, in a fertile plain, bounded on the north and south by lofty mountain ranges, and on the west by Lake Urumiyeh, about 4800 feet above the sea. N. Lat., 38. 4.; E. Long., 46. 8. It is surrounded by a wall of sun-dried bricks, about 3½ miles in circuit, but outside of this there are extensive suburbs, in which a large proportion of the people dwell; and there are here also immense gardens, producing in abundance all the fruits of southern Europe. Owing to the lofty site of the town the climate is temperate in summer, but in winter the cold is very intense. Tabriz is entered by seven gates; its streets are straight and unpaved, and its houses are generally built of brick, and made low on account of the danger of earthquakes. There are no buildings at all remarkable for their architectural merit; the most conspicuous is a castle, formerly a mosque, a lofty brick building about 600 years old, and much injured by earthquakes. The town has also numerous mosques, barracks, a cannon foundry, and manufactures of coarse cotton cloth and silk fabrics. It is one of the chief commercial towns in Persia, and trades with Tiflis in Russia, with Trebizond, and with Constantinople. To the first of these places it exports silk, cotton, rice, and dried fruits; receiving in return iron, copper, leather, cloth, and manufactured goods. European goods are imported into Tabriz by way of Trebizond, and partly also by caravans from Constantinople. In this way there are exported rice, wool, hides, furs, carpets, shawls, and other articles. The value of the annual imports of English goods alone is estimated at a million sterling. Tabriz also receives merchandise from India and Bokhara, through Herat and Teheran. Thus the town is still of great importance, though it has declined very much from its ancient prosperity, when it contained hundreds of caravanserais, mosques, and cafés, with a population of 550,000. It is said to have been founded by the wife of the caliph Haroun al Rashid in 791 A.D., and it was a favourite residence of that celebrated monarch. The present population is between 50,000 and 60,000.

TACITUS, CAIUS CORNELIUS, one of the most eminent writers of the empire, and "the first historian[1] who applied the science of philosophy to the study of facts." The meagre materials of his biography are derived mainly from notices in the correspondence of his contemporary, Pliny the younger, and from a few scattered allusions in his own writings. He belonged, in all probability, not to that celebrated branch of the Gens Cornelia which produced the Scipios and the Lentuli, but to a less distinguished equestrian family. This inference rests on the supposition that the Cornelius Tacitus, a Roman knight, and procurator of Gallia Belgica, who is mentioned by Pliny the elder,[2] was the father of our historian. The place of his birth is unknown, although tradition pointed to Interanua (the modern Terui), as his native city, and his statue and tomb were shown there for many centuries. The date of his birth is also uncertain; but we can determine it within a few years. Pliny[3] says that he and Tacitus were "nearly of the same age" (*propemodum æquales*), but that while he was a mere youth (*adolescentulus*) Tacitus had already gained a brilliant reputation, which must have been acquired by the display of forensic eloquence and skill. Now, we know that Pliny was born A.D. 61, for in the famous letter which he wrote in order to give Tacitus a correct account of the eruption of Vesuvius by which the elder Pliny lost his life, he mentions that he was eighteen years old at the time of the occurrence. As the expression "propemodum æquales" could *certainly* not have been used had Tacitus been his friend's senior by more than ten years, we have A.D. 51 as a *superior limit* for the date of his birth. Now, Tacitus himself informs us that the first political honour which he obtained was conferred upon him by Vespasian, who died A.D. 79. This office was probably the quæstorship, which entitled him to a seat in the Senate, and (as we learn from Dio Cassius[4]) could not be legitimately held under the emperors till the age of twenty-five. This, therefore, gives us A.D. 54 as an *inferior limit*, after which Tacitus could not have been born. As Tacitus was a man of distinction it is nearly certain that he must have held the quæstorship at the earliest possible period (*suo anno*), and we may thus conclude with some confidence that A.D. 54 was the date of his birth. This would make him eight years older than Pliny, and it is a supposition that agrees well with the passages which we have quoted, and with the remark in the *Dialogus de Oratoribus*,[5] that Tacitus (assuming him to have been the author of that treatise) had been, in early life, an eager admirer of the orators Marcus Aper and Julius Secundus, whom, with boyish ardour, he attended not only to the forum but even in their own houses. If, then, A.D. 54 was the date of his birth, we may notice the fact, that "the same year saw the accession of Nero, the horror of the human race, and the birth of Tacitus its avenger."

Tacitus incidentally mentions,[6] that his political dignity was founded by Vespasian, increased by Titus, and still further advanced by Domitian. Taking as the basis of our chronology, the inference (which we have shown to be so highly probable), that Tacitus was made quæstor in the last year of Vespasian's reign, A.D. 79, it follows from the above remark that he must have gained the tribuneship[7] (or ædileship) in A.D. 81, in which year Titus died. Under the empire the prætorship must be held at the age of thirty,[8] but Tacitus could not have gained it earlier than his thirty-fourth year, as we know that he was not prætor earlier than A.D. 88, the eighth year of Domitian's reign, at which period he also presided at the *ludi sæculares* in his capacity of *sacerdos quindecimviralis*.[9]

In the year 78, at the age of twenty-four, Tacitus married the only daughter of the good and illustrious Cn. Julius Agricola; the betrothal had taken place in the previous year, when Agricola was consul, and immediately after the marriage he was despatched to take the command in Britain. Agricola died A.D. 93, and Tacitus mentions it as a source of keen sorrow that both he and his wife had for the few years previous to this event lost the advantage of their parent's affection and guidance. What was the cause of this absence from Rome is entirely conjectural, but it is not unlikely that Tacitus assumed the government of a prætorian province. There is no proof that he personally visited either Britain or Germany, nor is there the shadow of an authority for the vague rumour that he was driven into exile by Domitian. Had this been the case he would have been obliged to mention it, when vindicating his own claim to impartiality in the first chapter of his *History*. At the same time Tacitus, who had been an unwilling spectator of the atrocities of Domitian, and had met with opportunities only too frequent of seeing that red, yet unblushing countenance[10] in the midst of the faces which had grown pale with the terror which it inspired, would probably have hailed with satisfaction any duty or position which enabled him to indulge, at a safer distance, the fierce indignation which lacerated his heart.

In the reign of Nero, A.D. 97, Tacitus obtained the rank of consul suffectus, and pronounced the funeral oration of his illustrious predecessor, Virginius Rufus. This we learn from

Tacitus.

[1] Gibbon, i. 225, ed. Milman. [2] *Hist. Nat.* vii. 16. [3] *Ep.* vii. 20. [4] See, too, Tac. *Ann.* iii. 29.
[5] *Dial.* c. ii. [6] *Hist.* i.1.
[7] The offices are mentioned in this order (*Dial. de Orat.*, 7). "Quæsturam aut tribunatum aut prætoram."
[8] τεσσαρακοστὸν τρισκαιστόν γενόμενον. (Dion. Cass.) [9] *Ann.* xi. 11.
[10] Vit. Agric. xlv.

Tacitus. a passing allusion of Pliny,[1] who says that it was the crowning felicity of Rufus to have had in Tacitus, the consul suffectus, a most eloquent speaker to deliver his funeral harangue.

In A.D. 100, in the reign of Trajan, Tacitus was engaged with Pliny in the prosecution of Marius Priscus, for gross cruelty and maladministration in Africa during his proconsulship. Salvius Liberalis defended the accused, but Tacitus replied in a strain of powerful[2] and dignified eloquence, which caused the condemnation and banishment of the unworthy governor. It is pleasing to find that the little we know of the historian's private life is in perfect accordance with the noble standard of his recorded sentiments.

After this period we have no further mention of Tacitus, who spent the remainder of his life in the peaceful pursuits of a learned retirement. A late and obscure authority says that he died at the age of eighty, but such a testimony has no weight. We do not even know whether he left any children or not; it is certain that the *lusus naturæ* mentioned by Pliny the elder as the son of a Corn. Tacitus, a Roman knight, was not the *son* of the historian, though he may have been his *brother*. It is, however, most likely that Tacitus had some children, for the Emperor Tacitus claimed to be descended from him, and Sidonius Apollinaris attributes the same illustrious origin to Polemius, a prefect of Gaul. Almost the only other fact recorded about Tacitus is his cordial intimacy and friendship with Pliny the younger. Pliny was quite aware of the honour done him by so distinguished a connection, and he always addresses and speaks of his friend with proper respect and appreciation, and indeed with a humility which must, if honest, have caused some uneasiness to his own good-humoured vanity. Tacitus towered like a giant above all his contemporaries, isolated and unapproachable; for this very reason, perhaps, Pliny was quite as popular *in his day*, and may not have known how immeasurably inferior he was to his friend in real genius and power.

In order to arrive at a correct estimate of the literary value of the writings of Tacitus, it is necessary to know the date of their composition, and the order in which they were published.

It is now generally agreed that the *Dialogus de Oratoribus* is the work of Tacitus. If so, it was quite his earliest production, as the *Dialogue* is supposed to have taken place in the sixth year of Vespasian[3] when, according to our chronology, Tacitus was not much more than twenty years old. This is quite sufficient to account for the difference of style between this treatise and his later works. When we remember that it was a youthful effort, that it was written in great leisure, and that the subject was widely different from those on which he was afterwards employed, we shall cease to wonder at its smooth, diffuse, and easy elegance. The only other authors who were capable of writing it, or to whom with any shadow of probability it has been assigned, are Pliny and Quinctitian. It could not, however, have been composed by either of these writers, for the author says he was "admodum juvenis" at the time when he heard the discussion; and as this is stated to have been in A.D. 75, Pliny would have been at that time too young, and Quinctitian too old, to admit of such an expression being applied to either of them. Perhaps the strongest reason for accepting the superscription of the MSS. which name Tacitus as the author, has been adduced by Doederlein. Pliny[4], in one of his letters, addressing Tacitus, remarks, "Itaque poemata quiescunt quæ tu *inter-nemora et lucos* commodissime perfici putas," which can hardly be otherwise than in allusion to a sentiment expressed in these very words in the eleventh chapter of the *Dialogue*. Eichstad and other able opponents of the Tacitean origin of the treatise, find it very difficult to diminish the cogency of this direct testimony. The *Dialogue* was probably published in the reign of Titus;—not in that of his predecessor, for it makes unfavourable mention of two of Vespasian's favourites, Ebrius Marcellus and Vibius Crispus, which would not have been done by a man entering on the course of political honours;—and not in that of Domitian, because, in the *Life of Agricola*, Tacitus hints that during the reign of that emperor he had been reduced to an unwilling silence.[5] The discussion turns on the course which had led to the corruption of eloquence in recent times. Tacitus.

The next work of Tacitus was undoubtedly the *Life of Agricola*. We infer from the introduction that it was written after the reign of Domitian, and it was probably published when Tacitus was consul suffectus, A.D. 97. That it came out during the reign of Nerva, and after the adoption of Trajan seems likely, from the title, "Nerva Cæsar" and "Nerva Trajanus," which occur in chapter iii.; although the omission of the word "Divus" ("of happy memory") before Nerva's name is no sufficient proof that it was not given to the world after Trajan's accession. Be this as it may, this incomparable biography, with the stern, nervous, compressed passion of its style, "shows all the greatness of the man." It is an immortal monument to the memory of the great and good Agricola, by a son-in-law, who was at the same time the only person in the empire capable of doing justice to the life of this noble victim to imperial jealousy. The style is peculiarly difficult, owing not only to the brevity of the treatise and the corruption of the text, but far more to the intensity of those deep feelings, which, after having been so long stifled, now found, for the first time, an unimperilled utterance. Tacitus was fortunate in finding in his wife's father so grand a subject for his affectionate commendation. They had been united during life by a perfect unanimity. Both were stoics in philosophy, and moderate in politics;[6] both agreed in the duty of dignified obedience even to a man whom they hated and despised; both knew how to maintain their independence without compromising their loyalty;[7] both were regular in their morals, pure in their married life, honest without ostentation, and faithful without subservience.

Next in order was the *Germania*, which was written during Trajan's second consulship, A.D. 98. It contained all that Tacitus knew or could learn by inquiry from the numerous traders and soldiers who had frequented Germany during their journeys and campaigns. Whether it consists of mere collectanea, which were intended for expansion into a larger work, or was originally an episode of the history which had outgrown its proper dimensions, is quite uncertain.

The Histories were written after the death of Nerva, who is called Divus in chapter i.; and they preceded the Annals, being directly referred to in the latter work.[8] They contained the history of the Flavian dynasty, which, after the extinction of the Julian line, had succeeded to its honours. They commence with the period when Vespasian first appeared on the stage of public opinion, and conclude with the death of Domitian, because Tacitus says that he had reserved the reigns of Nerva and Trajan as the material for his old age. Four books only and a fragment of the fifth are extant, and as they only occupy the space of a single year, we must lament as an irreparable loss the large portion which has not come down to us. St Jerome mentions thirty books of the historical works of Tacitus, and Niebuhr thinks that this is not too much for the his-

---

[1] *Ep.* ii. 1. [2] Plin. *Ep.* ii. 11. [3] Cap. 17. [4] *Ep.* ix. 10. [5] Vit. *Agric.* 2, 3.
[6] *Nisard Poëtes de la Decadence*, ii. 437. [7] See some admirable remarks on the uselessness of conspiracy, Vit. *Agric.* xlii.
[8] *Ann.* xi. 11.

Tacitus. tories alone, if they were continued on the same scale as the extant portion. If, however, St Jerome meant to include the Annals among the thirty books, the Histories could not have originally occupied more than fourteen books. As Tacitus paid great regard to symmetry, it is the supposition of Ritter, that the Annals contained eighteen books, and the Histories twelve. The Histories are his most finished work, and the space which he allowed himself, as well as the difference in plan, obviated the necessity of that painful conciseness which marks the style of the Annals, and left room for more vivid and animated narrative.

The last and greatest of all his works is the Annals, which could not have been published at the earliest before A.D. 116, because in book ii. chap. 61, he alludes to the expedition in which Trajan extended the boundaries of the empire as far as the Red Sea. Trajan died the year following, and Tacitus, although he survived him, was probably not anxious to fulfil his promise of becoming the historian of his greatness. The Annals comprise a period of fifty-four years, from the death of Augustus, A.D. 14, to the death of Nero, A.D. 68. They have come to us in a very mutilated state, and the entire 7th, 8th, 9th, and 10th books are lost.

So profound and accurate a writer as Tacitus must have had some good reason for distinguishing between the titles "Annales" and "Historiæ." What was the intended difference has long been a matter of dispute, and is not unimportant to the right understanding of these great works. Without attempting to decide where such eminent writers disagree, we will briefly mention the main opinions on the subject. 1. The classical passage for a description of Annals, is *Cicero de Oratore*, ii. 12; and they were, he says, dry and jejune records of the facts of each year, published by the Pontifex Maximus—mere notes of the eclipses, prodigies, triumphs, or other events which had happened during the year; whereas the fuller and most embellished style of history commenced with the works of men like M. Cato, Fabius Pictor, and Cælius Antipater. 2. Aul. Gellius, who treats of the distinction as a lexicographical problem,[1] makes Annals differ from History, in the fact that in the former regard is had not to epic unity, but to chronological succession. 3. Servius,[2] who has been generally followed by modern writers, makes the difference consist in the contemporaneousness of the History with some part of a person's life. For this reason Grotius gave the name of "Annals" to the earlier, and "History" to the later portion of his History of the Netherlands. Niebuhr, in an admirable paper[3] on this subject, rejects all these opinions, and combines the two first of them, and we entirely agree with him, although Ritter has returned to the definition of Servius. That the distinction between the words was not accurately kept, we may see from the application of the term "Annales," by Livy,[4] to his great work; but Tacitus, doubtless, had in view the difference of style between his two narratives—a difference which probably became less marked as the Annals advanced. We should have been better able to discriminate this difference if the latter books of the Histories, which paint the gloomy reign of Domitian, had survived; for the part which has come down to us treats of a period which, with all its "dreary reality," was an infinite improvement on the times of a Tiberius or a Nero.

"The Annals," says Niebuhr in the paper above quoted, "carefully preserve a resemblance to their prototypes, differing only as a Madonna of Cimabue from one of Raphael. Each year is kept strictly separate, the most heterogeneous events strung together, and many things mentioned, which in a history would have found no place. It is St Peter's seen under the illumination of the Cross, where most parts of the building lie in darkness, while others are more strongly delineated by the shadows with which they are bound. The histories are like the sun falling on the same building through the great window of the tribune, and showing all things in broad day, though not under noontide brightness, not under the clear sky. The difficulties of Tacitus were really insurmountable. Tiberius had made the world torpid, and reduced it to the silence of the grave; its history is confined to himself, his unfortunate house, his victims, and the enslaved senate. In this dreary silence we shudder and speak in a whisper; all is dark, mysterious, perplexing. Was Germanicus poisoned? was Piso guilty? what urged him to his mad violence? did the son of Tiberius die of poison, and Agrippina by assassination? Tacitus knew no more certainly than we." Suetonius had a right instinct in describing this period under the form of biography; but Tacitus was too proud, too deeply wounded, to degrade the history of his country, in form as well as in fact, to the mere life of men so unfortunate and depraved as those who then wielded the sceptre of the world. We have already shown, in the life of Suetonius, how the two writers supplement each other, and how Suetonius solves the problem which the study of Tacitus had excited in the mind of the Emperor Napoleon I., by penetrating into those mysteries of the Palatine which Tacitus was prevented from entering by shame or by disgust.

The writings of Tacitus have the "majestic melancholy" of a tragedy, and indeed the Annals may be divided into the twofold dramas of Tiberius and of Nero, while upon scene after scene falls, like the heavy fold of a curtain, an atmosphere thick with debauchery and blood. It was the influence produced on the mind of Tacitus by having lived through times not dissimilar to those which he describes, that constituted him a philosophic historian. There is no withoutness in his narrative; he writes, not like a cold spectator of past events, but like one who had a living share in their degradation and their horror. Thucydides, desirous only to present unembellished facts, details them without colour and without comment, and, at the most, the veil of individuality which he throws over them is as transparent as the light of the Grecian sky. But in Tacitus every sentence bears the characteristic impress of a profound and troubled soul; and the reader never loses sight of the author in dwelling on the events which he narrates. He writes with the distinct consciousness of an avenging[5] purpose, and something of the world's former terror still trembles involuntarily in his page.[6] It is this deep feeling, joined with the most elevated moral purity and rectitude of purpose, which entitle him to Bussuet's panegyric of having been "the most dignified of historians;" and if he were the author to whom Pliny alludes in the 27th letter of his 9th book, we can easily imagine that he made the polite littérateurs of Trajan's court feel, as they had never felt before, "the power, the grandeur, the majesty, the divinity of history." At the same time, this keen comprehension of the period he was describing led to an exaggerated sensibility, an unconscious affectation, an unnecessary suspicion of profundity, which is the main and almost the only fault of this incomparable writer. He probably owed this defect to the influence of his contemporaries; but in him alone does it become tolerable, and he shares it in a much less degree than the other writers of his age.

Böttticher, in an admirable treatise, *De Vita, scriptis, et stilo Taciti*, classes his peculiarities under three heads, viz., 1. Love of variety; 2. Brevity and force of expres-

---

[1] Gell. v. 18.
[2] On *Æn.* i. 377.
[3] In the *Rheinisches Mus.*, translated by Dr Thirlwall, *Philolog. Mus.* ii. 661.
[4] Liv. xliii. 13.
[5] *Ann.* iii. 65.
[6] Nisard, *ubi supra.*

Tacna ‖ Taganrog.

sion; and 3. A certain poetical colouring of the language, which is almost the only characteristic in which Tacitus resembles the writers of the *Decadence*. To the first class belong his different modes of spelling and inflecting the same word, his heteroclites, his copiousness, his coined words, and his interchange of constructions; to the second, the condensed periods and scornful avoidance of every unnecessary word, which makes him so remarkable a contrast to the babbling loquacity of some of his contemporaries; to the third, his numerous Græcisms, his *syntaxis ornata*, and his rhythmical conclusions.

Tacitus has never been a popular writer, and preferred an audience, "fit though few." This must have been the case at a very early period, or the Emperor Tiberius would have found it unnecessary to publish an edict that ten copies of his Histories should be made at the public expense every year.[1] In spite of this pious care, large portions of them have perished.

The first and incomplete edition of Tacitus was that by Vindelin de Spira, Venice 1470. The first edition of the entire work is that by Beroaldus, Rome 1515. The best modern commentaries are those of Brotier, Walther, Ritter, and Orelli. The latter is an admirable work, and contains nearly everything that is necessary for the understanding of Tacitus. Bötticher's *Lexicon Taciteum* is also useful. Walch has published a separate edition of the *Agricola*, and Grimm of the *Germania*, of which there is also an English edition by Dr Latham, containing a vast amount of ethnological information. The Italian translation by Davanzati is the best, and there are English versions by Gordon and Murphy. The former is accurate and antiquated; the latter avoids all the difficulties, but may be read with advantage from its interesting style and undeniable eloquence. It is the work of a man who loved and appreciated the author whom he was translating. (F. W. F.)

TACNA, a town of Peru, in the department of Arequipa, on the left bank of the small river Tacna, about 20 miles from the sea, and 30 N.N.W. of Arica. It is 1700 feet above the sea-level, and stands in a very fertile district. Tacna is the residence of many wealthy foreign merchants, and has an extensive trade. Pop. 8000.

TADCASTER, a market-town of England, in the West Riding of Yorkshire, on both sides of the Wharf, which is here crossed by a handsome stone bridge, 9 miles S.W. of York, and 185 N.N.W. of London. It is generally well built, and has straight, clean streets; a fine old parish church in the Gothic style, with a lofty tower; places of worship for Wesleyans and Independents; a grammar school, national schools, and an alms-house. There are quarries in the neighbourhood; and in the town markets and cattle fairs are held. Pop. 2527.

TADMOR. See PALMYRA.

TAFILLELT, or TAFILET, a town of Morocco, capital of a province of the same name, near the southern foot of Mount Atlas, about 270 miles E.S.E. of Morocco. It consists of several contiguous villages, enclosed with walls and towers, and defended by a citadel. Manufactures of morocco leather, silk, carpets, and woollen fabrics are carried on here; and there is a considerable trade with the interior of Africa. Pop. 11,000.

TAGANROG, a seaport of European Russia, in the government of Ekaterinoslav, on the north side of the Sea of Azoph, opposite the mouth of the Don, 65 miles W.S.W. of Novo-Tcherkask. It is walled, and defended by a citadel, and though, for the most part, built only of wood, has a very imposing appearance. It contains three stone churches, besides others of wood, a splendid monastery, gymnasium, normal seminary, exchange, and barracks. There are also docks, a naval hospital, and a quarantine establishment. Leather, wax-cloth, soap, candles, &c., are manufactured here; and an active trade is carried on. Wheat, linseed, rapeseed, tallow, wool, and other articles are exported in large quantities; and wine, fruit, tobacco, woollen, cotton, and silk fabrics are imported. The bay is so shallow on account of the quantities of sand brought down by the Don that only small vessels can enter it; and in consequence the trade of the town has somewhat declined of late years. It is still, however, much frequented by vessels. Taganrog was founded in 1697 by Peter the Great, but subsequently deserted, and rebuilt in 1769. The Emperor Alexander died here in 1825, in a room which has since been converted into a chapel. Taganrog was bombarded, and much of its stores destroyed by the allied fleet in July 1855. Pop. 18,515.

Taghmon ‖ Tagus.

TAGHMON, a market-town of Ireland, formerly a parliamentary borough, in the county, and 7 miles W. of Wexford. It consists partly of good houses, built of stone and roofed with slates, and partly of mere mud hovels. There are a parish church, a Roman Catholic chapel, and two schools. Pop. 1082.

TAGLIACOZZI, GASPARO, a renowned surgeon, was born at Bologna in the year 1546. He studied in that university under Cardan, and took his doctor's degree at the age of twenty-four. He was appointed professor of surgery, and afterwards of anatomy; and after having acquired much reputation, he died at Bologna on the 7th of November 1599. His principal work is entitled *De Curtorum Chirurgia per Insitionem libri duo*. Venit. 1597, fol. It was reprinted under the title of *Chirurgia novo de Narium, Aurium, Labiorumque Defectu per Insitionem Cutis ex Humero, arte hactenus omnibus ignota, sarciendo*. Francof. 1598, 8vo. This new title sufficiently indicates the art which he professed, of repairing noses, ears, and lips, by a species of ingrafting. His Latinized name of Taliacotius is well known to the readers of Butler's *Hudibras*.

TAGODAST, a town in the interior of Morocco, at the west foot of Mount Atlas, 98 miles N.E. of the town Morocco. It has some trade in oil and honey, and a population of 7000.

TAGUS (Span. *Tajo*, Port. *Tejo*), the largest river in the Iberian peninsula, which it traverses from east to west, and divides into two nearly equal parts. It rises in the Sierra Molina, on the borders of the Spanish provinces of Cuença and Teruel, and flows at first in a north-east direction, separating the former of these provinces from that of Guadalajara. After receiving the Molina from the north-east, it turns to the south-west, and about 50 miles lower down receives the Guadiela, on the frontiers of the three provinces of Cuença, Guadalajara, and Madrid. It continues to flow south-west until it enters the more open country in the province of Toledo, where it takes an irregular westerly direction, and traverses the fertile and well-peopled tableland of central Spain. In this part of its course, the Tagus receives the Jarama with its affluent the Tajuna, and further down the Guadarama and the Alberche, all from the north. The tributaries which join it from the south are of much smaller size, as the Sierra de Toledo on that side approaches much nearer to the river than the Sierra de Guadarama on the north. The Cedron is the chief affluent that the Tagus here receives from the south. After traversing the province of Toledo the river enters that of Maceres, where it is joined by the Alagon from the right, a river which brings down from the mountains such a volume of water as to render the united stream navigable from the sea up to the confluence at Alcantara. Above this point the Tagus cannot be navigated, owing, in some measure, to the rapidity of its current through narrow valleys, and it forms rapids of great length. Below Alcan-

[1] Vopiscus, Tac. *Imp.* c. x.

Tahiti || Talfourd.

tara it begins to turn towards the south-west, and for some distance forms the boundary between Spain and Portugal, finally entering the latter country, in which it separates the provinces of Bara and Alemtejo, and after traversing that of Estremadura, falls into the Atlantic by a wide estuary which forms the port of Lisbon. The chief affluents of the Tagus in Portugal are the Zezere from the right, and the Zatas from the left. Its whole length is estimated at 540 miles; and it probably drains an area of 40,000 square miles. The most important towns on its banks are—Aranjuez, Toledo, Talavera, Almaraz, Alcantara, Santarem, and Lisbon.

TAHITI. See POLYNESIA.

TAIN, a royal, parliamentary, and municipal burgh of Scotland, in Ross-shire, on the south shore of the Dornoch Firth, 24 miles N.N.E. of Inverness, and 88 N.W. of Aberdeen. It stands on a gravelly terrace, elevated a considerable height above the sea, and is irregularly laid out, but contains many good houses. Near the centre of the town stands an ancient tower with a spire, connected with the handsome new court-house and county-buildings. The most interesting building in Tain is the old church of St Duthus, now in a very neglected and ruinous condition, but still a beautiful specimen of Gothic architecture. The modern parish church is a huge square building, with a tower at each corner. The Free Church and the United Presbyterians have places of worship in Tain, and there are also an academy and several other schools, a mechanics' institute, a large poor-house in the Elizabethan style, a prison, &c. Besides several mills, the town contains an iron-foundry and a brewery. There is no harbour here, but a considerable retail trade is carried on. The burgh is governed by a provost and fifteen councillors; and it unites with Wick, Dingwall, Cromarty, Dornoch, and Kirkwall in returning a member to Parliament. Pop. of the parliamentary burgh, 2049; of the town, 2588.

TAI-WAN, a town of the Chinese empire, capital of the island of Formosa, on its west coast, N. Lat. 23. 8., E. Long. 120. 22. It contains two celebrated temples, and the fort of Zellandia, erected by the Dutch in the seventeenth century. The trade of the place was formerly considerable, but has of late declined, as the harbour has become so choked up with sand as to admit none but small vessels. Pop. 50,000.

TAI-YUAN, a town of China, capital of the province of Shan-si, on the Fuen-ho, 250 miles S.W. of Pekin. It is about eight miles in circumference, surrounded with walls; and it contains a ruinous palace, the imperial residence of the Tchao dynasty, and a burial-place, planted with cypresses, and containing the tombs of many monarchs of that dynasty. Tai-yuan is densely peopled, and has manufactures of porcelain, hardware, and carpets.

TALAVERA-DE-LA-REINA, a town of Spain, New Castile, in the province of Toledo, on the Tagus, 64 miles S.E. of Madrid. It is an ancient, decayed town, formerly surrounded with a triple wall, portions of which still remain, and present a very picturesque appearance. The streets are straggling and ill paved, but many of the houses are good, with porticoes and balconies. There are here a Gothic collegiate church; a fine old convent, now a manufactory; several other churches and convents; a town-hall, prison, theatre, schools, and hospitals. Silk, earthenware, leather, and soap are manufactured here; and there are also several mills. Talavera is historically celebrated for the victory gained here, on the 27th and 28th of July 1809, by the English and Spanish troops, under Wellington, over the French. Pop. 5500.

TALENT. See COIN, and WEIGHTS AND MEASURES.

TALFOURD, THOMAS NOON, an English dramatic poet and popular barrister and judge, was born at Reading in Berkshire, January 26, 1795. His parents were respectable dissenters of the middle class; his father a brewer in Reading, and his mother the daughter of a dissenting minister, the Rev. Thomas Noon. A certain puritanical strictness environed the early days of Talfourd, "a crabbed sectarianism (as he himself termed it), at once active and stern," which, for a time at least, "cradled the thoughts of childhood." He was only permitted to look on the world of literature through the network of sincere but exclusive opinions. One book, however, was open to him which afforded peculiar enjoyment. This was the *Sacred Dramas* of Hannah More, from which he derived his first idea of dramatic action. His preceptor, Dr Valpy, of the Reading Grammar School, also inspired him with a taste for classic literature, especially the Greek tragic drama; and this noble field of poetry and passion, grace and majesty, it was ever afterwards his highest delight and ambition to study and imitate. From his childhood Talfourd was a writer of verses,—the form in which literary talent generally makes its first manifestations,—and he obtained some local celebrity as a contributor to the columns of the Reading newspaper. It was necessary, however, that he should be put to a profession, and he selected that of the law. In his eighteenth year he proceeded to London, and placed himself under Mr Chitty, the eminent pleader. He was a diligent student, and in after years, when he published his dramas, he could honestly prefix to them the declaration of Pope—

Talfourd.

> "I left no calling for this idle trade,
> No duty broke."

But jealous as the goddess Themis is acknowledged to be, the closest votary of law has his hours of recreation. Talfourd occasionally frequented the theatre, and studied the poetry of Wordsworth. He has described in his preface to *Ion* the delight with which, for the first time, he saw the curtain of Covent Garden Theatre raised for the representation of *Cato*—the Roman Stoic being personated in rigid grandeur by John Kemble—and he was haunted by the wish to write a tragedy. But his taste and feeling, he says, underwent an entire change on his becoming acquainted with the works of Wordsworth, introduced to him by his friend Mr Barron Field. He was possessed with a love of contemplative poetry; "he pondered over the resources of the profoundest emotions," and at a time when Byron was the object of the national idolatry, he unhesitatingly proclaimed Wordsworth to be the greatest poet of his age. At this period Talfourd contributed essays and criticism to the magazines, and we believe was an occasional reporter for the daily press. In 1821 he was called to the bar, and joined the Oxford circuit. Next year he was married to Miss Rutt, daughter of Mr John T. Rutt of Clapton, to whom he was tenderly attached. More than twenty years afterwards, he dedicated his *Recollections of a First Visit to the Alps* to his wife, "whose image," he says, "endears the recollections of a delightful tour, as it cheers and graces the journey of life." This inscription is characteristic of the affectionate nature of Talfourd, which overflowed with kindness to all his relatives and friends. Having now "given hostages to fortune," the young barrister applied himself assiduously to his profession. He rose into extensive practice, and in 1833 was rewarded with a silk-gown, or made serjeant-at-law, on which occasion he was heartily congratulated by his friends, Charles Lamb being among the number. Higher honours were soon to follow. In 1835 he was returned to Parliament as representative for his native town, and the same year he printed for private circulation his tragedy of *Ion*. He had no hope, as he has stated, of his drama being found capable of representation on the stage; its severe classic fable and incidents were remote from the ordinary range of human sympathies. But Mr Macready the actor, a better judge of stage effect, produced it at Covent Garden Theatre in

Talfourd.

May 1836, with distinguished success, and it was afterwards received with no less favour in the United States. The name and situation of the hero, as a foundling youth, educated in a temple and assisting in its services, were borrowed, as the author states, from the tragedy of Euripides. He had recourse also to the old Grecian notion of destiny, working its results apart from moral agencies, and impelling its victims onwards, as it were, by fascination towards the predoomed and inevitable issue. The city of Argos had been visited by a deadly pestilence consequent on the misrule of its kings, and the oracle had announced that vengeance could only be averted by the extirpation of the guilty royal race. Ion, the foundling, undertakes to slay Adrastus the king, who keeps frantic revelry and uproar in his palace; but the heroic youth turns out to be the son of Adrastus, and in the end, after the royal tyrant had fallen a victim to the popular fury, Ion sacrifices his own life to remove the curse which his ancestry had entailed on the devoted city. Thus a stern and lofty spirit of patriotism pervades the drama; but it is relieved and varied by scenes of deep tenderness and moral beauty, and by a profusion of imagery select and picturesque, though sometimes misplaced where the tragic interest and pathos predominate. Indeed, an excess of ornament, the fruit of an exuberant fancy, characterises both the poetry and prose of Talfourd. His next production was also cast in the classic mould. It was a drama entitled *The Athenian Captive*, which was brought out with success at the Haymarket Theatre. Like *Ion*, the *Athenian Captive* is conceived in the spirit of the Grecian drama; and it also abounds in high-toned romantic sentiment and passion, but the plot is less artistically managed, and the catastrophe less interesting, than those of the first tragedy. The production and success of these two plays were attributed by some parties—disappointed dramatists and critics—to the author's friendship with Mr Macready, and to other personal circumstances. He therefore resolved that his next piece should be offered to manager and actors as the work of a stranger. He produced *Glencoe, or the Fate of the Macdonalds*, which was accepted and passed the ordeal of its first representation in 1840, before the disclosure of the author's name. This play is founded, as the name imports, on that "terrible incident which deepens the impression made on all tourists by the most awful Pass of the Highlands." The massacre of Glencoe, in its genuine historical features, is tragic enough. The rugged solitary glen, the wild freebooter tribe of Mac-Ian, the almost incredible cruelty and treachery of the Campbells, and the wintry midnight scene of death and terror crowning the whole, seem materials exactly shaped and grouped for the stage. The genius of Melodrame could not desire a better combination. Talfourd connected a love-story, somewhat complicated, with the event of the massacre, and introduced personages possessing the refinements of modern society. Such adjuncts were perhaps necessary towards a regular five-act play; but they do not harmonize with the actual scene and its historical associations. The real characters, the Macdonalds and Campbells, and the fiend-like statesman Dalrymple, are too well known, and too strongly imprinted on the imagination, to give place to fictitious scenes and actors. The latter appear as intruders on the wild domain, and they do not excite any strong interest. The play is marked by Talfourd's fine fancy and feeling, but it is altogether an inferior performance, and has not kept possession of the stage. A fourth tragedy, *The Castilian*, founded on Spanish history, completed the dramatist's labours in this department of literature. We believe this play was never acted, and, like *Glencoe*, it is deficient in nationality and true colouring; but in point of literary merit, as respects the delineation of passion and feeling, it is equal to any of its predecessors, except *Ion*, which must be held to be the crowning effort of Talfourd in his favourite field of the drama. The prose works of our author may be considered as, in some measure, accidental productions rather than regular studies. He made journeys to the continent during intervals of professional employment; and having kept a journal, was induced to publish *Vacation Rambles*. One of his most cherished literary friends died, and he was importuned to collect and publish *The Letters of Charles Lamb, with a Sketch of his Life*. He made one striking appearance in the House of Commons, and he was led to put forth to the world a *Speech on the Law of Copyright*. Early in life he wrote a memoir of Mrs Radcliffe the novelist, and he contributed to an encyclopædia an essay on the Greek drama. His fugitive magazine productions have never been collected. Talfourd's travelling records—*Recollections of a First Visit to the Alps*, 1841; *The Alps Revisited*, 1842; *Chamouni Revisited, with Attempt to Ascend Mont Blanc;* and *Supplement to Vacation Rambles* (containing an account of his journey to Naples, Rome, &c.), are very pleasant, truthful narratives, possessing a sort of biographical interest. The traveller never loses his identity amidst foreign scenes. His passion for theatres and courts of law, his epicurean tastes and propensities, are undisguisedly exhibited. But along with these we have a genuine love of nature in its grandest as well as its loveliest forms, and a large-hearted sympathy with every good and benevolent object. His *Life of Charles Lamb* is a more ambitious performance. It contains some passages of "fine writing," and occasional disquisition, that would be as well away; but few memoirs possess so strong and painful an interest, or have so marked a character of originality. Lamb was unique among literary men, and the life of the delightful humorist deserved to be portrayed at length. In 1849, Serjeant Talfourd was raised to the bench. The welcome intelligence was telegraphed to him from London to Stafford, where he happened to be on the circuit attending the assizes. About five years afterwards, the same wires conveyed from Stafford to London the sad and startling announcement, that Justice Talfourd had died of apoplexy, while delivering his opening charge to the grand jury. He had reviewed the calendar, and from the number of cases of highway robbery which it contained, was led to speak of the evils connected with our artificial state of society. Suddenly he fell forward on the desk, and in a few seconds expired. This solemn and affecting close of a life so honourable, so successful, and happy, took place on the 13th of March 1854, when Talfourd was in his sixtieth year. At the Derby assizes, Mr Justice Coleridge adverted to the melancholy occurrence, and said his deceased friend "was much more than merely a distinguished leader, an eminent judge, or a great ornament of our literature. He had one ruling passion of his life—the doing good to his fellow-creatures in his generation. He was eminently courteous and kind, simple-hearted, of great modesty, of the strictest honour, and of spotless integrity." What higher eulogy could be desired? (R. C—S.)

Talipat.

TALIPAT, TALAPOT, TALPAT (*Corypha umbraculifera*, Linn.), one of the noblest and most gigantic of the majestic family of palms. It is found in the Southern Dekkan and in the Malay peninsula, and attains to the utmost perfection in the forests of Ceylon. Here its cylindrical stem, spirally marked by the traces of fallen leaf-stalks, reaches the height of 100 feet; rising generally without flexure, and bearing a crown of fan-shaped leaves, with numerous bilobed divisions. Of these the petiole is from 6 to 7 feet in length, and the blade, when expanded, forms an oval 8 feet long by 16 broad, calculated to cover an area of 200 superficial feet.

The talipat having a terminal panicle, flowers but once; and dies after ripening and dispersing its seeds. The spathe appears at the extremity of the stem; and its burst-

Talleyrand.

ing on the expansion of the flowers is said to be accompanied by the phenomenon of an audible explosion. The flowers, of a greenish white, tinged with red, and emitting a sickly odour, are produced on a blanched spadix, which during efflorescence adds from 10 to 15 feet to the height of the palm. These are succeeded by a multitude of roundish one-sided berries, on the dispersion of which decay begins, and proceeds with such rapidity that the tree is extinct within a very few months from the first appearance of the flower. The talipat is said to live to the age of 100, but its leaves are largest and most luxuriant about its thirtieth year.

No part of the talipat contributes materially to the economic uses of man, with the exception of its umbrageous leaves. These, when full grown, are used for covering houses and forming ceilings, screens, and partitions in rooms. The natives of Ceylon improvise from them parasols and umbrellas on their journeys, and tents when reposing for the night; and one of the attributes of rank among the mountaineers of Kandy is the privilege of having borne by their attendants gigantic fans made of the talipat leaf, highly decorated with tinsel, and inlaid with plates of transparent talc.

But the most interesting purpose to which the young leaf of the talipat is converted is in substitution for parchment and paper, as a material for records, letters, and books. The custom of so applying it has prevailed from the earliest ages; and Albyronni relates, that, prior to the tenth century, the Arabian mariners resorting to India found the people writing on strips of the "*târy*" or "*tala*" palm, which, after cutting them into pieces a cubit long and three finger-breadths wide, they formed into books by passing a string through a hole pierced in the centre of each. This passage describes accurately the *olas*, as they are made at the present day, from the tender leaves both of the talipat and palmyra (*Borassus flabelliformis*). The practice is to free the leaf from the midrib and tendons, and to macerate it in heated spring-water, and occasionally in milk, when it is slowly dried in the shade, and afterwards more thoroughly in the sun. In this state the strips are called in Ceylon *karakola*, and are used for all ordinary purposes. But a fine description, called *puskola*, is prepared in the temples by the Buddhist priests and novices, who, after damping the *karakola*, draw it smartly backwards and forwards across the edge of a smoothed plank of Areca-wood, till its surface becomes even and partially polished. As the moisture dries during the operation, the *ola* is damped afresh till the required effect is produced.

The faculty for receiving writing possessed by the talipat leaf depends on the thin layer of spongy matter enclosed between the two coriaceous surfaces of the upper and under side; these latter are readily incised with the point of an iron stile, leaving sharp furrows, that are afterwards rendered legible by rubbing in a mixture of charcoal tempered with oil. The effect of the latter is said to protect the *olas* from destruction by the white ants (*termites*), and other insects. If intended to form a book, two holes are made in the leaves, one near each end, to receive cords, by which they are secured between two wooden covers, generally decorated with carving or lacquered devices. (Berthold Seemann's *History of Palms and their Allies;* Sir J. Emerson Tennent's *Ceylon;* Fergusson's *Palmyra Palm;* Reinaud's *Mémoire sur l'Inde*, p. 305–307.) (J. E. T.)

TALLEYRAND-PÉRIGORD, CHARLES MAURICE DE, Bishop of Autun, and the most celebrated diplomatist of his age, was the eldest of three brothers, and was born at Paris on the 13th of January 1754. He was sprung from a very illustrious race, both by father and mother. His maternal grandmother was the celebrated Princess des Ursins, who befriended so materially King Philippe V. in his attempts to keep possession of the crown of France. As was usual among families of distinction of that period, the infant Talleyrand was given out to nurse as soon as it had seen the light; and for the next twelve years of the child's life, he only looked on the face of strangers in a remote faubourg of Paris. If this training had a bad effect on his mind and morals, it at least exerted a beneficial influence on the health and spirits of the future diplomatist. The Comte de Talleyrand, his father, was absent, engaged in the wars of his country, and the brilliant and gay countess, his mother, could not deprive her swarm of admirers of the fascination of her company any longer than was absolutely necessary. The father was in the pursuit of ambition and of fame, and the mother was in hot chase after pleasure and fortune. So their offspring, instead of being cared for by those who had brought them into being, had to shift as best they might amid the ignorance and squalor of a country village. An accident which Talleyrand met with when a child rendered him lame for life, and his uncle, the Bailli, who had just returned to Paris from the French fleet, on riding out long miles through the snow and mud to obtain a glimpse of the heir of the Talleyrands, found the fair ruddy boy with his long wavy ringlets hobbling along with the help of a crutch, to entrap larks among the snow. The rough simple nature of the sailor was much moved by this spectacle. He at once sought out Mère Rigaut, the ancient nurse with whom the boy resided. After some hot words with her, the Bailli, with a sturdy swing, planted the youth in the saddle before him, put spurs to his roadster, and was out of sight, hugging the boy in transports of affection, before the astonished Mère could get her cracked voice raised to a decent shriek of lamentation. The brave Bailli had no sooner seen the lad safely in the hands of a professor at the Collége D'Harcourt, than he immediately set off to embark in his fleet at Toulon, where he was drowned some few months afterwards. Talleyrand's father likewise died some time after from the effects of an old wound; and so Charles Maurice was now by right the Comte de Talleyrand, and the head of that branch of the family to which he belonged. *Madame sa Mère* now descended from the height of her *salon*, and in the company of an eminent surgeon visited the Collége D'Harcourt, where her son was. After the surgeon had burned, cauterized, and tortured the poor lad's weak limb for some time, he was at length removed to St Sulpice, where a black-robed priest informed him that his birthright was to be transferred to his younger brother. "Why so?" faltered the strong-hearted youth. "He is not a cripple," was the stern and cruel answer. And not only was he to lose his birthright; he was likewise deprived of the liberty of choosing a profession. The church, he was informed, was open to him; and Talleyrand, with a combined feeling of despair and resignation, stifled the rebellious passions which raged in him, and with a fierce look hobbled out of the room. Men should see yet whether the rightful heir to the princely house of Talleyrand should drag out his existence as an humble curer of souls. But, could not he bide his time? The power of patiently waiting until his star arose was perhaps the most signal mark of real greatness which Talleyrand possessed. This disposition at once asserted his superiority to the vulgar standards of pre-eminence, and raised him up, as it always does, to a dignity in the eyes of his contemporaries, such as few men could lay claim to. It was perhaps dexterity rather than original power that he gave evidence of during his school and college days. Adroitness, suppleness both of body and mind, were his ruling characteristics. He astonished the timid Paris youths by the singular fleetness and nimbleness which a lame rustic youth could occasionally display. The sharp, keen, cutting penetration; the dexterous manœuvring; the wily flattery; the haughty arrogance; the lively wit; the bitter sarcasm; the occasional spurts of gross immorality which he exhibited, evinced a nature strong, energetic, and morally unscrupulous, that gravitated rather to what was unlawful than to what was established. Doubtless his parents had much of the sin of the youth's wickedness to bear. He had never slept a night under their roof until he was seventeen years old! No tender motherly education had he ever received: no experienced paternal warnings ever came to check the course of his headlong passions: nothing but the surly and unwelcome command of domineering priests, which made the lad's blood boil within him, and caused him to vow vengeance against the whole world. Talleyrand took to his books with a surly doggedness, with which no one cared to interfere. His studies were pursued fitfully. It was evident that he would neither make a learned *savan*

Talleyrand

Disinherited.

Early vices.

Early training.

Talleyrand.

nor a profound theologian, but he gave unquestionable evidence of his skill in cunning intrigue and in diplomatic astucity.

He had much too strong a nature to consume his time in cursing his fates. During these years at St Sulpice, and at the Sorbonne, he was untiring in his zeal for literary and scientific knowledge. If he did not go very deep into anything he came in contact with, he at least stored much knowledge away in the treasure-house of a most tenacious memory, whence, in after-years, he drew forth, whether for the purposes of illustration or of ornament, the stock which had lain so securely there until it was required. By the time he had reached his twentieth year, his reputation for talent and bodily vigour had become so great, that the Talleyrands half repented of having disinherited the *abbé boiteux;* and accordingly resolved to acknowledge him. They introduced him to society on the coronation of Louis XVI. in 1774, under the title of the Abbé de Périgord. This young priest was without doubt one of the most licentious men in all Paris. The secret memoirs and chronicles of the time are filled with his seductions and amours. Some of the tales are obviously mythical, bearing as they do so much of that character of invention and romance peculiar to the time and country, that a patient biographer of the present day had much better pass them by as fabulous, than quietly record them as if they were true. While there was certainly nothing in the character of the Abbé's robes to shield him from such charges, yet there was much in his high rank, in the functions which he was afterwards chosen to fulfil, and in the ambition for future promotion, which never slept in his breast, which all tend to throw into discredit a great many of the foul tales told respecting the gross irregularities of his youth. After all reasonable allowance has been made for the exaggerations of folly or of calumny, a pretty considerable sediment remains, sufficient to darken into the character of rakes any score of ordinary men. However, there is but little need to overstrain any fibre in the character of Talleyrand, where the whole moral network is so warped by turpitude and entangled by falsehood. There can be no doubt, that for his lechery and other kindred crimes, he was incarcerated for a good many months in the Bastille jail, and in the prison-house of Vincennes. Caution and subtlety in future, in the accomplishment of his designs, were all he would gain from his prison experience.

Publicly recognised.

The licentious Abbé.

But the Abbé de Périgord now ascended a few rounds of the ladder, and came forth as a public character in the salons of Paris. Intrigue, which was written all over his nature in his youth, instead of being converted into honesty of purpose, only grew in subtlety and complication with his expanding years. He now set himself to become, despite his hated priestly robes, a thorough man of the world. The pride and reserve of former years were cloaked over by that condescension and politeness which only a Frenchman knows how to employ. The ruder aspects of his strong nature had now to give way before the elegancies of refined society and the principles of good taste. Conversational talent, always in high demand in a city like Paris, was then in very great request. In this accomplishment the Abbé resolved to shine, and he had little difficulty in doing so. Voltaire, whom Talleyrand had met in 1776, was the deity to whom the Abbé offered up his daily devotions. Fontenelle was his constant companion. He formed his written style on those exquisite models, and his conversational style was drawn from the same source. Having made himself master of the arts of good breeding, and of concealing his thoughts under the guise of polished speech, his ambition urged him forward to new conquests in a higher and giddier sphere. As lust had hitherto been the amusement of his leisure hours, he resolved to make money henceforward his pastime. He had gambled hitherto for pleasure rather than for gain; hereafter he should study lucre in place of enjoyment. The penetration and depth, the consummate prudence and dexterous skill, which he had occasionally displayed, could not be passed by, particularly in one so well connected as Talleyrand. The Abbé was Accordingly appointed, in 1780, to the office of general agent for the clergy of France. He had all along studied more or less fitfully the subject of finance, then not much understood in France. M. Necker's first administration had given place to M. de Calonne's. The Abbé de Périgord dedicated a paper on the state of the finances of France to this minister. Mirabeau, who was then a prisoner at Vincennes, recommended the Abbé to the favourable notice of Calonne, in a letter which curiously displays the ardent generosity of this strange man's nature. "You have stated to me," writes Mirabeau, "the regret you experienced at my unwillingness to devote my feeble talents to the embodying of your high conceptions. Permit me, sir, to point out to you a man deserving of this proof of your confidence. The Abbé de Périgord unites great and tried abilities to profound circumspection and unshaken discretion. You will never find a man more trustworthy, more religiously devoted to the dictates of friendship and gratitude, more desirous of giving satisfaction, less envious of the glory of others, and more convinced that such glory is essentially due to him who possesses the capacity to conceive great designs and the courage to execute them." This is very interesting and curious, as coming from a man who only knew the half of the individual whom he so warmly recommended. Mirabeau did not require to wait long to see the darker side of the picture. Here it is in a letter to the Comte d'Antraigues. "The situation I am placed in," says Mirabeau," "rendered still more gloomy by the infamous conduct of the Abbé de Périgord, has become intolerable. I send you, unsealed, the letter which I have written to him: read it, and send it to him. I repeat it, send it to him; for I trust you do not know that man, and I am quite sure he ought to be known to every honourable person. But my misfortunes have thrown me into his hands, and I must still deal cautiously with this vile, rapacious, mean, intriguing man. He breathes nothing but turpitude and venality. For money he has sold his honour and his friend. For money, he would sell his soul, and he would be right, for he would in such case barter dirt for gold." This is much more savage than the polite churchman could have wished; but he knew how to gain over Mirabeau, and the two politicians afterwards became great friends. M. de Calonne meanwhile resigned, and M. Necker was again reinstated. The nimble Abbé was all bows and smirks before the new financier. True to what we have already seen of his character, however, he turned his back upon M. Necker as soon as the breeze of popular favour took a different direction.

Talleyrand.

Finance.

His friendship with Mirabeau.

The Abbé de Périgord discharged the function of clerical agent for eight years. There he had ample room for cultivating his talents for administration. Forming, as the Gallic church did, an important element in the state, the general agent of the church was their clerical representative before the highest court of the nation. He consequently held a prominent place in the eye of the public, and was regarded on all hands as a powerful subject. Years had had their influence both on the appearance and the mind of Talleyrand. If he still hobbled in his gait, he carried himself with much greater dignity than formerly. His manners were quite fascinating, and he heightened his attraction greatly by the winning expression of his countenance, and by the charm of his conversation. The boyish rake had become the intriguing man; the breaker of young hearts now proved the ruin of old ones. In 1788, the Abbé de Périgord donned the ermine of the Bishop of Autun. Thirty-four years was a young enough age for a

Clerical agent.

A bishopric.

Talleyrand. bishop, but had not Cardinal Medici been devoted to the popedom when he was no older? Had not this good Abbé de Périgord likewise pronounced a great *Discours sur les Loteries* in the Assembly of the Notables at Versailles in February 1787? What more could be said? The Bishop of Autun was accordingly a member of the States-general assembled in May 1789. The interval from this date to the ultimate dissolution of the assembly is a highly curious and important one for all who wish to obtain any key to the character of this subtle diplomatist. In one or two speeches of much logical force and coherence, and a large commingling of that suavity of manner and sweetness of air, which he knew better than any other Frenchman of his time when and how to assume, he set forth to the assembled clergy the propriety of their giving up their tithes and church lands to the free disposal of the nation, to whom they properly belonged. Speaking on the latter question, the bishop said—"I warn my colleagues, the members of the order to which I have the honour to belong, to bear in mind the actual danger of our situation. The clergy, in fact, are no longer an order of the state, but a class of the community. In this entirely new order of things, which, it seems to me, people are but too apt to forget, the clergy have only kept possession of their lands. . . Now, who is the true proprietor of those lands? Is it the clergy? No: most certainly not. . . To whom then ought to devolve the property of those lands? The answer cannot be doubtful—To the nation." Then the speaker sums up: "Let us trust our persons and our fortunes to the nation, and that without reserve. Such entire devotion can but raise its gratitude and ensure its respect. A few more attempts at resistance in so unequal a struggle, and we shall lose for ever the fruits and honour of a generous resignation. Boldly to face necessity, is the only way to appear not to fear it; or, to speak in a manner more worthy of you, is not to fear it in reality. . . Let us show that we wish to become citizens, and remain nothing but citizens; that we are anxious to form part of that national unity which makes France a whole. It is then that the clergy will have justified, by the greatness of its sacrifices, the honour it formerly enjoyed of being considered the first order in the state. In fine, it is by ceasing to be an external object of envy and hatred, that the clergy will become an assemblage, it may be said, of much better materials, an assemblage of citizens, and the object of the eternal gratitude of their country." Thus this dexterous negotiator, this disciple of Voltaire and Fontenelle, this worldly-minded Bishop of Autun, tried his hand thus deftly at gilding the pill which his brethren the French clergy were designed to swallow. It took the genius of Mirabeau, however, to force it down the clerical throats. The good bishop evidently loathed the church and the whole of its votaries in his heart. He only clung to it as to a useful political machine, in which, however, he had no faith, and which he could only support from mere motives of expediency. In the same manner it was that he gave unmistakable marks of having a pretty favourable leaning to the side of the aristocracy, of which he himself was a scion. At times one would be inclined to think that he maintained with the *philosophes* of his day the natural equality of men; but this, if it was at all real, could only have been something like a logical conviction which he had caught up from the ceaseless jargon of the constitution-builders of his time. Talleyrand had all the involuntary and unconscious *hauteur* of his class, and he had been long accustomed to regard with pride the superiority of his birth. Despite the eminence of his mind, and his philosophical notions, he could not get the better of being vain of that illustrious origin which, so far as he was concerned, was the bestowal of mere chance. Even during the republic, when men required to walk as warily as fawns, he gave no unmistakable signs of his aristocratic insolence. Subsequently, during the time of the consul- Talleyrand. ship, his style of remarks respecting upstarts is well known. The causticity and the possible truthfulness of his comment makes it all the more telling. "It is easy to perceive," said he, "that they are not much used to the drawing-room." With the people he had, from his early training and associations, more than a partial sympathy; but he never ceased to look upon the noblesse as the natural rulers, even when he was constrained to shape his speech and his actions into directly the opposite course, either from motives of policy or of self-interest. This anti-radicalism, as an Englishman would call it, showed itself strongly in his desire to assimilate French institutions to English ones; and this was more than mere talk. He even avowed his anxiety to establish a constitution in France similar to that of England. But we are anticipating.

Plausible debater.

The Bishop of Autun, during the six months of the existence of the Etats Généraux, was very actively engaged. He began by using his influence to induce his order to join the General Assembly. He proposed to annul the imperative mandates of the provinces to their deputies, and maintained the obligation of the bailiwicks to submit to the decrees of the Assembly. He introduced a bill of rights in favour of citizens, and proposed to abolish the tithes and church lands of the clergy. The financial schemes of M. Necker were supported by him; he proposed to supply the public treasury from the sale of church lands; he successfully endeavoured to secularise public education; and he made a great speech on the readjustment of weights and measures. These and many other projects engaged the attention of the active bishop during these months. He was besides a most useful member of the National Assembly; and, mong many speeches which he spoke in the hall of that great meeting, few were more applauded than his harangue to the people, warning them against libels, and recommending a firm and steady line of conduct. It was regarded as a masterpiece of parliamentary eloquence. The Jacobin and other clubs were now got fairly set agoing, and Talleyrand was engaged in founding the society of the Feuillantes. In the month of May 1790, the Bishop of Autun received a letter of the most polite mockery from the canons of his diocese. It was to this effect:—"My Lord Bishop, we have read with the liveliest interest the declaration of a portion of the members of the National Assembly in favour of the holy catholic religion, and at the same time we have been deeply afflicted at not finding at the bottom of this document the name of our deputy and bishop. Far be the supposition from us that a minister of Jesus Christ, honoured with his sacerdotal functions and raised to the episcopal dignity, has refused to sign his name to the profession of faith which every one of the faithful ought to be ready to do at every moment of his life! God forbid that we should yield to suspicions so injurious to the honour of episcopacy, as well as to the glory of the see which you occupy! . . . We therefore hasten to forward to you the resolutions in which we have attempted to embody the expression of our fidelity and attachment to the catholic, apostolic, and Roman religion. We beseech your lordship, after having affixed your signature, to present it to the Assembly as the most glorious testimony of our patriotism. . . . We shall also publish the letter we have the honour of addressing to your lordship. It is honourable both to you and to ourselves, as it is the deposit of the confidence we place in your lordship, and which you will no doubt justify with alacrity. It will serve, besides, to propagate and give solemnity to the religious and patriotic feelings expressed throughout the whole of it, and will make known to all the world the real feelings of the bishop and canons of the diocesan chapter of Autun." This masterpiece of irony would have galled to the quick many a lord bishop, but the humble canons of Autun for-

Talleyrand.

got the nature of the man they had to rule over them. Of the profoundest dissimulation, he feigned to take their letter, which really annoyed him, in the most serious strain, and answered it in the very gravest manner. In the politest way in the world my Lord Bishop of Autun gives his too meddling canons the most direct rap over the knuckles, and advises them, as it were, to mind their flock for the future. "In closing my letter," says the Bishop to the Dean of Autun, "I come to that part of yours where you request me to present to the National Assembly the text of your deliberation. Do not blame me, sir, for declining to do so. I do not know how to bring myself to present to a legislative body a protest against its decrees; and to present it, above all, as you desire me to do, as a glorious testimony of your patriotism. I prefer consigning it altogether to oblivion."

The want of faith of the Bishop of Autun had become notorious both to clergymen and laity, but the astute politician treated all such charges with indifference, and went on his way, urging forward the revolution to the extreme point. He felt the necessity of keeping up an established system of religion, if merely to act as a quasi-political check upon the natural license of men. And hence, after breaking down the strength of the clergy, he wanted to be thought their protector. In this portion of his conduct we see but too clearly the ruling maxim of his policy throughout his entire public career. One of the greatest shams of his entire episcopate was his consecration of the eighty-three departmental banners, and the bestowal of his blessing, "another than that of Jacob," upon the young republicanism of France. Mr Carlyle remarks, in his *French Revolution* (vol. i. p. 277), with the other sorrowing historians of that day, that "suddenly, while Episcopus Talleyrand, long-stoled, with mitre and tricolor belt, was yet but hitching up the altar-steps to do his miracle, the material heavens grew black; a north wind, moaning cold moisture, began to sing; and there descended a very deluge of rain." This is the way in which certain truth-speaking "irreverent" historians talk of this glorious consecration. But a serious and withal an unexpected accident was soon to happen to his reverence of Autun. His holiness the pope, having got tired of the unbelieving bishop, had him excommunicated. For which good deed, among others, Father Adam (Saint Hurugeviz), on the 4th of May, burnt the pope in effigy. There was no church, either living or dead, that had not the most indubitable right to excommunicate Talleyrand. A man destitute of all kinds of faith, both divine and human, whose only belief was that the world was his oyster, which he by dint of policy rather than force must strive somehow to open.

Acmé of insincerity.

He is excommunicated.

Talleyrand, now that he had lost the power to bless, urged on the republic with the energy of a Tamerlane. He was almost the only aristocrat who countenanced republicanism; and yet he was by no means a republican at heart. He was not an advocate for the total subversion of order, and for the diabolical scenes of bloodshed which the revolution witnessed. His manners were too elegant, his habits were too luxurious: he was too fond of sensual pleasure, and of its pre-requisite lazy indulgence, to regard a real republic in any other light than one of pure speculation. In his heart Talleyrand despised the people and their clumsy attempts at carrying out the principles of Jean Jacques. Indeed, it is rather to be feared that at times he despised all mankind. Meanwhile he served the clubs, he served the king, and he served the constitution; but none, or all of those parties together, could fairly gain him over.

The Constituent Assembly terminated its career by instituting the self-denying ordinance, by which its members were declared incompetent either to hold office from the crown before the lapse of two years, or to occupy a place in the next Assembly. Talleyrand was thus fairly thrown out of office. The court party hated him for his frank espousal of the revolution; the republicans hated him for advocating a limited monarchy; all parties disliked the perpetual sneer with which he greeted them. Yet they all combined in regarding him as the only man in France who could preserve peace with England. This country had hitherto maintained an ostensible neutrality, but was every day becoming more and more alienated from its French neighbours. Yet it was impossible to appoint him without a breach of the sacred paper treaty known as the self-denying ordinance. He was accordingly despatched to London in 1792, in the train of brisk young Chauvelin, who contrived to hold over his person the "ambassador's cloak." Talleyrand was the real ambassador, Chauvelin merely wore the ambassador's clothes. The want of any official position stood materially in the way of the ex-bishop of Autun. The queen turned her royal shoulder to him at St James's, which ensured his exclusion from high society. The French government besides had become obnoxious to a large majority of the English people, and M. de Talleyrand in his unofficiality, could do little where both court and people disliked both himself and the government which he really represented. Yet Talleyrand was not to be beaten down by a few rebuffs. The steadfastness with which he pursued his political mission, despite the annoyance of having his words thrown back in his face, and the irksomeness of acting through a pompous puppet such as Chauvelin, deserves considerable praise. He had a fixed determination not to be insulted, and, when he had once made up his mind, but few could change him. He kept himself aloof, and never committed himself. His manner in public was grave, thoughtful, cold. His hitherto pleasing appearance, with its perpetual smile, "as if he mocked himself," became now remarkable for its severe gravity and staidness. Of course, in private and among his friends who knew him, he was still the old man. He fascinated them by the splendour of his conversation, which no Frenchman of the time could equal, and astounded them by the brilliancy of his caustic wit, which no man of his day could rival, and in which he greatly outshone his professed master Fontenelle. But the reserve of the man, which was perhaps constitutional, was quite noteworthy in public. The circumstances of his early life, and perhaps also the necessities of his position in future years, may have compelled him to adopt silence as a convenient cloak to his own thoughts. Save for his eye and his voice, the one of which was exceedingly bright, and the other of which was remarkable for its rich sonorousness, people might have been apt to have mistaken him for "a nice little Frenchman," so *dollish* was his face and so impassable his look. He was more like a statue than a man.

Talleyrand.

In London.

Talleyrand had returned to Paris before the momentous 10th of August, which broke down the last prop of the monarchical edifice. It was with great difficulty that he obtained a passport from Danton, who confirmed his appointment in London. A letter from Laporte, intendant of the king's household, presenting to the king a letter from the Bishop of Autun, was discovered in the celebrated iron chest, which involved Talleyrand yet deeper in public hatred. The letter ran thus:—"The new faction that is raising itself among the Jacobins desires the re-establishment of the public force, the maintenance of the monarchy, the destruction of the democracy, and the safety of your Majesty's person." M. de Talleyrand did not treat this letter as he had done the epistle of the canons of Autun. His life was at stake, and he knew it. He argued, with much ingenuity and abundance of plausibility, that Laporte had very greatly exaggerated the case; but, to a reader of the present day who knows anything at all of the previous character of his lordship the ex-bishop, his reasoning is

The iron chest.

Talleyrand. merely specious, and by no means affects the essential truthfulness of the charge. Ex-Bishop Talleyrand had played the part of bottleholder so long to almost every party, that he need not be at all astonished, now that he had withdrawn his hand from those frail vessels, if they should choose, as bottles will, to tumble down amid the howls and yells of those about whose ears they fell. It was as well for Talleyrand that he was out of France, else his head should have paid for his attempting to play fast and loose with the determined Jacobins. Dishonesty, and all kinds of speciosity, are pretty sure in the long-run to get wind; and when they do so, it will be well for the guilty party if some convenient England is near whither he can withdraw, for the moral tempest rages, and woe worth the wight whom it finds within its sweep! Thus is written, in pretty legible marks, the high origin, the noble destiny of man.

Flees to England. Talleyrand, as we have said, fled to England in great perturbation, for he had secured very little of his property, and is said to have been compelled to sell his library to procure means for his support. The English government did not like so much intrigue to be moving about in its immediate neighbourhood. It accordingly ordered Talleyrand to quit the country in twenty-four hours; and with a dilapidated fortune, and with both France and England shut against him, he set sail for America in his fortieth year.

Flees to America. While here he used his eyes to good purpose, if he was denied the use of his other powers. The published essays on colonisation and on the commercial relations of England and America, may be considered as masterpieces of shrewdness and of felicity of expression.

Returns to France. Madame de Staël instigated Chenier to recall the exiled Talleyrand after the Reign of Terror had closed. The National Institute had just been founded, and M. de Talleyrand, who had during his absence been chosen a member of the class of moral and political science, having been present at its first sitting, was chosen its secretary. This office he held for six months. Having read some exceedingly clear-sighted papers regarding the state of American society, and having revived the nearly dead influence of the *salons*, as a reward to this diplomatic financier he was made foreign minister under the new Directory. Here again he owed much to Madame de Staël's influence with Barras, although from some cause or another he seldom spoke very respectfully of the author of *Corinne* in her absence. While necessity may be pled in favour of Talleyrand's embarking in such a crazy and unprincipled government as the Directory is known notoriously to have been, yet no honest man will deny that the life of the diplomatist hitherto has been, in a great part, very corrupt and very unworthy. His American voyage *may* have purged the black drop out of him: we shall see. Certainly, it was quite true that political diplomacy was the only profession that he cared for; and the fact of his having accepted this equivocal position may be cited in evidence of the fact that his old diplomatic sympathies were still strong in him, and that he had not attained even to normal purity from his baptism in the waters of the Atlantic. The truth is, that Talleyrand was by no means a stoic; an epicurean rather in everything that concerned life and its awards. We must not, then, expect too much from him. What he has—keenness, penetration, sagacity, dexterity, a pre-eminent talent for diplomacy—he can give us; and if we are anxious to make the acquaintance of a man of high morality, of simplicity, and of purity, we must avoid going too near the diplomatist's head-quarters: we must, in short, pass by on the other side. He can charm us if he will with his talk, he can dazzle us with his wit, but if we try to go any deeper into the heart of the man, we find it rather an abode of unclean beasts than otherwise. Carnot's outspoken accusation of him on his return to France, after having been engaged on a mission of duping statesmen and cajoling their wives to the court of Prussia, need not astonish us. Hear how he speaks of the ex-bishop: "That man brings with him all the vices of the old régime, without having been able to acquire a single virtue of the new one. He possesses no fixed principles, but changes them as he does his linen; adopting them according to the fashion of the day. He was a philosopher when philosophy was in vogue; a republican now because it is necessary at present to be so, in order to become anything; to-morrow he would proclaim and uphold tyranny if he could thereby serve his interests. I will not have him at any price; and so long as I am at the helm of the state, he shall be nothing." Talleyrand.

Foreign minister. The principal burden of Talleyrand's foreign office was the perpetual series of petty intrigues in which he was engaged, having for their sole aim his own maintenance in office. The blundering character of the attempt to extort money from the American envoys in October 1797, alone saves the character of the foreign minister from being implicated in it. We may rest assured he knew well the character of the nation who had afforded him an asylum during his exile. But it betrayed a despicable meanness to allow himself to be made the tool of such shabby jobbers as his employers were, destitute alike of national honour and even of national courtesy. He enjoyed the honour of being cast aside as soon as public indignation had been called to the excesses practised upon the envoys of a friendly power. It was towards the beginning of his office as minister that Madame Grant became the mistress of the ex-bishop.[1]

Luxurious and expensive in his habits, Talleyrand could ill get on on the stinted allowance of a republic. The hard fare of America was a thing of necessity. Now that he was returned to smiling France, it should go hard with him if he did not get vent for the epicureanism of his nature. Success, besides, in the diplomatic art could only be found under a settled monarchical government. Believing, and perhaps truly, that this was the only kind of government that could bring tranquillity to France, and attracted no doubt powerfully by the fascination of "the little Corsican," Talleyrand foresaw it to be his interest to put himself in intimate connection with the most powerful man in France. When Bonaparte returned from Egypt, citizen Talleyrand had been six months deprived of his ministerial office. Here is an anecdote, which, although coming on no higher authority than that of Bourrienne, bears nevertheless on the face of it such signal marks of authenticity, that we have

[1] It may not be uninteresting to know what kind of a person it was who charmed the heart of the *roué* of forty. Here is a description of her by a person who knew her well. "Madame Grant was at that time in the full zenith of her beauty, and of the kind of loveliness most rare and most admired in France. I have heard that she was of English origin. This is not true. Her maiden name was Dayot, and she was born at L'Orient; but her connection with India, where a great part of her family resided, and the peculiar character of her beauty, would seem to have been the groundwork of the supposition. She was tall, and at that time slight in person, with that singular ease and languor in her carriage which have been considered the peculiar attribute of the creole ladies. Her features were of that soft and delicate mould but seldom seen in Europe; her eyes, large and languishing, were of the deepest black, while her hair played in curls of brightest gold upon a forehead of dazzling whiteness, pure and calm as that of an infant. Throughout her whole person was spread a singularly childlike grace, which at once interested the beholder infinitely more than the sublimer beauty which distinguished her great rivals for the admiration of the worshippers of fashion of that day, Madame Tallien and Madame Beauharnais." Madame Grant was not what is called a "clever woman," but she was simple and *naïve*, which gave so strong a tinge of originality to all she said or did, that one was ready at once to pardon all her natural defects.

Talleyrand.

His address to Bonaparte.

not scrupled to set it down here. "'Citizen Consul,' says Talleyrand, 'you have confided to me the department of foreign affairs, and I will justify your confidence; but I must work under no one but yourself. This is not mere arrogance on my part: in order that France be well governed, unity of action is required. You must be first consul, and the first consul must hold in his hand all the mainsprings of the political machine; the ministries of the interior, of internal police, of foreign affairs, of war, and the marine. The ministers of these departments must transact business with you alone. The ministries of justice and finance have, without doubt, a powerful influence upon politics; but it is more indirect. The second consul is an able jurist; and the third, a master of finance: leave these departments to them; it will amuse them; and you, general, having the entire management of the essential parts of government, may pursue without interruption your noble object, the regeneration of France.' These words accorded too closely with the sentiments of Bonaparte to be heard by him otherwise than with pleasure. He said to me after M. de Talleyrand had taken his leave, 'Do you know, Bourrienne, Talleyrand's advice is sound. He is a man of sense.' He then added smilingly, 'Talleyrand is a dexterous fellow: he has seen through me. You know I wish to do as he advises, and he is in the right. Lebrun is an honest man, but a mere book-maker; Cambacérès is too much identified with the revolution: my government must be something entirely new.'"

The connection of Talleyrand and Bonaparte.

Napoleon was just right in his estimate of Talleyrand's dexterity; and he was right also in his conjecture of that citizen's insight. Whether or not he had "seen through" Napoleon may be questioned; but he saw as far into him as it was possible for any man to do, gifted with merely human eyes. Abbé Sièyes, that arch constitution-builder, had seen into Napoleon in his way, from his high logical pinnacle; but Talleyrand's view of him was much more practical, because his mind was much more nearly akin to Bonaparte's own than that of the witty framer of political systems. Both Citizen First Consul and Citizen Talleyrand had a taste and talent for action, for administration, for the exercise of power. They resembled each other again by the thorough unscrupulousness with which each attained his ends. Though they differed in various important respects, these diversities only cemented their union the more closely. Talleyrand really admired Napoleon. If he flattered him, as he could not but do, he likewise appreciated, as few could do, the enlightened views which he disseminated. He had the courage, besides, to speak unpalatable truths to the imperious general, and to arrest his impetuosity until coolness returned to him. It cannot be doubted that M. de Talleyrand was powerfully instrumental in bringing about the re-establishment of peace in Europe. This he may have accomplished more by the arts peculiar to himself than by those of honest and fair dealing, but it is without doubt that he did accomplish them. Napoleon, as Talleyrand hinted, never interfered in the direction of any of the duties of his government, but left solely to his ministers the business of their respective departments. Talleyrand was the real king of the French diplomacy during the First Consulate; and it has been very generally admitted by his contemporaries, that no minister, not even himself when minister at the Restoration, has since been considered of so much importance. The concordat with the Pope, the basis of the future empire, was Talleyrand; the treaty of Luneville, secularizing the ecclesiastical principalities of Germany, the treaty of Amiens, the convention of Lyons, all bear more or less the marks of the hand of the subtle minister for foreign affairs.

After the battle of Ulm, Talleyrand addressed to the emperor a plan for diminishing the power of Austria, and for increasing that of France. Napoleon gave no heed to it. After the victory of Austerlitz, the minister for foreign affairs again brought forward his plan with renewed urgency. Still it was treated with silence, which was easily construable into contempt. Whether or not this was the cause of the growing coolness which ensued between these two great men, it is at least certain that they were never again so intimate as they had hitherto been. Accordingly, on the 9th of August 1807, Talleyrand resigned the place of minister for foreign affairs, and retired with the dignity of vice-grand-elector of the Empire, in addition to the titles of grand chamberlain and Prince of Benevento, with which he had been honoured some time previously. Success had evidently flushed the emperor more, perhaps, than was meet, and neglect from such a man as Napoleon, Prince Talleyrand had not the courage to endure. If the active diplomatist was lost to France, he could not be said to have lost by his last office. The Pope's excommunication of him had rankled more deeply in his bosom than he was prepared to allow. He had the satisfaction to see it annulled, and the first consul compelled him to marry the woman with whom he lived as a wife. There was another rather important respect in which the prince was a gainer by his late office. This was as a monied individual. He had begun, we saw, a very poor man; and when he threw up his office, it is said he was worth 30,000,000 francs, from the 18th Brumaire. Doubtless this sum is greatly exaggerated; but it is but too well known that he gratified his stock-jobbing propensities a great deal too much for the liking of Napoleon. The emperor, who was not to be trifled with on the score of fortunes, sent for Talleyrand one day, and said to him in a tone of affected blandness:—"By the by, citizen minister, they say you are very rich: how does that happen?" "The simplest thing in the world, general," answered Talleyrand, who had never his answer to seek; "I bought stock the day before the 18th Brumaire, and sold it again the next day." Thus ingeniously flattered, the emperor could not take offence, and the Prince of Benevento fairly gained his point. In 1809 the ex-minister was so loud in his denunciation of the expedition to Spain, that Napoleon, on his return from the Peninsula, deprived him of his office of chamberlain. Thus shorn of his honours, the irritated prince indulged himself in sarcastic criticisms against the policy pursued by the emperor, and even predicted, as early as 1812, the ultimate overthrow of the empire. In 1814, on the capitulation of Paris, the Emperor Alexander took up his residence in the prince's house. Talleyrand had, in 1800, betrayed the Directory in favour of Napoleon; and in 1814 he betrayed Napoleon in favour of the Bourbons. The alliance of Bonaparte and Talleyrand had long been broken up, and it was destined never to be united. There is another extract from Bourrienne, which bears its own authenticity on the face of it. Talleyrand is represented as having said at this time—"There is no other alternative but Napoleon or Louis XVIII. After Napoleon, there is no one whose personal qualities would ensure him the support of ten men. A principle is needed to give consistency to the new government, whatever it may be. Louis XVIII. represents a principle. Anything but Napoleon or Louis XVIII. is an intrigue, and no intrigue can be strong enough to support him upon whom it might confer power." In few cases do we find Talleyrand's sagacity failing him, and in this case he was undoubtedly right. We have here, besides, his views of *intrigue* as a means to the higher end of compassing power. It is only when it is "strong enough" that it should be ventured upon, he says. This is the key to the whole art of Talleyrand's diplomacy. The first thought that occurred to him when a political difficulty arose, was, by what policy, tortuous or otherwise, can this intricacy be got over?

Talleyrand. Resigns his portfolio.

The Bourbons again.

Talleyrand, accordingly, got Louis XVIII. duly made

Tallien. king; and he, besides, insisted upon the combination of constitutional forms with the recognition of legitimacy with remarkable persistency. So much so, that he was a terror to the courtiers of the Restoration, who could neither bear his political views, much less the cutting sarcasms which he flung out against them. Talleyrand visited the congress of Vienna in 1814, and gained by his dexterity what was denied to the sword of Napoleon in 1792. Again the imbecile Bourbon unsettled everything by inviting the descent of Napoleon at Frejus. The confession of faults and short-comings, in 1814, of Louis XVIII., is ascribed on good grounds to the Prince of Benevento. He besides obtained an extension of the democratic principle in the constitution of the Chamber of Deputies, recommended a hereditary peerage, and was himself chosen first president of the cabinet council which he had induced Louis to establish.

Louis XVIII.

The constitutional monarchy now being got settled on a tolerably firm basis, Talleyrand found, to his astonishment, that the part he was called upon to perform in it was that of a leader of opposition. He protested in vain, on the 21st September 1815, against the new terms the allies were to impose upon France. Louis bowed to the dictation of his allies, and his prime minister had to resign office. He became an opposition leader, and no man could have played that difficult part better than Prince Talleyrand. His *salon* was a place of resort for the leaders of the liberal party; and in 1830, when the dynasty changed, he had the gratification of seeing not only the constitution remaining unmoved, but what had been one of the darling projects of his earlier years, an alliance between France and England, he had the happiness to see consummated. Under Louis Philippe, Talleyrand was appointed ambassador extraordinary and minister plenipotentiary to the court of Great Britain. This office he held from the 5th September 1830 till the 7th January 1835. Returning from this mission to England with much better success than his first visit had received, he retired from public life. He only emerged from his retirement to pronounce the *éloge* of Count Reinhard before the Académie des Sciences Morales et Politiques. He died at Paris on the 20th of May 1838, in his eighty-fourth year.

Louis Philippe.

In London again.

Death.

It is quite useless attempting to gather up the scattered fragments of Talleyrand's character, and endeavouring to combine them into a moral unity. No such thing *can* be done consistently with truth. The unprincipled intriguing power of the man, which seems to have stuck to him as closely as the Nessus-shirt of Hercules, we have tried to delineate. We have endeavoured, likewise, to portray the liking which he had all along for some sort of monarchical constitution, and have tried to find a basis for that pretty steady conviction in the constitutional luxuriousness of the prince's character. But whether or not he was ever really in earnest or not about anything, it would be very difficult to say. Doubtless, as soon as he had laid down the end which he wished to gain, he was sufficiently in earnest until that object was accomplished, in whatever way. But whether anything more than mere caprice or self-interest ever moved him, we should like to be better informed before we should allege. "A man," as Mr Carlyle remarks, "living in falsehood; yet not what you can call a false man: there is the specialty! It will be an enigma for future ages, one may hope." (*French Revolution*, vol. i. p. 207.) His Memoirs, which it is said are still in manuscript, he gave express orders not to publish for forty years after his death. Whether or not these contain anything likely to clear up the difficulties of Talleyrand's character remains to be seen. Eighteen years hence men will know.

TALLIEN, Jean Lambert, a notorious personage during the French Revolution, was born at Paris in 1769. He was the son of the house-porter of the Marquis de Bercy, who, attracted by the quickness of the lad, took the charge of his education. He afterwards became clerk to an attorney, secretary to the deputy Broustaret, and was foreman for some time in the printing-office of the *Moniteur*. In August 1790, by the advice, it is said, of Marat, Tallien placarded the walls of Paris with a sheet called *L'Ami du Citoyen*. The Jacobin Club defrayed the cost. The design of this broad-side was to excite the populace against Louis XVI. On the 8th of July 1792, so well known had he become as a furious revolutionist, that he was chosen orator of a section of the people before the bar of the Assembly. He likewise became a favourite of Danton's, who employed him as one of his agents. The signature of Tallien is attached to most of the warrants preceding the massacres, and to the orders for payment to the executioners and assassins. It was he who received the plunder from the persons of the killed, and he is reported to have "locked them up in a chest of which he kept the key." He was subsequently made a deputy of the National Convention; he voted for the king's death; and made vigorous efforts in defence of Marat. In 1793, he was sent on a mission to extirpate the Girondists in the neighbourhood of Bourdeaux. There his diligence rivalled the bloody terrors of Lebon and Carrier. He erected the guillotine in the great square of the town, and watched from the neighbouring windows the progress of the bloody work. Famine and terror brought up the rear of Tallien's butchery. The "red-gloomy Dis" (Carlyle's *French Revolution*) seized upon the coin of the bankers, upon the exchange of the shopkeepers, and upon the funds of the wealthy, not to procure food for the starving inhabitants, but to treasure it up securely in his own coffers. Suddenly a change was observed in the stern rigour of the assassin. A certain Madame Cabarus, subsequently de Fontenai, a Spanish lady of great beauty, is said to have fallen into the hands of Tallien, and proved a deliverer to the last remnant of the Girondists. News of this Delilah was heard in Paris: orders came for her imprisonment and for Tallien's recall. Danton, Camille Desmoulins, and others, were now gone. Tallien found himself disgraced, and entirely at the mercy of Robespierre, who had recently assumed dictatorial power. A short reflection told him how to act. He would fawn on the dictator, and strive meanwhile secretly to overthrow him. Tallien accordingly bore all the tyrant's denunciations with great meekness. On the 27th of July 1794, he started up, amid the noise and tumult of the Assembly, and flashed his "Brutus-steel" in the face of "the incorruptible," denounced Robespierre openly, and had him dragged off to prison. (See Robespierre.) Tallien was next created a member of the Committee of Public Safety, and was re-elected to the Jacobin Club. He is said to have used his influence on the side of mercy; but the taunts of the state prisoners, and the attacks of the newspaper press respecting his atrocities at Bordeaux, brought him into general discredit, which neither his services in May 1795, nor in the district of La Vendee, could at all retrieve.

Tallis.

Tallien was employed by Napoleon on his expedition to Egypt in 1798; but he was sent back to Paris in 1801 by the orders of General Menou. He parted from his wife, Madame de Fontenai, the old Bordeaux beauty, whom he had married in 1794; and languished in great distress till 1814, when Fouché obtained for him the consulship of Alicante. The return of the Bourbons in 1814 cut him off from this last resource. He died in great poverty in Paris, on the 16th of November 1820.

TALLIS, Thomas, one of the greatest musicians of England, was born in the earlier part of the sixteenth century, and died on the 23d November 1585, aged about sixty years. Thus, for the greater part of his life, he was a contemporary of Palestrina; and Burney, in his *History*

Tallon ‖ Talma.

of Music, does not hesitate to rank Tallis with Palestrina in respect of good harmony and ingenious construction. It is certain that Tallis was organist of the Chapel Royal in the reign of Queen Elizabeth; but, as Burney remarks, there is no evidence, and little probability, that he held that office in the reigns of Henry VIII., Edward VI., and Queen Mary, as has been asserted. In 1575 he published, jointly with his celebrated pupil, William Bird, *Latin Motets*, and *Hymns for Five and Six Voices*; and at the same time Queen Elizabeth granted to these two musicians a very arbitrary and monopolizing patent for twenty-one years, for the publication of any music whatsoever, English or foreign, and even for the ruling and vending of music-paper. These motets and hymns are full of the dry and learned contrivances of that age. Tallis's most extraordinary production is his *Song of Forty Parts*, not in simple counterpoint, but in forty real parts, crowded with subjects of fugue and imitation; the whole consisting of 138 bars in *alla breve* time. In 1560 and 1565 John Day, and in 1641 John Barnard, published some pieces by Tallis; and Dr Boyce inserted some in his *Collection* in 1760. Specimens are also given by Burney and Hawkins in their *Histories of Music*. In the first of Dr Thomas Tudway's six MS. volumes of *Church Music*, preserved in the British Museum, there are five anthems by Tallis, and the whole of his *Service* in D minor. It may be noticed, that in the same MS. volume, among the compositions by William Bird is the canon *Non nobis Domine*, which, although ascribed to Bird by tradition, does not appear anywhere in print under his name during the sixteenth and seventeenth centuries. Besides Tallis and Bird, there were other distinguished English composers of cathedral music in the sixteenth century, viz., Tye, Shephard, Johnson, Parsons, White, Farrant, Cawston, Oakland, Taverner. (G.F.G.)

TALLON, a market-town of Ireland, in the county of Waterford, 10 miles N.W. of Youghal, and 38 miles W. by S. of Waterford. It has a fine old parish church, a Roman Catholic chapel, an hospital, alms-houses, and a poor-house. Many of the women are employed in making lace. Pop. 1986.

TALMA, François Joseph, a distinguished French tragedian, was born at Paris on the 15th of January 1763, but spent the first nine years of his life in London, where his father exercised the profession of a dentist. Having returned to Paris in 1772, he began his studies and gave signs of great intelligence and of a rare talent for scenic display. Having again returned to London, he appeared in an amateur company of French players and attracted considerable notice by the depth and power of his delineations of the various characters assigned to him. He was urged by some persons of distinction to appear in the theatre of Drury Lane, but Talma, who had probably an instinctive consciousness of the career of honour which awaited him in Paris, returned to that city, and, after assisting his father for eighteen months, he appeared in the character of Séide in Voltaire's *Mahomet*, in 1783. According to his confidants, who were duly collected on the occasion, he would never make an actor. There was a total want of *le feu sacré* for the youthful Parisian taste. Talma, who knew what he still wanted, although his audience mistook restraint for coldness, took as kindly as a youth with a strong central fire burning in him and raging for egress is likely to take a hostile criticism, and retired to the peaceful pursuit of his profession, to the study of history and the antiquities of the stage. On the 21st of November 1787, he reappeared as Charles IX. at the Theâtre François and took his audience by storm. He had now got complete master of himself, and his life henceforward was a series of ovations. He reformed the costume of the French stage by introducing into each play the appropriate dress of the time in which the scene of the piece was laid. This reform had been vainly attempted by M. Lekain, by Mdlle. Clairon, and by Mdlle. Saint-Huberti. Talma is said to have created some seventy-one characters. Among the most popular of those delineations were his Orestes, Œdipus, Nero, Manlius, Cæsar, Cinna, Augustus, Coriolanus, Hector, Macbeth, Hamlet, Othello, Leicester, Sulla, Regulus, Danville, Leonidas, Charles VI., and Henry VIII. He broke up the jingling regularity of French rhyme into something like impassioned prose, in the steady yet careful vehemence of his delivery. He appeared on the stage for the last time on the 11th of June 1826, and he died on the 19th of October of the same year. He is said to have been about the middle height, square built, with a most plastic countenance, which, with the tones of his voice, was capable of expressing the fiercest passion and the tenderest sympathy. In his manners he was eminently kind, manly, and frank. He spoke English well, and admired both England and her institutions. He was a friend of the great actor, John Kemble.

Talmud.

TALMUD (from תַּלְמוּד, *doctrine*) is the work which embodies the civil and canonical law of the Jewish people. It contains those rules and institutions by which, in addition to the Old Testament, the conduct of that nation is regulated. Hence the contents of the Talmud are of a diversified character, relating not merely to religion, but to philosophy, medicine, history, jurisprudence, and the various branches of practical duty. The *oral* law is an interpretation of the *written*, and constitutes the *text* of the Talmud. To the oral law the same antiquity is assigned as belongs to the written. According to the Jews, Moses received both on Mount Sinai. It was received by Joshua from Moses; Joshua again delivered it to the seventy elders, from whom it was received by the prophets, who transmitted it to the men of the great synagogue, the last of whom was Simon the Just. From the men of the Synagogue it was received by the Rabbins. After the second destruction of Jerusalem under Adrian, and the consequent dispersion of the Jews throughout the world, fears were entertained lest the oral traditions which they held so sacred should be lost, particularly as their number rendered it inconvenient, or rather impossible, to preserve them in the memory. Hence arose the necessity of committing them to writing, that they might be handed down from age to age as a national treasure. It is generally agreed that Rabbi Judah Hakkadosh (i. e. *the holy*) made the first permanent record of them, about 120 or 150 years from the destruction of the Temple, A.D. 190 or 220. R. Judah is said to have lived under Antoninus Pius. Such was the origin of the *Mishna* or text. It must not be supposed, however, that all the traditional interpretations were embodied in the official Mishna. Many others existed which were not incorporated in that work.

A twofold commentary, or series of commentaries, was subsequently appended to the Mishna; one called the Babylonian *Gemara*, the other the Jerusalem *Gemara*. The former was begun by R. Asche, who died A.D. 427, and was completed A.D. 500. It is the work of several Rabbins, whose names continue to be venerated by the learned Jews. These portions, committed to writing, after the *Mishna*, constitute *notes on that text*, and make up, together with it, the *Babylonian Talmud*. The Jerusalem Gemara proceeded from the academy at Tiberias, and embodied the comments of the Palestinian Jews. It is said to have been written chiefly by R. Jochanan, rector of that academy. It is not agreed when R. Jochanan lived; but most writers follow Buxtorf, who places him in A.D. 230. David Ganz prefers A.D. 270; while Moses Maimonides, Abarbanel, Simeon Mikkenon, and Elias Levita fix upon A.D. 370. But internal evidence shows that it was composed towards the

Tamaulips ‖ Tambov.

end of the last half of the fourth century, which would agree nearly with the opinion of Maimonides. Hence R. Jochanan could not have been the principal author. The Jerusalem Talmud has contributed to the Babylonian, since there are evident traces of it in the latter.

From this statement it will be seen that the two Talmuds differ in their Gemaras or notes upon the text, while both have the same Mishna. The term *Mishna* (מִשְׁנָה) signifies *repetition*, because it is, as it were, a repetition of the written law, or a second law (δευτέρωσις). The word *gemara* (גְּמָרָא), according to Buxtorf, denotes *completion* or *supplement*, inasmuch as it *completes* the work; but it is better to regard it as synonymous with *Talmud*, "doctrine," from the Armenian word, *to learn*. By the Jews the Babylonian is always preferred to the Jerusalem Talmud. It is far more copious and abundant in its expositions. Hence, in speaking of it, they call it *the Talmud*, while the other is never mentioned without prefixing the name Jerusalem. Yet Christians generally value the Jerusalem Talmud more than the Babylonian: its brevity and succinctness recommend it to them; besides, it is generally free from the absurdities and fables of the other; it is, however, more difficult to be understood; both, indeed, partake of obscurity. The Mishna is written in the Hebrew dialect, but the Gemara in Aramæan. The former is tolerably pure, and free from the admixture of foreign terms, but the latter contains many Persian, Greek, and Latin words—a circumstance which contributes to the difficulty of understanding it. The style of the Babylonian Gemara differs from that of the Jerusalem commentary. The latter is more in the Palestinian dialect, approaching to the Syriac.

The earliest edition of the *Jerusalem Talmud* was published at Venice by Bomberg, in 1 vol. folio, about the year 1523. No date is attached to it. Another edition was published at Cracow in 1609, folio; and another at Amsterdam in 1710, folio. The *Babylonian Talmud* was published by Bomberg at Venice in 12 folio vols. in 1520 30. This edition contains the comments of Rashi and others, as also various appendices by different Rabbins. In the years 1578, 1579, 1580, the celebrated Froben of Basel published the same work; but passages which calumniated Christ were rejected by command of the Tridentine bishops. Accordingly the Jews prepared a new and complete edition at Cracow, in 13 vols. folio, in 1603, and following years. Another edition was prepared and published at Frankfort and Berlin, 1715, in 12 vols. folio; and another at Amsterdam, 1763, in 18 vols. folio, with additions and notes, besides various passages not found in preceding impressions. This last has been pronounced the best. The best edition of the Mishna is that of Surenhusius, published at Amsterdam, 1698, and following years, in 6 folio vols., with a Latin version and copious commentaries by the Rabbins. The best lexicon to the *Talmud* is still that of Buxtorf, Basel, 1639, folio. The celebrated Maimonides, in the twelfth century, made a digest of all the laws and ordinances contained in the *Talmud*. This excellent abridgment is sufficiently copious for most readers, since it contains everything of value in the whole work. It is entitled *Yad Hachazakah, seu manus fortis quam fecit Moses in conspectu Israel*, and was first published at Soncino, 1490, folio; republished at Venice, 1524, 3 vols. folio; and at Amsterdam, dated 1561, 4 vols. folio. Selections from it have also been published in Hebrew and English, with notes by Bernard, in a book entitled, *The Main Principles of the Creed and Ethics of the Jews, exhibited in selections from the Yad Hachazakah of Maimonides, with a literal English translation, copious Illustrations from the Talmud*, &c. Cambridge 1832, 8vo.

TAMAULIPS. See MEXICO.

TAMBOV, a government of European Russia, lying between N. Lat. 51. 30, and 55. 20; E. Long. 38. 40, and 43. 50; bounded on the north by those of Vladimir and Nijni Novgorod, E. by Penza and Saratov, S. by Voronej, and W. by Orel, Tula, and Riazan. Its length from N. to S. is 270 miles, its greatest breadth 195, and its area 26,539 square miles. The surface is a vast low plain, without any large mountains, lakes, or rivers, and broken only by a few low ridges of hills. The northern portion is partly covered with wide-spread forests, which contain many marshes; and in the south there are extensive steppes almost entirely destitute of trees. The largest river in Tambov is the Oka, an affluent of the Volga, but this only traverses the north-west corner of the government, receiving from the south the Moksha, with its affluents the Zna and the Vad. The Verona, a tributary of the Don, waters the extreme south of the country; and the Don itself flows for a short distance within its limits. The climate is temperate and healthy, but somewhat cold in winter. In the extreme north there is a marshy and sandy soil, but the rest of the government is fertile, and almost entirely an agricultural country. The steppes are cultivated in some places, and yield good crops; while in other parts they afford excellent pasture land. About one-half of the total area consists of arable land, one-fourth of pasture ground, and one-fifth of wood. Corn is raised in such quantities as to leave a large quantity for exportation; and all the kinds common in Russia are grown; especially rye, oats, millet, buck-wheat, and wheat. The country also produces poppies, hemp, flax, hops, and other vegetables. Large herds and flocks are reared on the steppes and pasture grounds; the horses are of an excellent breed; and the raising of sheep is much attended to, although the wool is coarse. Excellent timber for ship-building and other purposes is supplied by the forests, and in their vicinity many people are employed as carpenters and coopers, or in preparing charcoal, pitch, tar, &c. The mineral productions of the country are of little importance, consisting chiefly of iron, freestone, and saltpetre. There are some iron furnaces, but on the whole very few manufactories; woollen and linen cloth, tallow, soap, and brandy, being almost the only articles made. An extensive trade in the produce of the country is carried on; and, among other articles, cattle, corn, cheese, butter, honey, wool, hemp, hides, and tallow are exported. Trade is much facilitated by the rivers of the country. With the exception of a comparatively small number of Tartars and a few gipsies, the population of the government is entirely Russian. Some of the Tartars are Mohammedans; but among the rest of the people the Greek Church is the prevailing religion, and Tambov is the see of a bishop. Education is but ill provided for. The government is divided into 12 circles, as follows:—

Tambov.

	Pop. (1851.)		Pop. (1851.)
Tambov.....	232,670	Morschansk	179,946
Schatzk.....	110,348	Jelatma.....	107,437
Spask.....	79,983	Temmikov.....	99,934
Koslov.....	200,259	Usman	122,269
Lebedjän.....	100,370	Kirsanov.....	173,772
Lipetzk.....	100,274	Borissoglebsk	159,241

Total (1851), 1,666,505; (1856), 1,808,172.

TAMBOV, the capital of the above government, on the Zna, 125 miles N.E. of Voronej, and 263 S.E. of Moscow. It is an old town, built chiefly of wood, and surrounded by a rampart, which was erected as a barrier against the incursions of the Tartars. There are 13 churches, 6 of which are only of wood, a monastery of our Lady of Casan, a gymnasium, military school, seminary for priests, hospital, &c. Many of the inhabitants are employed in farming, but there are also manufactories of cloth, canvass, cordage, shawls, and an imperial establishment for making alum and vitriol. Some trade is carried on; and an annual fair held here in spring is much frequented. Pop. 14,000.

Tamerlane ‖ Tanagra.

TAMERLANE. See TIMUR.

TAMPICO, or SANTA ANNA DE TAMAULIPAS, a seaport of Mexico, in the department of Tamaulipas, on the Panuco, about 5 miles above its mouth, and 215 N.N.W. of Vera Cruz. It has broad regular streets, and many good houses of brick or stone. There are here two churches, a custom-house, prison, and two hospitals. Tampico exports hides, tallow, bones, and salt beef, to Great Britain and the United States. The harbour is unsafe, and a dangerous bar at the mouth of the river prevents the approach of large vessels. Pop. 7000.

TAMWORTH, a market-town, municipal and parliamentary borough of England, on the border of the counties of Stafford and Warwick, 25 miles S.E. of Stafford, and 115 N.W. of London. As the church stands in Staffordshire, the town is generally regarded as belonging to that county. It is a large and generally well-built place, lying in the midst of extensive and rich meadows, at the confluence of the Tame and the Anker. It has several good streets, and a market-place, containing a fine bronze statue of Sir Robert Peel. Here also stands the handsome town-hall, beneath which there is a small jail. The parish church, which is of ancient date, is a very fine building. It is chiefly in the decorated English style, with some trace of of Norman architecture. The other places of worship in Tamworth belong to Wesleyan Methodists, Independents, Baptists, and Roman Catholics. Education is provided for by a free grammar school, national and infant schools, Sir Robert Peel's schools for poor boys, and others. The town has also a good library and a reading-room. Some ancient remains of Tamworth Castle, which formerly belonged to the Lords Marmion, still exist; but considerable modern additions have been made to the building, which is now the residence of the Marquis Townshend. Tamworth contains an almshouse, established by Guy, the founder of Guy's Hospital in London, and a savings' bank, which occupies a handsome stone building. Several branches of manufacture are carried on in the town. Coals, and clay for brick-making, are obtained in the neighbourhood; and bricks, tiles, and similar articles are made. There are also tanneries, breweries, a carpet factory, tape manufactories, and establishments for dyeing, calico printing, and cotton spinning. There are weekly markets and annual fairs; and trade is considerably facilitated by the Coventry Canal, and by the Trent Valley and Midland railways, which have a joint station here. The borough is governed by 4 aldermen and 12 councillors, among whom one is mayor; and it is represented in Parliament by 2 members. Pop. of the municipal borough, 4059; of the parliamentary borough, which corresponds with the parish, 8655.

TANAGRA, an ancient town of Greece, in Bœotia, in a fertile plain on the left bank of the Asopus, about 16 miles W. of Oropus, and 25 E. by N. of Platæa. Some ancient writers have identified this town with the Graea of Homer; but as others have given a different opinion, this must remain a doubtful point. It was sometimes called, in ancient times, Pœmandria, from the fertility of its neighbourhood, which at one time produced a highly-esteemed wine. The chief temple in the town was dedicated to Bacchus, and contained a celebrated statue by Calamis. There were also several other temples, a theatre, and a gymnasium, the latter containing a picture of the poetess Corinna, who was a native of the town. Tanagra is chiefly important in history on account of the military operations carried on in its vicinity between the Athenians and the Spartans and Bœotians, in the 5th century B.C. In 457 a Lacedæmonian army, on its return from an expedition to Doris, was met at Tanagra by a body of Athenians, Argives, and Thessalians. The Athenians were on this occasion defeated, owing chiefly to the desertion of the Thessalian troops; but about two months after, early in the following year, they again invaded the country, and gained a decisive victory at Œnaphyta near Tanagra. In 426 they made another incursion; and on this occasion, too, defeated the Bœotian forces. Some traces of the ancient city still mark the site of Tanagra, which is now known by the name of Grimadha or Grimala.

Tanderagee ‖ Tangier.

TANDERAGEE, a market-town of Ireland, in the county and 10 miles W. by S. of Armagh. It stands on a hill, has a church and other places of worship for Presbyterians and Methodists, several schools, flour and flax mills, and some trade in corn, linen, &c. Pop. 1496.

TANGANYIKA, a lake recently discovered in the interior of Eastern Africa. In October 1856, the Royal Geographical Society, having determined to send out an expedition to the reputed Lake Nyassa in Eastern Africa, to explore the surrounding country, and if possible to penetrate northwards to the source of the Nile, appointed Captain Burton to command the expedition. He accordingly, after being joined by Captain Speke and others, arrived at Zanzibar in December 1856, but was prevented from leaving that island till June 1857, when the rainy season was over. On the 26th of June they landed on the mainland, and began their journey westwards into the interior; and on the 13th of February 1858, they gained sight of Lake Tanganyika. The lake lies between S. Lat. 3. 10. and 7. 46.; E. Lon. 29. 35. and 30. 35. It is of a long narrow form, its length being upwards of 300 miles, while its breadth at the southern extremity, where it is widest, is about 65 miles; and it gradually diminishes in width towards the other end, near which it is no more than 10 miles across. Its water is fresh and deep, and its elevation above the sea is 1844 feet. There are several islands on its surface. The chief river that falls into it is the Malagarazi, from the east. The first view of this lake from the adjacent hills is described by Captain Burton as exceedingly picturesque. Beyond the steep and rugged slope of the hill lies a flat green sward, bounded by a narrow strip of sand, on which the waves of the lake break. The light blue waters, studded with islands, stretch to the south and north; on the other side rises a ridge of purple hills, while the villages and cultivated land on the shores, and the fishermen's boats on the lake, add animation to the scene.

TANGERMÜNDE, a town of the Prussian monarchy, in the province of Saxony, at the confluence of the Elbe with the Tanger, 32 miles N.N.E. of Magdeburg. It is an ancient town, historically remarkable as having been the first residence of the electors of the house of Hohenzollern. It contains a castle, a church, hospitals, and public offices. There are breweries, oil-mills, and manufactories of leaden shot here; and some trade is carried on in corn and cattle. Pop. 4580.

TANGIER, a seaport of Morocco, near the western entrance of the Strait of Gibraltar, a short distance S.W. of Cape Spartel; N. Lat. 35. 47.; W. Long. 5. 48. It stands on an eminence at the west end of a spacious bay, and it has a fine appearance from the sea, rising gradually upwards in the form of an amphitheatre, and defended by walls, a castle, and several forts. The streets are very narrow and crooked, and the houses, with the exception of these occupied by foreign ambassadors or consuls and a few others, are of the meanest description. The manufactures of Tangier are of little importance, consisting chiefly of coarse woollen cloth, mats, and pottery. Tanning is also carried on; but the leather, though much esteemed in Europe, is inferior to that made in other parts of Morocco. Between Tangier and Gibraltar an active trade is constantly going on; the exports from Tangier being hides, wax, wool, leeches, dates, almonds, oranges, bark, flax, durra, cattle, sheep, various dyes, woollen sashes, Moorish slippers, &c.; and the imports, cotton goods, silk, velvet, hardware of all

Tanis ‖ Tanjore.

kinds, cochineal, indigo, tea, coffee, paper, looking-glasses, and other articles. In 1856, the total value of goods exported from Tangier was L.77,263; of which L.63,580 went to British ports; and the total value of imports was L.135,566; of which L.101,773 were British goods. In the same year there entered the port 313 ships, tonnage 15,663, including 203 British vessels, tonnage 10,883; and there cleared 317, tonnage 15,714, among which were 207 British vessels, tonnage 10,934. The harbour is a mere roadstead, but it affords good anchorage and shelter to the largest vessels, except during the prevalence of strong winds from the north-west or east, when the shipping is somewhat exposed. There are some remains of an old English mole, which, if reconstructed, might improve the harbour very much. Most of the goods imported here are sent on to Fez; but the defective state of the means of internal communication offers many obstructions to this branch of trade. The climate of Tangier is temperate and healthy, but the inhabitants often suffer much from the want of water, as the aqueduct that supplies the town frequently falls into disorder. The ancient Tingis, which occupied the site of Tangier, was, under the Roman emperors, a colony, and the capital of the province of Tingitana. The population of the modern town is estimated at 8500, of whom about 6000 are Moors, 2200 Jews, and 300 Christians.

TANIS, the Hebrew *Zoan* (צֹעַן), and the modern Arabic *San*, a town of ancient Egypt, which gave its name to one of the mouths of the Nile, the second from the east, on which it stood. It was a very ancient city, having been founded, as we are told in the book of Numbers (ch. xiii. 22), seven years later than Hebron, one of the oldest cities in Palestine. Its position near the sea, and among the marshes of the Delta, gave Tanis much importance, and it became one of the chief cities of Lower Egypt. It was probably the residence of some of the Egyptian monarchs; and the field of Zoan, or the rich plain in its vicinity, is described in the Psalms as the scene of the wonders that preceded the Exodus of the Israelites. At a later period, Isaiah mentions the princes of Zoan and the princes of Noph, or Memphis, as if these were the chief cities of Egypt. The rise of Sais seems to have led to the decline of Tanis; but until about the time of the Christian era it continued to be an important town. It probably depended much on the manufacture of linen, for which it was famous. Extensive and interesting monuments still exist on the site of Tanis.

TANJORE, a town of British India, capital of a district of the same name, in the presidency of Madras, in a large and fertile plain on a branch of the Cauvery, 30 miles E. of Trichinopoly, and 180 S.W. of Madras. It consists of two forts connected together, and several suburbs. The greater fort, which is about 4 miles in circumference, is enclosed by a high embattled wall, and a ditch partly filled with water and partly dry. The smaller fort is about a mile in circuit, and has very strong and well-constructed defences. The streets of Tanjore are very irregular; and of the houses some are well built of brick, while many in the town itself, and almost all in the suburbs, are mere mud hovels. In the middle of the greater fort stands the palace of the rajah, an ancient though unfinished building, with several high towers. It contains a fine hall of audience, with black stone pillars and roof; but as this hall is considered unlucky, a much inferior one is used in its stead. The palace contains also a library, hung with portraits, of all the Mahratta princes of Tanjore. In the smaller fort stands the great pagoda, which is considered the finest building of the kind in India. The size of the exterior court, which is in shape oblong, is 570 feet by 200; and over the shrine rises a pyramidal tower 100 feet high. Over the porch is a colossal figure of a bull carved in black granite, a fine specimen of Indian art. Tanjore contains numerous smaller pagodas, and infantry barracks. Silk, muslin, and cotton are made here. Pop. estimated at 80,000.

Tannahill.

The district of Tanjore is bounded on the N.W. by those of South Ascot and Trichinopoly, E. and S.E. by the Bay of Bengal, S.W. by the district of Madura, and W. by the native states of Poodoocottah and Trichinopoly. Length from N.E. to S.W. 120 miles; breadth, 75; area, 3900 square miles. It is a low, level, and alluvial country, the northern and larger part of which is occupied by the delta of the Cauvery, which river, when swelled by the rains that fall in the mountains, rolls a sufficient volume of water to irrigate, and sometimes to overflow the country. The largest branch, called the Coleroon, forms the northern boundary of the district; and the other, or Cauvery proper, divides into a number of small channels, which are prevented from overflowing the land by large embankments, and made to fertilize the soil by an extensive and ingenious system of irrigation. Probably no part of India, with the exception of some tracts in the Ganges' valley, exceeds in fertility this district. The coast is low and sandy, affording no good harbours or anchorages. In 1678 Tanjore was conquered by the Mahratta chief Vencajee, brother of Sevajee; and from him the line of rajahs was descended. In the reign of the Rajah Tooljajee, the nabob of Arcot, supported by the Madras government, laid claim to tribute from Tanjore, and the rajah was deposed; but was subsequently restored on consenting to pay not only the tribute but a subsidy for a British force in Tanjore. After this first alliance with the British in 1781, a dispute in the succession between Serfojee and Ameer Sing occurring in 1787, was settled by the British government in favour of the latter; but he was deposed, and Serfojee elevated to the throne in 1798. The new rajah, in the following year, sold his dignity for an annual payment, retaining only the title and the government of the capital; and subsequently the reigning family became extinct. Pop. (1851) 1,676,086.

TANNAHILL, ROBERT, a song writer of considerable merit, was born in Paisley on the 3d of June 1774. His parents were poor, and he was brought up to the trade of a handloom weaver. With the exception of a visit to Lancashire of some two years, he spent his whole life in the town where he first saw the light, steadily plying the shuttle, and weaving what of feeling and passion stirred within him into the impressive language of lyrical verse. "Jessie, the Flower o' Dumblane;" "The Braes o' Gleniffer;" "Yon Burn Side;" "The Braes of Balquhither;" "O are ye sleeping, Maggie;" "Thou bonnie Wood o' Craigie-lea," present, with considerable variation, nearly all that Tannahill can claim as pledges of our remembrance. He wrote poems and dramas certainly which possess some merit, but these are the pieces which are most popular, down to the present day, of all that he has left to us. Greater power of song, and a much fuller tide of passion, more, in short, of the fervour of genius, runs through the lyrics of Burns, but Tannahill, while occupying a considerably lower pedestal, must nevertheless stand pretty far forward when the god of lyrical verse descends to crown with an immortal diadem all those who have distinguished themselves as the song writers of their country. In truth, simplicity, tenderness, and genuine pathos, it would be difficult to find a writer to excel Tannahill. Nevertheless there are occasional marks of defective taste in his poems, such as turgidity, sometimes rising into bombast, and a straining after effect which always defeats itself. He is generally characterised by great ease and sweetness of versification. Some of the verses in the "Braes o' Balquhither" literally glide through one's mouth like honey. The language of his poems is eminently simple, sometimes even homely, yet he now and then displays a fondness for old-fashioned or obsolete words.

Tannahill returned from Preston in 1802 to lay his father in the grave; and from this period, until the date of his own lamented end, he resided constantly with his mother. He was a very retiring man, and was considerably annoyed by the vulgar curiosity of visitors. The arrival of James Hogg, the Ettrick shepherd, who had made a pilgrimage all the way to Paisley to see the weaver bard, was very welcome to Tannahill. Consumption was in the poet's family, and a depressing melancholy kept him almost constantly under its dark shadow. Slight symptoms of mental aberration began to manifest themselves, and, on the morning of the 17th May 1810, his body was found in a pool in the vicinity of Paisley. He had just reached his thirty-sixth year when this melancholy event took place. Many of the songs and poems of Tannahill were published in newspapers and magazines, and shortly before he committed the rash act which put a term to his life, he gave all of his unpublished pieces to the flames on which he could lay his hands. His *Poems and Songs* were first published in 1809, and the last regular edition of them is dated 1851.

Tanner || Tapestry.

TANNER, THOMAS, an eminent antiquary, was born in 1674. His father, Thomas Tanner, was vicar of Market Lavington, in Wiltshire. The son was sent to Queen's College, Oxford, in 1689; took the degree of A.B. in 1693, and that of A.M. in 1696, and was elected a fellow of All Souls College in 1697. He became prebendary of Ely in 1713, archdeacon of Norfolk in 1701, and canon of Christ Church in 1724. He was consecrated bishop of St Asaph on the 23d of January 1732, and died at Christ Church on the 14th of December 1735. He was thrice married. Dr Tanner was a very industrious antiquary, and left an immense collection of papers, which are preserved in the Bodleian Library. He had a considerable share in the second edition of Wood's *Athenæ Oxonienses*. He published a work entitled, *Notitia Monastica; or a Short History of Religious Houses in England and Wales*, Lond. 1695, 8vo. After the author's death, an enlarged edition was published by his brother, the Rev. John Tanner, Lond., 1744, fol. And an improved edition was published by Nasmith in 1787. His principal work, with which he had been more or less occupied for the space of forty years, bears the title of *Bibliotheca Britannico-Hibernica; sive, de Scriptoribus qui in Anglia, Scotia, et Hibernia, ad sæculi xvii. initium floruerunt*, Lond. 1748, fol. The preface was written by Dr Wilkins, who did not live to see the completion of the work.

TANNING. See LEATHER.

TANTALUS, a fabled king of Phrygia and Paphlagonia, was, according to the common accounts, the son of Jupiter and the nymph Pluto. The ordinary account of him is, that being invited by Jupiter to the divine table, he afterwards divulged the secrets intrusted to him, and the gods punished him with perpetual hunger and thirst. He was chained in a lake, the water of which reached up to his chin, but retired when he attempted to drink. The branch of a tree loaded with fruit hung down even to his lips, but on his attempting to pluck the fruit the branch sprang upwards. Many other fables are told regarding Tantalus. His punishment was proverbial among the ancients, and hence the use of the English verb, "to tantalize."

TAPESTRY, derived from the French *tapis*, a carpet or table-cover (which comes from the Latin *tapetum*, a carpet, or covering for a bed or couch), is a name given to woven or embroidered fabrics, employed chiefly as linings or hangings on the walls of rooms or churches, and occasionally as ornamental coverings for articles of furniture, such as tables, couches, desks, &c.

Tapestry appears to be of Oriental origin. Its materials were silk and wool, dyed in brilliant colours; also flax, byssus, gold, and precious stones. Figures, landscapes, and various ornamental devices, were embroidered in the ancient tapestries, many of them apparently by hand. The embroidered curtains of the tabernacle, described in the book of Exodus, are supposed to have been worked with the needle in thread of silk, gold, or wool. Embroidery and other ornamental works were extensively practised among the Egyptians, and their figured cloths were made both by the needle and the loom. Respecting the latter, we are told that many patterns worked in colours by the loom were so richly composed that they vied with cloths embroidered by the needle. The Babylonians and other nations of antiquity were acquainted with this art, and made use of it to represent the mysteries of their religion, and also to celebrate historical events. The Greeks attributed the invention to Minerva. Shawls or hangings for the temples formed an important part of the gifts offered by devotees to heathen divinities. On these hangings the utmost care and skill were bestowed, and they were even celebrated by the poets. Thus, Euripides describes a shawl on which the sun, moon, and stars were represented, and which, with others containing hunting-pieces, &c., belonged to the temple of Apollo at Delphi, and was used to form a magnificent tent. In what way the precious metals, jewels, &c., were introduced into ancient tapestry, we are not clearly informed. In the 39th chapter of Exodus there are directions for beating gold into thin plates, and then cutting it into wires for the cunning work of the ephod; and it is thought probable that the gold thread used in Egyptian embroidery was made in the same manner, and rounded by the hammer, for no trace of wire-drawing has been discovered in the ancient accounts of working in metal.

Tapestry.

The working of tapestry with the needle can be traced in France to the earliest times of the monarchy. When Clovis and his people embraced Christianity, not only were the churches adorned with rich tapestries, but the very streets were curtained with them. At that time, and down to the ninth century, they appear to have been fabricated entirely by hand; but at about the latter date the loom was introduced, and shared in the manufacture, which, however, was still largely carried on by the needle, and formed the employment of females in convents and elsewhere. In the two following centuries other parts of Europe produced fine embroideries; and those of England gradually became highly prized on the continent.

A great extension of the employment of tapestry took place in the twelfth and thirteenth centuries, when it began to be applied to private use in the residences of the nobility, instead of being reserved, as heretofore, for the curtains, palls, altar-cloths, and vestments of churches and monasteries. The lofty walls of stone were no longer allowed to remain cold and naked, but were covered, often by the industry of the ladies of the family, with rich hangings, on which the heroic deeds of their ancestors were embroidered, with more or less dexterity, according to the skill of the draughtsmen in design, and of the needlewomen in execution. The taste for these household luxuries is said to have been introduced from the East in consequence of the increased intercourse occasioned by the crusades. The Oriental practice of covering walls with prepared and ornamented skins, united so as to form solid leather hangings, which not only resisted damp, but were capable of high ornamentation by means of gilding, seems to have suggested the use of tapestry for similar purposes, and thus to have led to a vast improvement in the domestic comfort of many a baronial dwelling. These solid and richly embroidered curtains must have saved the inmates from many a cold current of air, while their legends imparted an unwonted appearance of life and activity to the bare walls. The eastern origin of these wall-coverings may be traced in the name *Sarazins* or *Sarazinois*, formerly applied in France to the workmen engaged in their manufacture.

Tapestry. In the fourteenth and fifteenth centuries the Flemings, who had long been celebrated for their tapestries, carried the art to great perfection, and produced some of the finest specimens which had yet appeared. Guicciardini ascribed the invention of tapestry to Flanders; but this could only apply, if at all, to such as is produced by the loom, and embroidery by the loom appears only to have followed when the fingers became inadequate to meet the demand for a well-known and necessary article. Among the early manufactories of tapestry were those of Brussels, Arras, Antwerp, Lisle, Oudenarde, Tournay, Bruges, and Valenciennes. Those of Arras became highly celebrated: they were executed, as were most of the French tapestries, chiefly in wool, with a little hemp and cotton, but without silk or gold or silver thread. The richer and more costly kinds of tapestry were fabricated chiefly at Florence and Venice. In the sixteenth century, Francis I. established the celebrated manufacture of Fontainebleau, in which threads of gold and silver were introduced into the work: this manufacture was also patronised by his successor, Henry II., who brought Italian workers to further French art. In the following century, new edifices were erected for the tapestry weavers of Paris, and Flemish workmen were hired to assist them. But the work languished after the death of Henry IV. It was revived by Louis XIV., who founded a manufacture in premises which had been erected by celebrated dyers named Gobelin. The establishment was named *Hotel Royal des Gobelins*, and has attained a world-wide celebrity on account of the fine tapestries executed there—often from designs of Raphael, Giulio Romano, and other Italian painters. Le Brun was at one time chief director of the establishment, and many fine productions are from his designs. This manufacture continued to flourish until the time of the Revolution, when it greatly declined. It was subsequently revived under the government of Napoleon, but never regained its ancient fame. The works executed in it were thenceforth chiefly for the use of the royal palaces, and very few were presented for general sale. Our great Exhibition of 1851 presented two fine specimens from this celebrated manufactory. Both were copies of well-known pictures; the one, of Raphael's fresco in the Farnesina, in which Psyche is represented carried through the air by genii, and bearing the vessel which, at the behest of Venus, she has brought from the nether world; the other, of Horace Vernet's picture of Ali Pasha, looking on at the massacre of the Mamelukes, who at his command were shot by his soldiers. In both these copies the general effect, as well as much of the feeling of the artists, were preserved to an extraordinary degree, considering that the process of copying was so purely mechanical.

Of the use of tapestry in England we have many brief indications in Anglo-Saxon times. Silken curtains embroidered in gold were fabricated for some of the dwellings of the nobility; and in the wonderful specimen of industry known as the Bayeux tapestry, we have an evidence of the use of linen tapestry worked with wool in the days of William the Conqueror. This piece of needlework is said to have been executed by his queen and her maidens in commemoration of the conquest of England, and to have been bestowed by Matilda herself on the cathedral of Bayeux, of which Odo, the Conqueror's brother, was bishop. At one time this piece of tapestry was annually hung up in the church, where it entirely surrounded the nave, and was so kept for eight days, when it was again carefully locked up. By order of Napoleon I., the Bayeux tapestry was exhibited in Paris in 1803, and in other large towns of France: it was then consigned, not to the cathedral, but to the municipality of Bayeux. It is 20 inches wide, and 214 feet long, and is divided into 72 compartments, each bearing a superscription in Latin. Tapestry hangings were introduced more generally in the time of Eleanor of Castile, and began to be employed also as a covering for floors. Tapestry. The rich tapestry of Elizabeth's time is noticed by poets and writers of the day, and indicates an abundance which could not have been supplied by the needle. And it appears that tapestry weaving had been introduced into England in the reign of Henry VIII., and was practised from that time with more or less success. A celebrated manufactory at Mortlake, in Surrey, produced superb hangings for the royal palaces, &c. These were hung up on frames by means of hooks, and often at some little distance from the walls, so that concealment behind the tapestry was quite possible. This arrangement facilitated the removal of one suit of tapestry and the substitution of another to suit particular occasions, such as a royal progress, when the tapestry was sometimes sent on and affixed to the walls for that special occasion. At a later period, tapestry shared in the improvements of weaving and dyeing, but became less characteristic and interesting as its peculiar use in recording family or historical events passed away.

Tapestry-work is distinguished by the workmen into two kinds, that of *high* and that of *low warp* (*haute-lisse* and *basse-lisse*); though the difference is rather in the manner of working than in the work itself, which is in effect the same in both; only the looms, and consequently the warps, are differently situated; those of the low warp being placed flat and parallel to the horizon, with the weaver in a sitting position, and those of the high warp erected perpendicularly, so that the weaver is in a standing position. The loom on which the high warp is wrought consists of four principal pieces, two long planks or cheeks of wood, and two thick rollers or beams. The planks are set upright, and the beams across them, one at the top and the other at the bottom, or about a foot distance from the ground. They have each their trunnions, by which they are suspended on the planks, and are turned with bars. In each roller is a groove, from one end to the other, capable of containing a long round piece of wood, fastened in it with hooks. The use of it is to fix the ends of the warp. The warp, which is a kind of worsted, or twisted woollen thread, is wound on the upper roller; and the work, as fast as woven, is wound on the lower. In the inside the planks, which are 7 or 8 feet high, 14 or 15 inches broad, and 3 or 4 thick, are holes pierced from top to bottom, in which are put thick pieces of iron, with hooks at one end serving to sustain the coat-stave. These pieces of iron have also holes pierced, by putting a pin in which the stave can be drawn nearer or set farther off; and thus the coats or threads are stretched or loosened at pleasure. The coat-stave is about three inches in diameter, and runs all the length of the loom. On this are fixed the coats or threads, which make the threads of the warp cross each other. It has much the same effect here as the spring-stave and treddles have in the common looms. The coats are little threads fastened to each thread of the warp with a kind of sliding knot, which forms a sort of mesh or ring. They serve to keep the warp open for the passage of broaches wound with silks, woollens, or other matters used in the piece of tapestry. In the last place, there is a number of small sticks of different lengths, but all about an inch in diameter, which the workman keeps by him in baskets, to serve to make the threads of the warp cross each other, by passing them across; and, that the threads thus crossed may retain their proper situation, a packthread is run among the threads above the stick. The loom being thus formed, and mounted with its warp, the first thing the workman does is to draw on the threads of this warp the principal lines and strokes of the design to be represented on the piece of tapestry; which is done by applying the cartoon or design to be copied to the back or wrong side of the warp, and drawing the pattern on the front of the warp, the threads of which are sufficiently open to allow

Tapestry.

the artist to see the design between them. The original design by which the work is to be finished is hung up behind the workmen, and wound on a long staff, from which a piece is unrolled from time to time as the work proceeds.

Besides the loom, &c. here described, there are three other principal instruments required for working the silk or the wool of the woof within the threads of the warp; these are a *broach*, a *reed*, and an *iron needle*. The broach is made of a hard wood, seven or eight inches long, and two-thirds of an inch thick, ending in a point with a small handle. This serves as a shuttle; the silks, woollens, gold, or silver to be used in the work being wound on it. The reed or comb is also of wood, eight or nine inches long, and an inch thick on the back, thinning off to the extremity of the teeth, which are more or less apart, according to the greater or less degree of fineness of the intended work. Lastly, the needle is made in form of the common needle, only larger and longer. Its use is to press close the wool and silks when there is any line or colour that does not fit well.

All things being prepared for the work, and the workman ready to begin, he places himself on the wrong side of the piece, with his back towards the design; so that he works as it were blindfold, seeing nothing of what he does, and being obliged to quit his post and go to the other side of the loom whenever he would view and examine the piece, to correct it with his pressing-needle. To put silk, &c. in the warp, he first turns and looks at the design; then taking a broach full of the proper colour, he places it among the threads of the warp, which he brings across each other with his fingers, by means of the coats or threads fastened to the staff; this he repeats every time he has to change his colour. Having placed the silk or wool, he beats it with his reed or comb; and when he has thus wrought in several rows over each other, he passes round to see what effect they have, in order to reform the contours with his needle, if there be occasion. As the work advances, it is rolled upon the lower beam, and as much warp is unrolled from the upper beam as suffices. When the pieces are wide, several workmen may be employed at once.

The loom or frame on which the low warp is wrought, is much like that of the weavers. The principal parts are two strong pieces of wood forming the sides of the loom, and bearing a beam or roller at each end. They are sustained at bottom with other strong pieces of wood in the manner of trestles; and, to keep them the firmer, they are likewise fastened to the floor with a kind of buttresses, which prevent any shaking, though there are sometimes four or five workmen leaning on the fore-beam at once. The rollers have each their trunnions, by which they are sustained; they are turned by large iron pins three feet long. Along each beam runs a groove, in which is placed the *wich*, a piece of wood of about two inches diameter, and almost of the length of the roller: this piece fills the groove entirely, and is fastened from space to space by wooden pins. To the two wiches are fastened the two extremities of the warp, which is wound on the farther roller, and the work, as it advances, on the nearer. Across the two sides, almost in the middle of the loom, passes a wooden bar, which sustains small pieces of wood, not unlike the beam of a balance. To these pieces are fastened strings, which bear certain spring staves, with which the workman, by means of two treddles under the loom, on which he sets his feet, gives a motion to the coats, and makes the threads of the warp rise and fall alternately. Each loom has more or fewer of these spring-staves, and each staff more or fewer coats, as the tapestry consists of more or fewer threads.

The design or painting which the workman is to follow is placed underneath the warp, where it is sustained from space to space with strings, by means of which the design is brought nearer the warp. The loom being mounted, there are two instruments used in working it, the *reed* and the *flute*. The flute does the office of the weaver's shuttle; it is made of a hard polished wood, three or four lines thick at the ends, and somewhat more in the middle, and three or four inches long. On it are wound the silks or other materials to be used as the woof of the tapestry. The comb or reed is of wood or ivory; it has usually teeth on both sides; it is about an inch thick in the middle, but diminishes each way to the extremity of the teeth: it serves to beat the threads of the woof close to each other, as fast as the workman has passed and placed them with his flute among the threads of the warp. The workman is seated on a bench before the loom, with his breast against the beam, only a cushion or pillow between them; and in this posture, separating with his fingers the threads of the warp, that he may see the design underneath, and taking a flute, mounted with a proper colour, he passes it among the threads, after having raised or lowered them, by means of the treddles moving the spring-staves and coats. Lastly, to press and close the threads of the silk or yarn, &c. thus placed, he strikes each course (*i. e.* what the flute leaves in its passing and coming back again) with the reed.

Taprobane || Tara.

The usual widths of tapestry were formerly from two ells to three ells Paris measure: and it was the business of the *rentrayeurs*, or fine-drawers, to unite the tapestry into one picture, without any appearance of seam. Of late years, however, the pieces are woven of such a width that joining is seldom required even for the largest pieces. (C. T.)

TAPROBANE, the name given by ancient writers to the island of Ceylon. This island first became known to the Greeks at the time of Alexander's conquests; and for a long time the most erroneous ideas were current about its size and position. Onesicritus makes it twenty days sail from the continent, and Eratosthenes seven; either of which must imply something much more than the actual distance, 50 miles. The latter of these writers extends Taprobane 1000 miles in the direction of Africa; and other geographers make it lie very near the east coast of that country. As to its size, Strabo considers it not inferior to Britain; and Ptolemy reckons it 1000 miles in length by 700 in breadth. But the natural character and productions of the island are, for the most part, described by ancient writers with considerable accuracy. The fullest and best accounts of Ceylon in ancient times are those of Pliny and Cosmas Indicopleustes. (See CEYLON.)

TAR, a thick, black, unctuous substance, obtained chiefly from fir trees, or from coals, by burning them with a close heat. It consists of resin, empyreumatic oil, and acetic acid. When inspissated by boiling it is called *pitch*. It is prepared in great quantities in Norway, Sweden, Germany, Russia, and North America, and in other countries where the pine and fir abound. Becher the celebrated chemist first proposed to make tar from pit-coal. Manufactories for this purpose were established many years ago in the bishopric of Liege, and in several parts of England. Tar is often extracted in large quantities in the manufacture of coal-gas, from which it is usually separated by condensation. This substance, which is well known for its economical uses, is properly an empyreumatic oil of turpentine, and has been much used as a medicine both internally and externally. The importations of tar into Great Britain from Russia, Sweden, and the United States in 1858, were 10,107 lasts, free of duty, at a total cost of L.88,944.

TARA, a town of Asiatic Russia, Siberia, in the government, and 230 miles E.S.E. of Tobolsk, on the Irtish. It consists of a fortified port on a small hill, and a suburb near the river; and it has several churches, a mosque, and manufactures of leather, hats, and vitriol. Some trade is carried on with Chinese and Independent Turkestan. Pop. 5192.

Tarancon ‖ Taranto.

TARANCON, a town of Spain, in the province, and 38 miles W. of Cuenca, 45 miles S.E. of Madrid. It contains a handsome church, a splendid palace of the Duke of Rianzares, two schools, and several hermitages. Linen cloth is made here, and there is some trade in wine and oil. Pop. 4790.

TARANTO (Lat. *Tarentum*, Gr. Τάρας), a town of Naples, at the northern extremity of the gulf of the same name, in the province of Otranto, 35 miles S.E. of Matera. The modern town occupies the site of the acropolis or citadel of the ancient Tarentum, which stood on a rocky island in front of the inner harbour. As the city grew, it was artificially joined to the mainland, but was afterwards separated for the sake of defence, and is now again connected by a bridge of seven arches, supporting an aqueduct. The streets are very narrow and gloomy, and the houses lofty and crowded together. The chief buildings are the castle, built by Charles V., commanding both seas, and flanked with enormous towers; the cathedral, and several other churches; numerous monasteries, nunneries, and several hospitals. Linen, cotton, velvet, muslin, and gloves are made here. The purple dye, for which Tarentum was famous in antiquity, is still esteemed. A large proportion of the inhabitants are employed in oyster and mussel fishing. Some trade is carried on; but the inner port is so choked up as to be inaccessible, and the outer one is very much exposed. Tarentum was a Spartan colony, founded about 708 B.C., under a leader called Phalanthus. Of the early history of the colony little is known; but it seems to have acquired importance by means of its fertile neighbourhood, which produced excellent wool, honey, and oil, its celebrated purple dye, and, above all, its excellent harbour, which was the best on that coast. The settlers frequently came into collision with the native inhabitants of the interior, and gained over them several victories. A reverse of fortune, however, occurred about the year 473 B.C., when the forces of Tarentum, along with those of Rhegium, suffered a great defeat from the Messapians. The loss thus inflicted seems to have fallen chiefly on the higher classes at Tarentum; for it led to a change of government there from aristocracy to democracy. But however great the disaster was it did not stop the progress of the town; and soon afterwards the Tarentines engaged in a war with the Thurians to prevent them from occupying the district about the Siris. This dispute was finally settled in 432 by the establishment of the joint colony of Heraclea in the debateable land. For a long period after this the Tarentines seem to have enjoyed the happiness of these nations whose annals are vacant. Their only wars were probably with their old enemies the Messapians, until the Lucanians began to threaten the safety of the Greek cities in Italy. When hard pressed by these barbarians, they applied for aid from foreign countries. The first who came to their assistance was Archidamus, king of Sparta, who landed in 346, but was at length defeated and slain in 338. Alexander of Epirus arrived in 332, and, after defeating the enemies of Tarentum, turned against his allies themselves, and took from them Heraclea. From this enemy they were relieved by his death in 326; and they seem to have been able to defend themselves without aid till 303, when they again applied to Sparta. Cleonymus was the deliverer now sent, and he compelled their enemies to accept terms of peace. About this time they formed a treaty with Rome, by which the vessels of that nation were not permitted to enter the Gulf of Tarentum. This condition was violated when, in 282, ten Roman vessels came within sight of the city itself. They were immediately attacked by the Tarentines, who sunk four of them and captured one. The victors thereafter sailed to Thurii, expelled the Roman garrison, and took the city. Reparation for these injuries was demanded by the Romans, and its contemptuous refusal by the Tarentines led to an immediate declaration of war (B.C. 281.) Foreign aid was, as usual, sought against this formidable enemy, and Pyrrhus of Epirus entered the field in defence of Tarentum. His hard won victories and final defeat form part of the history of Rome. He finally retired from Italy in 274, leaving his general, Milo, to protect his allies; but he was unable to defend the city, and surrendered it in 272 to the Roman consul Papirius. Under the Romans Tarentum continued to enjoy its own laws, and a nominal independence; but as it was a military position of importance, a legion was commonly stationed there to overawe the town. At the second Punic war, after the great victory of Hannibal at Cannæ, a Carthagenian party was formed at Tarentum; and by their aid, in 212, the city was surrendered to Hannibal, though the Roman garrison still held the citadel. The Carthagenian general, after a vain attempt to storm the castle, blockaded it for two years. At length, in 209, Fabius determined to expel the Carthagenians from the position they had gained; and succeeded in capturing the city, putting the garrison to the sword, and obtaining an immense amount of booty. From this severe blow Tarentum never wholly recovered; and although surpassed by the ports of Brundisium and Hydruntum, the fertility and salubrity of its environs, and the excellence of its harbour, saved it from the complete decay that overtook most of the Greek cities of Italy under the Roman sway. After the fall of the western empire, it fell into the hands of the Goths, from whom it was captured by Narses in 553 A.D. It remained subject to the eastern empire till it was taken in 661 by the Lombards; after whom the Saracens and the Greek emperors successively possessed it till 1063, when it was taken by Robert Guiscard. From that date it has always belonged to the kingdom of Naples. Pop. 15,000.

Tarare ‖ Tarbagatai.

TARARE, a town of France, capital of a canton in the department of Rhone, 21 miles W.N.W. of Lyons. It stands in a narrow valley, and has risen to prosperity quite recently, chiefly through its manufactures. The chief branch carried on here is the weaving of muslin, which employs about 52,000 persons, and produces annually between three and four millions of pieces. Silk and merinoes are also made here. Pop. 10,334.

TARASCON, a town of France, department of Bouches-du-Rhone, on the left bank of the Rhone, which is here crossed by a suspension-bridge, 12 miles S.W. of Avignon. It is surrounded by walls, which are flanked with towers and pierced by several gates. The most conspicuous building is the massive and picturesque castle, which overhangs the river. It was founded in 1400, and is now used as a prison. The church of St Martha is a Gothic building of the fourteenth century, but some of its parts are considerably older. There are here also a town-hall, court-house, theatre, hospitals, barracks, and public library. Woollen and cotton cloth, silk stuffs, serge, ropes, leather, brandy, vinegar, and other articles, are manufactured; and boat-building is extensively carried on. There is an active trade in wine, brandy, oil, and the produce of the neighbouring country. Pop. 12,539.

TARAZONA, a town of Spain, in the province and 52 miles W.N.W. of Saragossa, on the Queiles, which is here crossed by three bridges. It rises gradually from the river, and has a fine appearance from a distance. The chief buildings are the Gothic cathedral with its spire of brick, several other churches, the Episcopal palace, town-hall, and Moorish castle. Leather and hats are made here, and there are oil and flour mills; but most of the people are employed in agricultural or pastoral pursuits. Pop. 5966.

TARBAGATAI, a town of the Chinese empire, near the frontiers of Siberia, 180 miles N. of Ili; N. Lat. 46. 8., E. Long. 82. 38. It is enclosed by turretted walls of stone, and traversed by several canals. The population is

Tarbes || Targum.

variable, consisting partly of Chinese troops, to the number of about 1000, who form the garrison; and partly of merchants who resort thither for the sake of commerce with the Kalmucks. Silk and cotton fabrics are exchanged for cattle from the Kalmucks.

TARBES, a town of France, capital of an arondissement and of the department of Hautes Pyrenees, on the left bank of the Adour, 23 miles E.S.E. of Pau. It occupies a fine situation in a flat and fertile country, and commands a view of the Pyrenees in the distance. It has broad clean streets with well-built houses, generally low and roofed with slates. There are three handsome squares and several public walks in the vicinity. The town was formerly surrounded with walls, but these have now entirely disappeared; although the old castle of the Counts of Bigorre still stands, and is used as a prison. The cathedral of Tarbes is a modern building not very remarkable, and the town has several other churches, a former Episcopal palace, now the residence of the prefect, an hospital, college, normal seminary, and theatre. Paper and leather are manufactured here, and a considerable trade is carried on in iron, wine, hides, cattle, corn, &c. Tarbes was once one of the principal towns of Aquitaine. For a long time it belonged to the English monarchs, and it was the residence of the Black Prince. In 1814 a combat took place here between the British and the French, in which the former gained the victory. Tarbes was the birthplace of Barere, who played so conspicuous a part in the first French revolution. Pop. (1856) 13,120.

TARBOLTON, a burgh of barony and village of Scotland, Ayrshire, 7 miles N.E. of Ayr, and 8 S. of Kilmarnock. It spreads over a considerable area, and contains, along with many neat houses, a handsome parish church, Free and United Presbyterian churches, several schools, a library, and a savings bank. Manufactures of needlework, cotton, woollen, and linen cloth are carried on here. Pop. of the parish 2824.

TARGUM (*interpretation* or *version*), a name given to the Chaldee paraphrases of the books of the Old Testament. They are called paraphrases or expositions, because they are rather comments and explications than literal translations of the text. They are written in the Chaldee tongue, which became familiar to the Jews after the time of their captivity in Babylon, and was more known to them than the Hebrew itself; so that when the Hebrew text was read in the synagogue, or in the temple, they generally added to it an explication in the Chaldee tongue for the service of the people, who had but a very imperfect knowledge of the Hebrew. It is probable, that even from the time of Ezra this custom began (Nehem. viii. 7–9).

At present we know of eleven Targums, three of which comprehend the five books of Moses.—1. The Targum of Onkelos. 2. That of the Pseudo-Jonathan. 3. The Jerusalem Targum. 4. That of Jonathan ben Uzziel on the Prophets. 5. That of Joseph the Blind or one-eyed, on the Hagiographa (Job, Psalms, Proverbs). 6. A Targum on the five Megilloth, *i.e.* the books of Ruth, Esther, Ecclesiastes, Song of Solomon, and Lamentations of Jeremiah. 7. A Targum on 1st and 2d Chronicles. 8, 9, and 10. Three on Esther. 11. The Jerusalem Targum on the Prophets.

Onkelos.—According to the Babylonian Talmud, Onkelos was a disciple of Hillel, who died 60 years B.C. The version of Onkelos, containing the Pentateuch alone, is incomparably the best of all the Targums. The style is pure, approaching that of Daniel and Ezra; it follows the original word for word, except where figures of speech are occasionally resolved in poetical passages, and anthropomorphic expressions removed or changed, lest corporeity should be attributed to the Supreme Being. The work is particularly useful in criticism, because it is very literal, closely adhering to the original words. Wherever the translator deviates from the Masoretic text, he has almost always the countenance of other ancient versions. He refers only two passages to the Messiah (Gen. xlix. 10; Num. xxiv. 17). Onkelos's reputation among the Jews has always been great; his version is even used by them as a kind of dictionary giving the significations of the Hebrew words; and they have composed a Masora on it like that upon the Hebrew Bible, called *Masora Hattargum*. This paraphrase is given in the Paris and London Polyglotts from Buxtorf's edition of 1618; the text, however, is not yet accurately printed after good MSS. Luzzato has recently attempted to revise it in his work entitled *Philoxenus, sive de Onkelosi paraphr. Chald.*, Wien. 1830, 8vo. (See the *Halle Literaturzeit* for 1832.)

Targum.

Jonathan Ben Uzziel on the Prophets and Historical Books.—The accounts of Jonathan's life are obscure. His Targum, like that of Onkelos, is frequently mentioned in the Talmud, and must have been well known when the latter was written. Some have erroneously looked upon this Targum as the composition of different authors, because it is more literal in the historical books than in the prophets; but external and internal evidence coincide in proving the unity of the whole. It contains Joshua, Judges, Samuel, Kings, Isaiah, Jeremiah, Ezekiel, and the twelve minor prophets. The style is inferior to that of Onkelos; it contains several Greek words, but no Latin terms, as Eichhorn affirms. We are aware that Hävernick, after Carpzov, asserts that the style agrees in the main with Onkelos's; but it is certainly less pure, freer, and more paraphrastical. The utility of this Targum chiefly bears upon the critical history of the Hebrew text, and it generally harmonises with the Masoretic recension. It is printed in the Bibles of Bomberg and Buxtorf, as also in the London Polyglott.

Pseudo-Jonathan on the Pentateuch.—This paraphrase has been falsely ascribed to the same Jonathan who translated the prophets and historical books. Its language is much more impure, being mixed with foreign words, such as Persian, Greek, and Latin, a collection of which has been made by Petermann, *De indole Paraphraseos, quæ Jonathanis esse dicitur*. Berol. 1829, p. 65, sq. The mode of rendering is entirely different; it contains numerous allegories, fables, and dialogues, unlike the manner of the real Jonathan. The dialect in which it is written is that of Jerusalem; and where the author abides by the Hebrew text, he uniformly follows the Rabbinical interpretation. Several circumstances, especially the character of the style and the mention of the Talmud, prove that it was made after the sixth century of the Christian era. Zunz, with great probability, assigns it to the latter half of the seventh century. It appears to have been compiled in part from former expositions.

The Jerusalem Targum on the Pentateuch.—This version is styled the *Jerusalem* Targum, either from having been made at Jerusalem, or rather from its being executed in the dialect of that place. It contains merely interpretations of select passages, and generally agrees with the Pseudo-Jonathan. The fables of the Pseudo-Jonathan are repeated, and Hebrew words are inserted without any explanation. The language is impure and barbarous; whole chapters are occasionally omitted; and again, a series of successive explanations is attached to a single word. It consists of mere fragments. Late investigations, conducted with great skill and industry, have fully established the fact that the Targum on the Pentateuch, falsely ascribed to Jonathan, existed much earlier under the name of the Jerusalem Targum or the Targum of Palestine. Thus the Pseudo-Jonathan is identified with the Targum of Jerusalem. They are merely *recensions* of the same work. There is also ground for believing that the Jerusalem Targum extended

Targum.

to the prophetic books, and even to the other parts of the Old Testament (Zunz, p. 77, sq.). Some of the Targums now existing on several books of the *Hagiographa* appear to belong to it. (See Zunz, *Gottesdienstliche Vorträge der Juden*, Berlin, 1832, 8vo, and Hävernick's *Einleitung*.) These two Targums, which are substantially one and the same, furnish extremely little aid in the criticism of the Old Testament. They exhibit the doctrinal system of the later Jews; indeed all the post-Talmudic versions were designed to furnish allegorical explanations agreeable to the rules laid down in the Talmud, and to embody current traditions, legends, and tales.

The paraphrases on *Job, Psalms, and Proverbs* possess a common character in regard to style and language, and probably proceeded from the same country, which Zunz conjectures to have been Syria; that on Proverbs, however, adheres closely to the Hebrew text, partaking more of the character of a *version* than a *paraphrase*, while those on Job and Psalms are loose and legendary, agreeably to the genius of the time in which they were made. It has been frequently noticed that the Targum on Proverbs has a remarkable agreement with the Syriac version, so that some have supposed the writer to have made use of that more ancient translation; this hypothesis, however, is not very probable. The dialects in which both are written were cognate; the country to which they owed their origin the same; it is not necessary, therefore, to conclude that the one was derived in part from the other. The paraphrases of the books of Psalms and Job appear to have been written by the same person, as far as we can judge from internal uniformity. Earlier Targums on Job must have existed, as they are mentioned by some of the Rabbins.

The Targum on Job, Psalms, and Proverbs, attributed to Joseph the Blind, is generally considered not to have been written by the reputed author.

The *Targum on the Megilloth* was probably written by the same person; it is exceedingly free and full of adventitious matter. The part upon Ruth is the best; that on Solomon's Song the most fabulous. The work must have been written a considerable time after the Talmud. In addition to the Targum on Esther, which forms a part of this Targum on the five Megilloth, and is also the oldest and best, there are two others on the same book. The second is an enlargement of this first, and was inserted in the London Polyglott; it had been previously published by Tayler in a Latin version, under the name of *Targum prius* (Lond. 1655, 4to). The third is still longer and more full of fables; it was published in Latin by Tayler, under the title of *Targum posterius*, but the original has never been printed. These three are properly different recensions of one and the same work, which, having been comparatively brief and free from absurd stories, was subsequently enlarged at two different times.

It was long thought that there was no *Targum on the books of Chronicles;* Beck, however, found such a paraphrase in a MS. belonging to the library at Erfurt, and published it with learned annotations in 1680–83. The MS. has several chasms. It was afterwards published by Wilkins from the Erpenian MS. at Cambridge in 1715: here the text is full and correct. This Targum resembles the later works of the same kind; and could not have been written before the ninth century, from its references to the Jerusalem Targum.

In cod. 154 of Kennicott, there is a passage of some length quoted in the margin at Zechariah xii. 10 (Bruns in Eichhorn's *Repertorim*, xv. 174). It is attributed to a Targum of Jerusalem on the prophets.

As far as our present knowledge reaches, there is no Chaldee version of Daniel, Ezra, and Nehemiah. The reason assigned in the Talmud for not translating Daniel into Chaldee is, because it reveals the exact time of Messiah's advent. But the true cause seems rather to have been the superstition of the Jews in supposing that if these books were translated into Chaldee, the holy text of the original should be mixed with that of the paraphrase, inasmuch as there are in them Chaldee sections. There are indeed no Chaldee pieces in Nehemiah; but it was taken along with Ezra as one book, and hence no Targum of either was made.

Tarifa ‖ Tarn.

The Targums are of considerable use in a critical view, and they show the integrity of the present Masoretic text.

(See the *Introductions* of Eichhorn, Bertholdt, and De Wette; Winer, *De Onkeloso ejusque Paraphrasi Chaldaica*, 4to, Lips. 1819; Gesenius *Comment. zu Jesaia*, tom. i.; Walton, *Prolegomena;* Jost, *Geschichte der Israeliten*, Berlin, 1824–9, tom. iii. and iv. Winer has published a grammar and Chrestomathy to facilitate the reading of the Targums, and Buxtorf's folio Lexicon is the best dictionary.)

TARIFA, a seaport of Spain, in the province of Seville, at the extreme south point of the peninsula, 15 miles W.S.W. of Gibraltar, and 52 S.E. of Cadiz. It is surrounded with Moorish fortifications, consisting of twenty-six towers with connecting walls; but its chief strength lies in a small rocky island connected with the mainland by a causeway. On this island stands a castle which commands the Strait of Gibraltar, and a good lighthouse. The town itself has narrow and crooked streets, several squares, an old Moorish castle, two churches, hermitages, schools, and an hospital. Leather, vermicelli, earthenware, and other articles are made here; fishing is extensively carried on, and there is an active coasting trade. The harbour does not admit large vessels. Tarifa was successfully defended in 1811 by Colonel (now Viscount) Gough, with a small body of British and Spanish against a much superior French force. Pop. 8116.

TARIFF, a table containing the names of different sorts of merchandize, with the duties to be paid as settled among trading nations.

TARKI, or TARKU, a town of Asiatic Russia, Transcaucasia, in the province of Daghestan, on the west coast of the Caspian, 70 miles N.W. of Derbend. It stands amidst immense masses of rocks on one of which is a fort commanding the town. Silkworms are reared in large numbers in the vicinity, and a considerable trade is carried on. The harbour is good. Pop. 10,000.

TARMA, a town of Peru, in a valley of the Andes, in the department, and 25 miles S. of Junin. It is much resorted to by invalids on account of its excellent climate and medicinal springs. Most of the people are employed in farming, but fine *ponchos* or loose cloaks are made here. Pop. 7000.

TARN, a department of France, lying between N. Lat. 43. 25. and 44. 12., E. Long. 1. 30. and 2. 55.; bounded on the N. and N.E. by that of Aveyron, S.E. by Hérault, S. by Aude, and W. by Haute-Garonne and Tarn-et-Garonne. Length from N.W. to S.E. 65 miles; breadth 46; area 2218 square miles. It is in general a hilly or undulating country, as its south-eastern part is traversed by the chain of the Cevennes, and the north-western by a branch running parallel to it; while between these there are various smaller ridges, and many fine plains. The chief river is that from which it derives its name, an affluent of the Garonne. It flows through the department from east to west near its centre, and it receives the Aveyron, the Tescou, and the Agout; the first of which forms the north-west boundary of the department, while the others flow within its bounds. Of these rivers, the Tarn and the Aveyron are navigable here for some distance. In the east of the department, the country consists chiefly of granitic and other primary or early secondary formations; while in the west the tertiary strata are more prevalent. Coal, iron, lead,

Tarn-et-Garonne.

copper, and other minerals are found here; and coal and iron are worked to some extent. The soil is generally good, and some of the plains and valleys are not surpassed in fertility by any part of France. The department also enjoys a mild and healthy climate. But agriculture is in a very backward condition, although corn is produced in sufficient abundance, not only for home consumption but for exportation. Of the entire area, about 112,000 acres are occupied by arable ground, and nearly 200,000 by heaths, waste land, &c.; the rest of the department consisting of forests and vineyards, of which the former cover 200,000, and the latter nearly 80,000 acres. Wheat, barley, rye, oats, maize, and buckwheat are the principal crops raised. A large quantity of wine is also produced; but it is not much valued, and is chiefly used for making brandy. Pulse, potatoes, flax, hemp, wood, anise, coriander, and saffron, are among the other productions of the country. Large numbers of live stock are reared in the department, especially sheep and swine; the veal of this department is highly valued, and the horses are much sought after for the light cavalry. It is estimated that Tarn contains 10,000 horses, 10,000 mules and asses, 90,000 horned cattle, 580,000 sheep, 75,000 pigs, and 4000 goats. Fowls are numerous; and the rearing of bees is extensively carried on. Of wild animals, there are found here the wolf, the fox, the wild-boar, the roebuck, the badger, &c. The manufacturing industry of the country consists chiefly in the making of steel, broadcloth, hosiery, and brandy. A considerable trade is carried on, the chief articles exported being—corn, wine, fruit, cattle, anise, wood, coriander, and manufactured articles. The capital of the department is Albi, from which the country was anciently called Albigeois. It is divided into 4 arrondissements, 35 cantons, and 315 communes, and contained in 1856, 354,832 inhabitants.

TARN-ET-GARONNE, a department of France, lying between N. Lat. 43. 47. and 44. 22., E. Long. 0. 35. and 1. 58.; bounded on the N. by that of Lot, E. by Aveyron, and Tarn, S. by Haute-Garonne, and W. by Gers and Lot-et-Garonne. Length from N.E. to S.W., 64 miles; greatest breadth, 44; area, 1436 squares miles. It is a gently undulating country, with a slight slope towards the west, and is broken by no mountains, and hardly by any hills, except a few in the south and east, which give rise to several streams that water the country. As its name indicates, the department is watered principally by the rivers Garonne and Tarn, which unite within its limits; the former entering the country from Haute-Garonne, and, after traversing it for a distance of 49 miles, leaving it in a north-westerly direction; and the Tarn, flowing westwards from the department of that name, and, after receiving the Aveyron, losing itself in the Garonne. Of smaller streams in the department, the Garonne receives the Lambon, the Gimone, and the Serre; and the Tarn and Aveyron several others. The three principal rivers, Garonne, Tarn, and Aveyron, are all navigable. The geological structure of the most of the country is tertiary, but some portions towards the east consist of secondary rocks. The soil varies very considerably in different parts; in general, however, especially along the rivers' banks, it is rich and alluvial; but in some places it is so light and sandy as to be incapable of culture. The climate is variable, but, on the whole, temperate and healthy. Tarn-et-Garonne contains about 375,000 acres of arable land, 30,000 of meadows, 67,000 of vineyards, 75,000 of forests, and 27,000 of heaths, waste land, &c. The produce of corn is more than sufficient for home consumption, and wheat is the chief crop raised, though barley, oats, maize, and rye are also grown. The district between the Tarn and the Garonne comprises the best vine-growing regions in the department, and much of the wine produced here is highly esteemed. Pulse, potatoes, flax, hemp, and tobacco are also raised. Of the live stock reared in Tarn-et-Garonne, the horses and asses are of good breed, the sheep indifferent, and the mules are much sought after in Spain. Their numbers are about 9000 horses, 66,000 horned cattle, 260,000 sheep, 1000 goats, 40,000 pigs, and 4000 mules. The mineral wealth of the country is not great; iron, marble, building-stone, and potter's-clay exist, but are only worked to a small extent. Manufacturing industry is in an advanced state here; the chief branches carried on being the making of woollen, linen, and silk fabrics, hosiery, paper, leather, cutlery, earthenware, soap, &c. A considerable trade is carried on; and the chief articles exported are mules, fatted pigs, corn, fruits, and brandy. The capital is Montauban, and the department is divided into 3 arrondissements, 24 cantons, and 192 communes, and contained in 1856, 234,782 inhabitants.

Tarnopol || Tarragona.

TARNOPOL, a town of the Austrian Empire, Galicia, capital of a circle, on the left bank of the Sereth, 75 miles E.S.E. of Lemberg. It is generally well built, and contains several very handsome houses. The inhabitants are chiefly employed in agriculture, but tanning is also carried on to some extent. An important horse-market is held here, and an active trade is carried on. Pop. 16,510.

TARPORLEY, a market-town of England, county and 10 miles E.S.E. of Chester. It consists of one long street, and has an old parish church, a Wesleyan chapel, several schools, endowed almshouses, &c. Pop. of parish, 2632.

TARQUINII, an ancient city of Etruria, on the left bank of the Marta, about 4 miles from the Mediterranean. Ancient traditions represent it as one of the oldest towns in the country, and some of them as the parent and head of the twelve cities that formed the Etruscan League. The story of the family of the Tarquins, which derived its name from this city, and gave two kings to Rome, is well known. Long afterwards, in 398 B.C., while the Romans were at war with the Veii, they were attacked by the Tarquinians, who seem from this time to have been frequently united with the other Etruscan cities against Rome. War was carried on with varying success and some intermissions till 351, when a truce for forty years was agreed upon. After its expiry, hostilities were again for a short time renewed; but in 309 another truce was concluded, in the course of which Tarquinii seems to have gradually become subject to Rome. It continued to be a flourishing town under the Empire, and after its fall, until it was destroyed by the Saracens. Extensive remains of the ancient Tarquinii, with tombs, containing various remnants of Etruscan art, have been discovered in the vicinity of the modern town of Corneto.

TARQUINS. See ROMAN HISTORY.

TARRAGONA (anc. *Tarraco*), a seaport of Spain, capital of a province of the same name, in Catalonia, at the mouth of the Francoli, 45 miles W.S.W. of Barcelona. It stands partly on a limestone rock, from 500 to 600 feet high, between the river and the sea, and partly on the low ground beneath it. The lower town is protected by a series of bastions along the river and the harbour; and the upper town is encircled by ancient ramparts, some portions of which are of Cyclopean structure. The upper town is irregularly laid out, and has narrow unpaved streets; but many of the houses are very handsome. In the lower town, on the other hand, the streets are broad and regular, crossing each other at right angles. Besides its remains of antiquity, which include a theatre, amphitheatre, circus, and aqueduct, Tarragona is chiefly remarkable for its cathedral, a fine edifice, partly in the Norman style, with many interesting monuments and works of arts. The archbishop's palace is a handsome modern building, with an Ionic portico in front. The harbour is protected by a stupendous mole, begun in 1790, and carried out 1300 yards into the sea. A considerable trade is carried on; but the harbour only admits small coasting vessels. The ancient Tarraco was originally a Phœnician settlement. It was enlarged and

Tarrasa ‖ Tarshish.

fortified by Publius and Cneius Scipio as a fortress against the Carthagenians; and it afterwards became the capital of the Roman province called by its name. After the fall of the Empire, it was taken by the Goths; and at a later period was laid in ruins by the Moors. In the eleventh century, the modern town was founded on the site of the former. In 1705, it was captured by the English, but afterwards abandoned; and in 1811 it was taken and sacked by the French under Suchet. Pop. 13,014.

The province of Tarragona is bounded on the E. by that of Barcelona, N. by that of Lerida, W. by those of Teruel, Castellon-de-la-Plana, and Saragossa, and S. by the Mediterranean; area, 1866 square miles. It is partly occupied by mountains covered with vast forests, and partly consists of extensive and fertile plains, producing grain, wine, oil, hemp, and fruits. It has also some important mines and quarries, which yield lead, copper, silver, limestone, and sandstone. Manufactures are extensively carried on, especially those of silk, velvet, cotton, and woollen fabrics, paper, leather, cordage, and brandy. Pop. (1857), 339,012.

TARRASA, a town of Spain, province and 15 miles N.N.W. of Barcelona. It is a well-built town, having broad, straight, and handsome streets, and has long been celebrated for its manufacture of cloth, which, however, has somewhat fallen off of late. Pop. 5225.

TARSHISH, a great emporium of antiquity, of which history has preserved to us nothing beyond the name, and an obscure indication of the nature of its commerce. Our only acquaintance with its existence is derived from allusions in the historical and prophetic Scriptures to the trade and navigation of the Phœnicians in connection with Tarshish, and to the commodities which the Tyrians imported from it. To the Hebrews, whose geographical acquaintance with the world barely extended beyond the countries bordering the east of the Mediterranean, "Tarshish" appears to have been a term suggestive of immense and mysterious distance. To them, the Caucasus and Chaldea were as the "north and sides of the earth." Egypt and Arabia were the boundaries of their knowledge to the south, and in the direction of the west they knew of nothing more remote than the shores of Greece. Beyond these "ends of the earth," stretched unknown seas, in which the "isles of the Gentiles" were believed to be the farthest verge of the habitable world. Even Moses, in describing the dispersion of mankind after the deluge, states that Elishah, Tarshish, Kittim, and Dodanim divided these islands amongst themselves (Gen. x. 4; 1 Chron. i. 7). So far were these islands removed from countries with which they were familiar, that flight to them was supposed to baffle all pursuit; the fugitive was concealed there from the sight even of the Creator himself, so that Jonah, when seeking to escape from Joppa, "went down into a ship to go with them unto Tarshish *from the presence of the Lord*" (Jon. i. 3).

The Phœnicians, in this early age, had undisputed possession of the navigation of all seas; the Egyptians made no effort to compete for the commerce of their own shores; the genius of the Hebrews discouraged intercourse with strangers; and even when Solomon and Jehoshaphat aspired to participate in maritime trade, their efforts were confined to the Elanitic Gulf of the Red Sea, so that, till the success of the Phœnicians inspired the Greeks with a passion for trade, the ships of Tyre had a practical monopoly in the Mediterranean. The ignorance of the earth and its productions, which thus prevailed universally, aided the Phœnicians in the policy of concealment, by which they sought to withhold all knowledge of the nature and operations of their commerce. Their ships sailed over unknown seas, and came back laden with commodities of which no stranger was permitted to discover either the origin or the countries which produced them. On all such points, Strabo (L. iii.) implies that any inventive explanation given by the Phœnicians, "Φοινικικον," was entitled to no greater credit than the *Punica fides* of Carthage. Amber, which they brought from the vicinity of the Baltic, was represented to be the tears of sea-birds that wept for Meleager (Pliny, L. xxxvii.); frankincense was the produce of trees guarded by serpents (Herod. iii. 107); cassia grew in a shallow lake protected by winged animals like bats (ib. 110); and cinnamon was the lining taken from birds' nests built with clay against the face of precipitous mountains, "in those countries where Bacchus was nurtured" (ib. 111). So jealously did they conceal the course of their trading expeditions, that Strabo tells the story of a Phœnician commander, whose ship, on her voyage from Gades to the Cassiterides, in search of tin, being followed by a Roman galley, rather than betray the secret of the locality in which tin was to be found, destroyed his vessel on a shoal, and on his return obtained compensation from the state for his fidelity (Strabo L. iii. 5). Tarshish.

With the exception of the Phœnicians, no seaman had ever ventured into the Atlantic, or passed beyond the Pillars of Hercules. From that mysterious promontary they saw with awe the sun sink into an unknown sea, and hence Strabo conjectures that Homer confounded "Tartarus" and "Tartessus" (L. iii. 147). Legends in later times survived that those who dared to explore its shores had discovered the *Islands of the Blest*, beyond the boundary of the earth, where, as Homer says, winter, rains, and snow are alike unknown, but "the never-failing breath of the ocean refreshes the weariness of the inhabitants" (Odys. iv. 565).

Availing themselves of the prevailing ignorance, and interested in perpetuating it, the merchants of Tyre who navigated these remote seas represented Tarshish to be contiguous to them, and appear to have assigned it as the native country, or at least, the far-distant emporium in which they professed to have found every article concerning the origin of which it was their object to withhold information. Hence a voyage to Tarshish was regarded as in the highest degree adventurous and mysterious. The knowledge of the route was possessed only by the "wise men of Tyre who were her pilots" (Ezekiel, xxvii. 8). Sidon and Arvad supplied the crews, while the inhabitants of other parts of the coast took on themselves the building and equipment of the vessels to be engaged in such perilous expeditions. These ships, from their superior size, and probably from some peculiarities in their construction, were known as the "ships of Tarshish," a term which afterwards became generic, and served to indicate vessels of sufficient magnitude for voyages of similar duration and risk. In the Septuagint they are designated indifferently—"*ships of Tarshish*," πλοῖα Θαρσεις (Ps. xlvii. 7; Isaiah lx. 9); "*sea-going ships*," πλοῖον θαλασσης (Isaiah xi. 16); and "merchant-men," πλοῖα ἐμπορων (Ezek. xxvii. 25). The most interesting account of these vessels that has been preserved to us is contained in the *Economics* of Xenophon, who, in the fifth century B.C., thus describes one which he had the opportunity of inspecting. "I once saw, I think, the most beautiful and accurate arrangement of implements possible, when I went on board that large Phœnician vessel to look over it; for I beheld a vast number of articles severally arranged in an extremely small space. For the ship is brought into harbour and taken out again by means of various instruments of wood and tow; it pursues its voyage with the aid of much that is called suspended tackle; it is equipped with many machines to oppose hostile vessels; it carries about in it many weapons for the men; it conveys all the utensils such as people use in a house, for each company that take their meals together; and in addition to all this, it is freighted with merchandise, which the owner of the ship transports in it for the purpose of profit. And all the things of which I am speaking were stowed in a space not much larger than is contained in a room that holds half a score dinner couches. Yet I observed that they were severally arranged in such a manner that they were not in the way of one another, nor required anybody to seek for them, nor were unprepared for use, nor difficult to remove from their places, so as to cause any delay when it was necessary to employ them suddenly." (Xenoph. *Œcon.* viii. 17). Ezekiel, who wrote a century earlier than Xenophon, has left in his prophecy the most detailed exposition extant of the nature of the trade which was then carried on in ships thus described, as well as by caravans overland. The imports from Tarshish, he says, consisted of a "multitude of all kinds of riches;" but the portion he particularizes is limited entirely to metals, silver, tin, lead, and iron. By sea, Tyre imported materials for ship-building from the coasts of Syria and Asia Minor; the ships and sails were brought from the Peloponnesus and Egypt; Greece supplied slaves and brazen utensils, while "Tarshish was her merchant for silver, iron, tin, and lead," the trade for the latter being in this instance limited to articles the produce of Western Europe (Ezek. c. xxvii). Had the enumeration terminated here, there would have been comparatively little difficulty in determining the position of Tarshish as being near to the junction of the Mediterranean with the Atlantic; but the Books of Kings and Chronicles particularise articles of an origin so obviously Indian, but nevertheless imported from some place known as Tarshish, that we are driven to the conjecture that there must have been two emporiums, one in the eastern hemisphere and another in the west, each bearing that designation.

The uncertainty as to this, and the attempts to concentrate in one locality the attributes of both, have involved the question of its site in confusion, which nothing but the above solution seems likely

Tarshish. to elucidate. Tarshish was conjectured at one time to mean Tarsus in Cilicia, and at another Tartessus in the south of Spain; the authors of the Septuagint translated it Carthage, Καρχηδών (Ezek. xxvii. 12, 25; Is. xxiii. 1, 14). Later geographers have assumed it to be a Phœnician epithet for *any* great emporium beyond sea; and Gosselin and Vincent conjecture that it may mean *the sea* itself. Cooley supposes that the word may be a modification of the Sanskrit term *Tar-dêsa*, applied to any *silver-producing country*—a conjecture which has one fact to sustain it, that all accounts of the trade of the Tyrians, as well that of Jeremiah (c. x. 9) as those of Isaiah and Ezekiel, describe silver and silver plates as one of the imports from Tarshish.

Close and more recent investigation, however, has rendered it probable that the references to Tarshish in the Sacred Writings point to *two* distinct emporiums, each remote from Tyre, and still more distant from each other; one situated at the extremity of the Mediterranean, and the other in the Indian Ocean. Expressions in Scripture seem to indicate that both were *islands* (Gen. x. 4; Psalm lxxii. 10, &c.) This may arise either from the habit of designating almost every unexplored country an *island;* or from the fact, that in the infancy of navigation, when commerce with distant countries was liable to risk from hostile races, an island was most generally chosen as an emporium, perhaps in consideration of its comparative security from surprise, as well as its superior facilities for escape in case of danger. That one important place known as Tarshish lay to the west of Phœnicia, is established by the allusions in Isaiah to the position of Cyprus or *Chittim*, in the course of the ships returning thence towards Tyre (c. xxiii. 1); and Jonah took shipping at Joppa to sail for Tarshish, a fact which shows it to have been within the navigation of the Mediterranean. Tartessus in Spain is generally, and no doubt correctly, supposed to have been that particular emporium; but such is the confusion that obscures even this branch of the inquiry, that Tartessus has been applied at one time to designate the greater part of Spain and Portugal:

"Non Tartessiacis illum satiarit arenis
Tempestas preciosa Tagi," &c.—CLAUDIAN *in Ruf.*, i. 101.

At another it represented the entire country of Baetica, the modern Andalusia; and again, only the portion of it lying south of the Baetis or Guadalquivir (Strabo, iii. 150). The Baetis itself is called the "silver-bedded Tartessus" by Stesichorus, as was also a city which was said to have been built in an interamnal angle lying between two of its branches. If the western Tarshish was situated in an island, it is most probably to be identified with Gades, the modern *Isla de Leon*, on which Cadiz is built; and which Bochart, on the authority of Aristotle, Strabo, Pausanias, and Avienus, believes to be the ancient Tartessus (*Phaleg*, iii. 7; *Chanaan*, i. 34). If so, Tartessus may possibly be a compound of Θαρσεῖς and νῆσος, "the *island of Tarshish*."

Assuming the book of Genesis to have been written in the fifteenth century B.C., the mention there made of Tarshish establishes the early knowledge of the Spanish coast by the Phœnician mariners; and the notice in Exodus of the "*tarsis*" (which the Septuagint renders a chrysolite, and the authorised version a beryl) amongst the gems in the breastplate of Aaron (Ex. xxviii. 20), shows that precious stones were amongst the early imports from Tarshish. The productions of the country surrounding it, one of the most fertile in the universe, were so varied and abundant as to justify the description of Ezekiel, that Tarshish was the "merchant of Tyre, by reason of the multitude of all riches" (xxvii. 12). It yielded oil and wine, gold, silver, copper, iron, lead, and quicksilver. The ocean was equally bountiful with the land; and on the coins of Tartessus, the device of a fish with an ear of corn was emblematic at once both of the sea and soil. To attest their appreciation of these advantages, the Phœnicians founded there one of their colonies, and erected a temple to Hercules Melecarth; whence his worship spread over the south of the peninsula, and was commemorated by the bestowal of his name on the promontories of Abyla and Calpe, which, like gigantic columns, guard the entrance to the Mediterranean. The decay of Tartessus, and the causes which produced it, are as obscure as the period of its foundation and the origin of its commercial renown. Six centuries B.C. the Greeks began to participate in its trade, the king, Arganthonius, having then welcomed the galleys of the Phœnicians, whom he had invited to settle in his territories (Herodotus, i. 163). The Romans drew from it some of their choicest delicacies, and Aulus Gellius, amongst the luxuries of the table, extols the lampreys of the Tartessian Sea (*Noct. Att.*, vii. 16). In all probability the aggrandizement of Carthage led to the decline of Tartessus: amidst neglect and obscurity, the events are unrecorded which led to its fall, and the time of its ultimate extinction is unknown.

Until a comparatively recent period, still greater uncertainty prevailed as to the second great emporium in the Indian Seas, to which the Sacred Writings allude under the designation of Tarshish. The facts recorded concerning it are briefly these:—In the tenth century B.C. the Hebrews, stimulated by the maritime success of the Phœnicians, aspired to become masters of a similar commerce; but having no ports in the Mediterranean, the attention of Solomon was necessarily directed to the Red Sea, where his father David had wrested from the Idumæans the upper portion of the Elanitic Gulf, with the harbours of Elath and Ezion-Geber. Equally ignorant of ship-building and navigation, Solomon obtained from Hiram, the king of Tyre, the assistance of artificers to construct a fleet of merchantmen ("ships of Tarshish") at Ezion-Geber, and pilots to conduct them to Ophir—whence, once in every three years, they returned, bringing algum-trees and precious stones, gold and silver, ivory, apes, and peacocks (1 Kings ix. 26, x. 22; 2 Chron. viii. 18, &c.) Sometime afterwards, Jehoshaphat, being then king of Judah, attempted to fit out a similar expedition, in conjunction with Ahaziah, the king of Israel. But they had no longer the co-operation of the Tyrian mariners and pilots; so that, having encountered an east wind, probably the N.E. monsoon which blows in the Indian seas, "the ships were broken, and they were not able to go to Tarshish" (1 Kings xxii. 48; 2 Chron. xx. 36; Psalm xlviii. 7). These passages and their context show that Tarshish was an emporium intermediate between the Red Sea and Ophir, at which the productions of the latter were procurable. To determine the position of the one, it was therefore indispensable to ascertain the actual site of the other; and no point of biblical geography has given rise to more ingenious and erudite conjecture than the actual situation of Ophir. It has been variously placed in Armenia and in Arabia; at Ormus, in the Persian Gulf; at Sofala, on the east coast of Africa, and at Angola, on the west; at Carthage; at Saint Domingo, in Mexico; and in Peru. Josephus, however, with better judgment, declares Ophir to be an Indian region—the *Golden Chersonese* of the Greeks, and now the Malayan peninsula (*Antiq. Jud.*, lib. viii. c. 6). The Alexandrian geographer, Hesychius, follows the opinion of Josephus, and both he and Suidas declare Ophir to be in India. One evidence which materially sustains the same conclusion is the fact, first adverted to by Le Poivre, who was envoy to Cochin China in the middle of the last century, that *ophir* is still the term applied in Malacca, Sumatra, and the Eastern Archipelago, to designate any *gold-mine* (*Voy. d'un Philosophe*, &c., p. 123). Bochart had previously recorded his opinion that Ophir was to be sought for in the Indian Seas, and gone so far as to place it in the island of Ceylon; while Tarshish was supposed by him to have been near the opposite promontory of Cape Comorin (*Phaleg.*, ii. 27; *Chanaan*, i. 46). Subsequent investigation has so far served to correct the dictum of Bochart, as to suggest that Tarshish may have been in Ceylon; whilst Ophir, as Josephus and other authorities had supposed, lay still further to the east. The probability of this solution, and the facts which appear to sustain it, are as follows:—Although the Singhalese themselves have at no period been addicted to commerce, Ceylon lying midway between the two great maritime countries of China and Arabia, became, at a very remote era, the centre and emporium of a great foreign trade. The Chinese brought thither silk and other wares destined for countries beyond the Euphrates; and the Persians and Arabians met them in Ceylon with their own products, to be there exchanged. The inhabitants of the opposite coast of India, aware of the natural wealth of Ceylon, participated largely in these operations; and the Tamils, who eagerly engaged in the pearl fishery, gave to the Gulf of Manaar the name of *Salabham*, "the sea of gain."

Tarshish.

The Greeks, during the Indian expedition of Alexander, acquired the knowledge of this flourishing trade, and of the riches of Ceylon, then known by the name under which Milton speaks of it—

"India's utmost isle, Taprobane."

Onesicritus, the historian, who acted as one of Alexander's pilots, is said to have visited Ceylon, and brought back accounts of its valuable productions and exports: its gems, its elephants, its ivory, and tortoises. Egypt, under the Ptolemies, took a part in the active trade of Ceylon; and the Romans, after the discovery, by Hippalus, of the periodical monsoon winds, carried it on with increased energy. Pliny, who had the advantage of personal communication with the embassy sent from Ceylon to the Emperor Claudius, describes not only the precious productions of Ceylon, but also its commerce with China, and the Seres, whose territory lay beyond the Himalayas. (Pliny, lib. vi. ch. 24.) The ambassadors detailed to Pliny the mode of trading among their own countrymen precisely as it is practised by the Veddahs in Ceylon at the present day; the parties to the barter being concealed from each other, the one depositing the articles to be exchanged in a given place, and the other, if the terms were agreed to, removing them unseen, and leaving behind what they give in return.

The importance of Ceylon, as a rendezvous for trading ships, has been successively recorded by Ptolemy, by the author of the *Periplus of the Erythraean Sea*, attributed to Arrian, by Agathemerus, Marcianus of Heraclea, and Cosmas Indicopleustes. The Arabian and Persian writers, from the eighth to the eleventh century, equally describe the trade which enlivened Ceylon, in forwarding the productions of the east to be distributed over the countries of the west · and the native historians of China, so early as the

Tarsus.

third century, have left authentic records, with detailed particulars of the articles in which this important commerce was carried on. (See Sir J. Emerson Tennent's *Account of Ceylon*, &c., part iv. c. 3.)

Gibbon dwells with particularity on the nature and extent of this luxurious commerce (*Decline and Fall*, c. xl.); and, looking only to the facilities of its "capacious harbour," pronounces Trincomale to have been the port and emporium of it. (See Trincomalie.) Bertolacci, on other grounds, conjectures it to have been at Mantotte, on the west coast of Ceylon (Bertolacci, *Ceylon*, &c., pp. 18, 19); but a combination of historical proofs serve to vindicate that distinction for the bay and harbour of Point de Galle, at the S.W. extremity of the island. Abouzeyd, an Arab, who wrote in the ninth century, alludes to the emporium to which the ships from the Persian Gulf went to meet those from China and Malacca, by the designation of *Kalah*, and as one form of the Arabic letter K is pronounced like G, *Kalah*, in their dialect, would be pronounced *Gala*, a name which has served to identify not only the town but the district, and the tribe of Gallas who, from a very early period, inhabited this region of Ceylon. Point de Galle, therefore, in remote ages occupied a position in relation to trade of equal, if not of greater importance than that which attaches to it at the present day. It was the central emporium of a commerce which in turn enriched every country of Western Asia, fostered the renown of the Ptolemies, rendered the wealth and the precious products of Arabia a gorgeous mystery, freighted the Tigris with "barbaric pearl and gold," and identified the merchants of Bagdad and the mariners of Bassora with associations of adventure and romance. In later times, it was the mart of the Portuguese whilst they held possession of Ceylon; and afterwards of the Dutch, when they became masters of the island.

From three centuries, therefore, before the Christian era, down to the present time, there is one unbroken chain of evidence to prove that Point de Galle was the grand emporium for the commerce of all nations east of the Red Sea; and the Scripture narrative shows that, in proceeding to Tarshish, the fleets of Solomon and Hiram navigated the Red Sea, and took an easterly course in the direction of Ophir. The ships intended for the voyage were built in the Gulf of Akaba; the rowers coasted along the shores of Arabia and Persia (Ezek. xxvii. 26; xxxviii. 13), headed by an east wind (Ezek. xxvii. 26; Psal. xlviii. 7), and the part for which they were bound would appear to have been situated in an island, governed by kings (Psal. lxxii. 10), carrying on an extensive foreign trade (Isaiah xxiii. 2). The voyage occupied three years in going and returning (1 Kings x. 22); and the cargoes brought home to Ezion-Geber consisted of gold and silver, ivory, apes, and peacocks. *Gold* could have been shipped at Galle from the vessels which brought it from Ophir. "*Silver* spread into plates," which is particularised by Jeremiah as an export of Tarshish, is one of the substances on which the sacred books of the Singhalese are even now inscribed; *ivory* is found in Ceylon, and must have been both abundant and full grown there before the discovery of gunpowder led to the wanton destruction of elephants; *apes* are indigenous to the island, and *peafowl* are found there in numbers. It is very remarkable, too, that the terms by which these articles are designated in the Hebrew Scriptures are identical with the Tamil names by which some of them are called in Ceylon to the present day. Thus, *tukeyim*, which is rendered "peacocks" in one version, may be recognised in *tokei*, the modern name for these birds; *kapi*, apes, is the same in both languages; and the Sanskrit *iboha*, ivory, is identical with the Tamil *ibam*.

Thus, by geographical position, by indigenous productions, and by the fact of its having been from time immemorial the resort of merchant-ships from Egypt, Arabia, and Persia, on the one side, and India, Java, and China, on the other, Galle seems to present a combination of every particular essential to determine the problem so long undecided in biblical dialectics, and to exhibit the necessary data for inferring that it is the eastern Tarshish of the sacred historians; and the great oriental mart frequented so long ago by the ships of Solomon and the Phœnicians. (See Bochart's *Geographia Sacra*; Vincent's *Commerce of the Ancients*, vol. ii.; Heeren's *Historical Researches*; Cooley's *History of Inland and Maritime Discovery*, vol. i.; Kenrick's *Phœnicia*; Reinaud's *Relation des Voyages*, &c., tom. i.; Sir J. Emerson Tennent's *Ceylon*; Gibbon's *Decline and Fall*; Robertson's *India*, &c.) (J. E. T.)

TARSUS, an ancient city of Asia Minor, the capital of Cilicia, on the Cydnus, about 12 miles from the sea, and 20 W.S.W. of Adana. According to one account, it was founded by Sardanapalus, the Assyrian monarch; but the Greeks also asserted that it was a colony of theirs. We find no mention of the town in authentic history previous to the expedition of the younger Cyrus, by whom it was taken and plundered. In the time of Alexander, it was governed by a Persian satrap, who having fled, the city opened its gates to the Greeks. It was conquered by the Romans under Pompey, and in the civil war having supported the cause of Cæsar, it was plundered by the republicans under Cassius; but after the battle of Philippi, Antony made it a free city. Under the Empire, it was not only a very wealthy city, but an important military position in the wars against the Parthians. It fell into the hands of the Saracens soon after the rise of their empire; and though recovered in the tenth century by the Emperor Nicephorus, was soon after restored to them, and has ever since remained in their possession. The modern town occupies only a small part of the site of the ancient Tarsus. It is partly surrounded by walls, and consists of low stone houses with flat roofs. The neighbouring country is productive, and the town carries on a considerable trade; but the river is only navigable for small vessels. The permanent population is about 7000; but in winter it is said to have sometimes as many as 30,000 inhabitants.

Tartaglia ‖ Tartini.

TARTAGLIA, or Tartalea. See Algebra.

TARTARY, more properly Tatary, a name applied with some degree of indefiniteness to a vast region of Central Asia, sometimes also to a part of Eastern Europe. In its widest sense, the name is applied to the whole country, from the sea of Japan on the east to the Dnieper on the west, and includes Manchooria, Mongolia, Thian Shan or Chinese Turkestan, Khokan, Koondooz, Bukhara, and Khiva, the Kirghiz territories, and the Russian governments between the Caspian and the Dnieper. Each of these divisions is described under its appropriate head; the Kirghiz territories and other Russian possessions under Russia. Some geographers restrict Tartary entirely to Asia, and make the Caspian its western boundary. It has on the north Siberia, and on the south China, Tibet, India, Affghanistan, and Persia. The name Tartary or Turkestan is properly applicable only to the western part of this vast region, which is peopled by the true Tartars or Turks, and was their original seat.

TARTINI, Giuseppe, the founder of a celebrated violin-school in Italy, was born at Pirano, on the coast of Istria, on the 12th of April 1692. When very young, he was sent to college at Capo d'Istria, where he received lessons in music, in violin-playing, and in fencing. His parents intended him for a monastic life, but his dislike to that condition was so insuperable that they were induced to send him to study law at the University of Padua. He made great progress in his studies, and at the same time acquired extraordinary skill in fencing, which rendered him quarrelsome, and led him into several duels. While meditating on abandonment of the law, and on the adoption of the profession of a fencing-master at Naples or at Paris, he fell in love with a young lady of Padua, a relative of Cardinal Cornaro, bishop of that city. Tartini married her privately, but the marriage being soon discovered by his father and by the bishop, the former withdrew his support from Tartini, and the bishop let loose the emissaries of the law against him. Tartini was obliged to fly, leaving his wife at Padua. At Assisi Tartini found refuge in a convent, of which one of his relatives was sacristan. There for two years Tartini remained concealed, and devoted himself to the study of the violin, while at the same time he received lessons in composition from Father Boemo, the organist of the convent. After this long seclusion, he was one day performing a solo in the church, when a gust of wind blew aside the curtain that concealed him, and he was recognised by a native of Padua, who immediately communicated the discovery to Tartini's parents. By that time the Bishop Cornaro had laid aside his enmity, and Tartini was permitted to return to Padua and rejoin his wife. Soon afterwards he went to Venice with his wife, and there heard the celebrated Florentine violinist, Veracini, whose new and bold style of playing astonished him, and suggested to him new resources for his instrument. He left Venice

immediately, and retiring to Ancona recommenced the study of the violin with indefatigable perseverance. From that period, 1714, he began to form a new style of his own, and by constant practice and observation established those rules for the management of the bow which, since then, have been adopted in all the violin-schools of Italy and France. During his studies at that time, he observed the phenomenon of the *third sound* generated by two sounds (bearing certain harmonic proportions to each other), when sustained strongly and uniformly on a violin, or by two violins, &c. He afterwards, but unsuccessfully, attempted to found a new system of harmony upon that phenomenon. He supposed, erroneously, that the *third sound* was represented by $\frac{1}{2}$, instead of by 1, in relation to the other two generating sounds. This phenomenon, in which two simultaneous sounds produce a third sound graver than either, has been termed the sub-multiple resonance. It is precisely the reverse of that phenomenon called the multiple resonance, in which a grave sound produces several acuter sounds called its harmonies, in the ratios of 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, &c., and which the French musician Rameau took for the basis of his system of harmony. In what has been called the theory of music, we must distinguish between two very different things. 1st. The physico-mathematical theory of sounds considered in themselves, without reference to their combinations in melody or in harmony. In that branch of natural philosophy considerable progress has been made. 2d. The æsthetic theory of the pleasing or displeasing effects produced on the human auditive organs by certain combinations of sounds in melody or in harmony. In this last theory we have made very little progress. The rules of practical harmony are merely the results of experiment, and were discovered empirically ages before any one dreamed of assigning them to physico-mathematical principles. That certain chords in succession require to be treated in a particular manner, is merely a fact derived from experiments made upon the organs of hearing. The rules laid down for such chords are merely general expressions of the facts observed; and to say that these rules depend upon certain musical "affinities," &c., is not the forming of a true theory, but only a mode of stating unexplained phenomena. Neither Rameau's nor Tartini's system of the "fundamental bass" is comprehensive enough to include many of those combination of harmony employed by Hadyn, Mozart, Cherubini, and Beethoven. Æsthetics—*i.e.*, the science of the beautiful, or the philosophy of the fine arts—has been applied to music with little success; and æsthetical speculations, physico-psychological as they are, have certainly contributed nothing to the advancement of the art of musical composition. J. A. Serre of Geneva has shown, in his *Essais*, the errors of Tartini's system of harmony, and its inapplicability to musical composition. In 1721 Tartini was appointed chief violinist of the Chapel of St Anthony at Padua. In 1743 he and his friend Vandini, the violoncellist, were called to Prague by the emperor Charles VI., where they remained for three years in the service of the Count of Kinsky. After his return to Padua in 1726, Tartini refused all the advantageous offers of employment made to him by foreign potentates. In 1728 he had established at Padua a violin-school of great celebrity, and which produced many excellent violinists. Among these were Nardini, Bini, Alberghi, Ferrari, Carminati, Capuzzi, Madame Sirmen (née Lombardini), Pagin, and Lahoussaye. He held his appointment at Padua till his death, which took place on 16th February 1770, from an attack of scurvy. He was buried in the Church of St Catherine. His compositions for the violin are original in style, and show both genius and skill in composition. He was a very voluminous composer, having left in manuscript 48 violin-sonatas, 1 trio, and 127 concertos, exclusive of his published works, which consisted of several sets of sonatas and concertos. After his death there were published his *Lettera*, &c. to his pupil Signora Lombardini on violin-playing; *L'Arte dell' Arco*, consisting of 50 variations upon the theme of the Gavotta in Corelli's 10th violin-sonata; *Trattato delle appoggiature*, &c., being a treatise on the ornaments used in violin-playing; and his famous *Sonata del Diavolo*. With regard to this curious and difficult *Devil's Sonata*, he told the astronomer Lalande, that one night in 1713, he dreamed the devil had entered into his service, and that all his wishes and expectations were far outstripped by the zeal and ability of this new domestic. That he thought he would ask the devil to play some airs on the violin, when the devil performed a sonata so singular and so beautiful, and executed with such amazing skill, that Tartini became breathless with delight and astonishment. Awakened by the violence of his sensations, Tartini seized his violin and endeavoured, but in vain, to recal some part of the sonata that he had just heard. However, the sonata which he then composed and named *The Devil's Sonata*, he considered to be his best composition. (G. F. G.)

TASHKEND, a town of Independent Turkestan, in the Khanat, and 90 miles N.W. of Khokan, on the east side of the Jaxartes, in a fertile region occupied to a large extent with gardens. It is surrounded by a wall of brick 12 miles in circuit, and entered by four gates. A great part of the area thus enclosed is occupied by gardens and vineyards; the streets of the town are very narrow; and the houses for the most part meanly built of mud, and thatched with reeds. The chief buildings are the castle, which is defended by walls and ditches, several mosques, colleges, temples, and a large bazaar. Gunpowder, silk, and cotton goods are manufactured here; and an extensive trade is carried on chiefly by means of caravans with the Russian territories: woollen and silken stuffs, indigo, precious metals, hardware, leather, &c., being the chief imports; and nitre and cattle the principal articles exported. Tashkend was captured by the Russians in 1854. Pop. 40,000.

TASMAN, Abel Janssen, one of the most celebrated of the Dutch navigators, was born at Hoorn about the beginning of the seventeenth century. Having entered the service of the Dutch East India Company, he soon rose to distinction, and was for some time employed in cruising about the Chinese and Japanese seas. In 1642 he was chosen by Anthony Van Diemen, the governor-general of India, to conduct a voyage of discovery in the South Seas. He sailed from Batavia with two ships on the 14th of August, and directed his course first to Mauritius, whence he sailed first S.E. and then E. across the Indian Ocean, till on the 24th November he discovered land, to which he gave the name of Van Diemen after the governor-general. Continuing his voyage to the S.E., he doubled what he conceived to be the southern extremity of the Australian continent, but which, in reality, was the southern extremity of the island of Tasmania or Van Diemen's Land. After proceeding a short distance northwards, he was met by contrary winds, and turning eastwards, he in a short time discovered New Zealand. He made numerous other important discoveries in these seas, and after an absence of ten months, returned to Batavia. In 1644, he was sent on a second voyage of discovery, but of this expedition nothing is known with certainty. (See Australasia, vol. iv. p. 252.) Neither is anything known of the after-life of Tasman, or of the time, manner, or place of his death.

TASMANIA, better known by its original name of Van Diemen's Land, a considerable island lying off the south-eastern extremity of Australia, from which it is separated by Bass's Straits, at 140 miles' distance. It has been a British colony since 1803, when it was founded as a penal settlement, and a dependency of the penal head-quarters previously established at Sydney, on the eastern coast of

asmania. the opposite mainland of Australia. In this character and as the receptacle of yearly legions of criminals, this island, replete with natural attractions, alike of climate and scenery, long held an unenviable and ignoble repute. The accumulated evils of the convict system having at length presented a social aspect to the colonists that had become utterly unbearable, a great and general effort, commenced by the organisation of an anti-transportation league in 1851, proved successful with the imperial government to effect its abolition, so far at least as regarded South-Eastern Australia and Tasmania. The penal stigma thus happily removed from this colony, was about the same time abrogated with reference to its too notorious adjunct, Norfolk Island. This terrestrial paradise, standing forth like a bright gem upon the bosom of the Pacific, after being cleared of its criminals, has lately and much more appropriately been given to the interesting group of the Pitcairn islanders. We must commend the policy which no longer devotes some of the finest regions of the world to the use or abuse of criminals. The desire to obliterate the past suggested and procured, by petition to the Queen, the change of name from Van Diemen's Land to Tasmania.

The onward progress of this colony has latterly been much less marked than that of its sisters across the straits. The expenditure from the British treasury under the convict system, gave a material prosperity that left a too visible blank at its cessation, while the heavily timbered soil was found too expensive to clear with the high wages of free labour under the new system. Added to these disadvantages was the fact that the young and thriving colonies of South Australia and Victoria on the opposite coast, which at first were largely supplied from Tasmania with agricultural produce, were now rapidly extending cultivation for themselves, and in doing so, could resort to soils, not only well adapted for cereal crops, but scarcely encumbered even with a single tree, and ready-made as it were for the ploughshare. The agricultural interest, therefore, whose vitality consisted in its cereal exportations to adjacent settlements, has hardly maintained the conspicuous and flourishing character of former years, while the limited pasturage has for some time past arrested any great increase in wool production and the breeding of sheep. But on the other hand, the colony is now standing on a surer foundation of social order and prosperity. The population is on the increase, although slowly, and some little emigration is directed to the colony. The present population (1860) is close upon 85,000, being the highest number ever attained. Of these above 30,000 are the sub-adult native born Tasmanians, the hope of the colonial future; and the local press assures us that the masculine activity of the stronger sex, and the beauty of the weaker come fully up to the national standard. The old Van Diemen's Land has turned to a new and brighter page, and we may hope her colonists are to exemplify the new christening of the "fair Tasmania."

The island was discovered on 1st December 1642 by Tasman, and named after Van Diemen, the governor of the Dutch East Indian settlements, the friend and patron of the great navigator. A long interval elapses, until between 1772 and 1792, when the coast outline was further made known by other explorers, Marion, Furneaux, and Cook, Bruné d' Entrecasteaux, and Huon Kermandee, whose names are still conspicuous upon the present map of the colony. As yet that part of Australia, which is now the colonies of Victoria and South Australia, was entirely unknown, and Van Diemen's Land was commonly held to be the southern extreme of the grand *terra Australis incognita* of New Holland. This idea continued until Bass, in 1798, in a bold cruise from Sydney in a whale-boat, demonstrated the separating strait which has since borne his name. He decided this point by reaching Port Western in Victoria, where he was only a few miles short of the now world-renowned Port-Phillip, which was not discovered till four Tasmania. years later.

The island was taken possession of as a British colony in 1803. On the 10th August of that year, Lieut. Bowen landed with a party from Sydney on the east side of the river Derwent, at a place now called Risdon. The following year Collins came over from Port-Phillip with his party of convicts, after an abortive effort to found a penal settlement at the south-eastern extremity of that harbour. He landed at Sullivan's Cove, on the opposite side of the Derwent, on the 19th February, and there founded, on a site at once convenient and attractive, the present city of Hobarton. Collins was the first governor, and died at his post in 1810. The colony made small advances until 1821, about which time there began a considerable immigration of respectable families, who were liberally attracted by grants of land, and the free use of the convicts as labourers. Thus originated many fine estates and comfortable homesteads, which gave a pleasant and thriving aspect to the colony. In that year the number of the colonists had attained to 7185, and there were 14,940 acres under cultivation. There were 170,000 sheep, and 35,000 cattle. The young settlement had come through severe trials, and in those days, when it was isolated from the busy world to a degree now hardly to be realised, it had repeatedly been at the point of starvation, particularly in extreme drought during the years 1813–1815. The young society, such as it was, had also thus early experienced that dreadful feature of penal colonies, bush-ranging, which had reached such an extreme, through the number of escaped desperadoes, as to call for the exertions not only of the whole military and police, but even also of the free colonists. In 1817 these united exertions had been very generally, if not completely successful. In 1825 Van Diemen's Land became a distinct colony, with a lieutenant-governor, and a legislative council consisting of 15 members of crown nomination. Since that time until towards the time when the present self-government was inaugurated, 1855–6, there had been a marked progress, especially after 1835 and 1836, when the Port-Phillip settlement (now Victoria) and South Australia were founded, the former having been first colonised from Tasmania, and both having been largely supplied with the agricultural produce, and sawn and split timber from the senior settlement. The great gold discoveries in Victoria in 1851 imparted a further stimulus; and during the bustle and wonderful expansion of the earlier years of that eventful time, produced a culminating prosperity and commerce. The exertions of the newer colonies in self-production have since diminished their demands upon Tasmania, and the reduced figures of import and export commerce still exhibit the loss the latter has thus sustained.

Tasmania is situated between the parallels of 40. 40. and 43. 38. S. Lat., and between E. Lon. 144. 33. and 148. 28. Its area is 14,482,592 acres, or 22,629 square miles, being about four-fifths of the area of Ireland. The shape has some resemblance to that of a heart placed due north and south, with a length in that direction of 173 miles, and a breadth east and west between the extremes of Eddystone Point and West Point of 196 miles. The climate, as might be expected in such temperate latitudes of the southern hemisphere, is mostly delightful and suitable to the European constitution, with much clear weather and genial sunshine, but also characterised by occasional unpleasant extremes of heat during summer, and on some rare occasions by long and destructive droughts. The average temperature of the island throughout the year is about 53°, and the rain-fall 21 inches. The extremes of heat and cold are 105° and 25°, the latter degree of cold occurring in mid-winter upon the higher lands. The scenery is of a bold mountainous character, plentifully diversified with picturesque inlets of the sea, with rivers and fresh-water lakes, and exhibiting

Tasmania. almost universally a vast forest, whose primeval solitudes have even yet been but sparsely intruded upon by the colonists. The trees attain to prodigious dimensions, having in some instances been found 102 feet in circumference, and 330 feet high. The eucalyptus family, as in Australia, are the conspicuous denizens of the soil. The blue gum, the swamp gum, and the stringy bark are used in both house and ship-building, and attain a height of 300 feet, and a diameter of 30 feet. The extensive mountain scenery culminates in elevations of upwards of 5000 feet, where the snow reposes for six months of the year. Cradle Mountain on the western side is 5069 feet, and Ben Lomond on the eastern side 5010 feet. Mount Wellington, immediately behind Hobarton, rises in a mass of striking magnificence to the height of 4166 feet. The island produces abundantly all the cereals and fruits of the northern half of Europe, but the perfect ripening of the grape cannot always be relied on except in particular situations. Besides the abundance of timber of a kind available for use, coal is also found in several situations, although hitherto of inferior quality. The search for gold under the stimulus of a promised reward, has shown at least that much of the country is auriferous, in common with the other side of the straits; but as yet the quantities obtained in the Fingal district and elsewhere are quite unimportant.

Organic nature in this island presents that peculiarity of aspect that distinguishes Australia. Tasmania, however, has not those grassy plains and open forest scenes that additionally characterise the latter country, and that are, in their immediately productive uses, a great element in its prosperity. But in both countries there are the colossal gum-trees, the graceful acacias, and the sombre evergreen foliage of the forest, with the numerous distinctive and exceptional specimens both of the vegetable and the animal world. The duck-billed platypus, well named by astonished naturalists *Ornithorhyncus paradoxus*, combines in one structure the mammal with the bird and the reptile. The pig-like wombat, and the kangaroo with its striking and complete marsupial development, are subjects of deep scientific interest. The great kangaroo (*Macropus major*) attains to 140 lb. in weight. It has been much used as food, and nearly hunted out of existence, as also the lesser Brush kangaroo, once very plentiful, but now rare, owing to the demand for the soft leather made from its skin. There are altogether 26 species of mammals, not including the seals or cetaceæ, and of these 14 are common to Tasmania and Australia, but 12 are peculiar to Tasmania. The more remarkable of the latter are the *Thylacinus cynocephalus* (tiger or hyena of the colonists), and the *Dasyurus ursinus*, or devil. The former, which is now rare, is of the size of a large dog, and carnivorous; the latter, less rare, is about the size of a bull terrier, fierce, and of disgusting appearance, and omnicarnivorous, even to devouring its own kind. The whole of this mammal family, under the divisions *Marsupialia* (kangaroo, &c.) and *Monotremata* (*Platypus* and *Echidna*), have latterly been the objects of increased attention, and in particular by Professor Owen, whose mammalian classification by the brain, superseding that of Cuvier by the teeth, has brought together these Australian quadrupeds more correctly, both as regards their own mutual relations, and their relative position in the animal world. They are thus the lowest division of the mammals; and, in accordance, they present features that ally them to orders less advanced and intelligent—as, for instance, to the egg-bearing orders, the reptiles and birds. The semi-viviparous kangaroo, with its marsupial arrangements for completing the development of the fœtus, is, in fact, a connecting link between the mammals giving birth to an offspring of perfect mammalian character, and a lower grade, that produce the egg with the deferred life and organization of its occupant. The brain of these Australian mammals presents a striking distinction, or rather deficiency, as compared with that of other mammals, and this cerebral deficiency seems connected with these peculiarities, or comparative shortcomings, in the generative system of the order. Among remarkable birds, the emu and the black swan belong to Tasmania as well as Australia, but both are getting scarce. There are many of the beautiful parrot tribe, besides quail and snipe, which are shot as game by sportsmen. Edible fish are abundant, but few are comparable to those of Europe. The best of this kind has the colonial name of the trumpeter. Tasmania.

We appropriately conclude this portion of our subject by a few sentences upon another animal of aboriginal Tasmania, also, like the marsupials, manifestly degraded, although in a different scientific sense—namely, man. The aboriginal Tasmanian differs somewhat from the Australian, particularly in the hair, which approaches to the woolly appearance of that of the negro. This is a sub-variety of our race that is now inevitably doomed to disappear, and that, too, within a very few years. They are supposed to have numbered 5000 when the colony was first formed; and they were long so troublesome and dangerous that, as with the bush-ranging convicts, it was deemed necessary to hunt them down almost like wild beasts. A small remnant was eventually collected and transported to one of the Furneaux Islands in Bass' Strait; but after a while, to their great joy, they were reconducted to their own country, where the diminishing and tiny band is attended to by the colonial government. At the beginning of 1859 they numbered altogether five old men and nine old women. No children are now born. "Uncleanly, unsober, unvirtuous, unenergetic, and irreligious, with a past character for treachery, and no record of one noble action:" so Mr Hull, a statistical writer of the colony, describes them; and with such a description one is tempted to ask with him, who is to regret their departure from the scene? But we may credit also the testimony of one who saw them in the only state in which, perhaps, it is fair to judge of extreme savage life, and who looked back with almost penitent regrets upon years of untiring hostility towards them. "Undoubtedly," writes Governor Arthur to the Colonial Office (6th April 1833), "the being reduced to the necessity of driving a simple but warlike, and, as it now appears, noble-minded race from their native hunting-grounds, is a measure in itself so distressing, that I am willing to make almost any prudent sacrifice that may tend to compensate for the injuries that Government is unwillingly and unavoidably the instrument of inflicting." There is something lamentable in thus witnessing the final passing away of a distinctive family of man. At all events, we have one example added to others to show that races of this savage character, as Count Strzelecki remarks, cannot associate with a civilized people. They imbibe only the vices that are presented to them, and are impervious to the counterbalancing adjuncts. If time and adverse circumstances have occasioned the degradation, time and a happier ordination of the future might effect a restoration. But all our theorizing is dissipated at the very threshold of the experiment; for we have hardly contemplated the question ere its subject has ceased to exist.

The island comprised at first only two counties, but there are now 17, with 217 parishes, and upwards of 100 towns and villages. Hobarton, the capital, is situated on the west side of the Derwent, a noble river, and the largest in the island. The town contained, in 1851, 23,107 inhabitants, and 4050 houses, of which 2932 were of stone or brick. This population has since scarcely been maintained, although that of the colony has increased. The withdrawal of the convict expenditure, and the restricted commerce of late years, already alluded to, have directed the colonists from the town to the resources of the country. Launces-

Tasmania. ton, the second town in size and importance, situated about 40 miles up the fine river Tamar, at the head of its navigation, is similarly circumstanced, having enjoyed, in 1851, a population of 10,855, with 2181 houses. The population is now (1859) about 8000. There are five newspapers published in Hobarton, three of them daily, and three in Launceston. These two ports nearly equally divide the commerce of the colony between them, Hobarton taking the southern, and Launceston the northern districts. There is a well-made road, 121 miles in length, and traversed by daily coaches, connecting the two places; and also the electric telegraph, which in 1859 was extended, *vid* King's Island, across the straits to Victoria. In 1857 there were 17 steamers registered as belonging to the colony, several of which ply between Hobarton and Melbourne, and Hobarton and Sydney, and between Launceston and Melbourne. The two towns enjoy municipal institutions.

The population of Tasmania, by the last census in March 1857, was 81,492, including the military, and may be thus analysed: married men, 14,333; married women, 14,524; single men, 31,583; single women, 20,362; troops with their families, 690. The proportion of prisoner population was 2139 males and 869 females, and of these there were 895 males and 241 females under coercion; the others being in private service, or earning their own livelihood upon leave. The convict system is thus gradually disappearing. Its culminating era was the year 1846, at which time there were no less than 26,001 male, and 4278 female convicts, a total of 30,279 adult criminals to a remaining population of 37,000, which itself was, to a large extent, composed of adults who had been convicts, but were free by servitude. The gold discoveries in Victoria in 1851 occasioned a great emigration, which, happily for Tasmania, included many of the worst of the convict class. The average yearly emigration of about 4000 was, in 1852, increased to 21,920, of whom 7357 were of the convict class, many of whom of course soon "came to grief" by their procedure in their new and tempting abode. Out of 26 bush-ranging parties captured in Victoria soon after their arrival, 25 were considered to have been composed of these convicts. The population fell from 69,497 in 1851, to 63,445 in 1852. There was, however, an eventual return on the part of most, and with some increase of means acquired at the gold mines; and the population has since gradually increased to about 85,000. In 1857, the religion of the people appeared as follows:—Church of England, 47,714; Church of Scotland, 7220; Wesleyan Methodists, 4721; other Protestant Dissenters, 3820; Roman Catholics, 16,852; Jews, 429; Mahomedans and Pagans, 46.

The colony possesses a considerable quantity of live stock, which increased rapidly at first, but has of late been stationary, or even retrograde in numbers, the limited pastoral area having become stocked. In 1857 there were 1,879,113 sheep, yielding 5,701,815 lb. of wool; and for 7 or 8 years preceding, these respective quantities scarcely vary. Horses, however, have been gradually increasing, and numbered, in 1857, 19,857; but there has for some years been a decrease in cattle, which numbered, in 1855, 110,304, but were in 1857 only 81,164. The acreage under crop had begun to fall off, but has latterly been on the increase; and, in 1858, was 229,489 acres.

The public revenue is derived chiefly from customs-duties, under a moderate tariff, nearly, but not quite resembling the tariff of New South Wales and Victoria. In 1857 these duties gave L.134,830, out of a total revenue of L.282,179, exclusive of loans. The treasurer's statement for 1858 was to the effect, that there had been a great falling off in revenue after 1854. The deficiencies were considerable and somewhat unexpected, and a system of borrowing had come into operation, by means of an issue of debentures. Towards the end of 1857 there had been thus issued L.282,280 in bonds, due on the years 1860–82. The balance of debt for which the colony was then liable was L.223,680. The government and legislature, however, proceeded to adapt the expenditure to the diminished income; and for 1858 the former was voted at L.208,978, the revenue for the same year being estimated at only L.183,978. The revenue for 1854 had been L.387,784; for 1844 it was L.167,622; for 1834, L.142,701; and for 1824, L.32,126. The colony has for several years past been devoting an annual sum to pay the passages of useful and suitable emigrants from the mother-country. Tasmania.

The commerce of this colony is chiefly in three articles of export—namely, wool, agricultural produce, and timber. In common with the revenues, the commerce has somewhat fallen off within the last few years, but caused partly by the lower prices of flour and grain since 1855. The imports of that year were L.1,559,797, and the exports L.1,428,629. In 1858 the imports were L.1,330,616, and the exports L.1,014,918. In 1824 the respective amounts were—imports, L.62,000; exports, L.14,500. In 1845 they had attained to L.520,562 and L.422,218 respectively. In 1855 the proportions of the chief articles of export were—wool (5,763,090 lb.), L.378,822; agricultural produce and fruit, L.371,181; timber, L.98,546. In 1857 these proportions were, respectively, wool, L.393,646; agricultural produce, &c., L.478,277; timber, L.133,953. In the earlier years of the gold discoveries (1851–54) gold appears as a considerable article of Tasmanian export. The whole, however, a few yearly ounces perhaps excepted, was the produce of Victoria, sent over for Tasmanian account, and re-exported. In this manner the exports comprise, in 1851, 7636 ounces of gold; in 1852, 145,420 ounces; in 1853, 59,054; and, in 1854, 17,411 ounces. After that year this branch of trade became insignificant, the competition in gold buying in Victoria having by that time so raised the price as to leave no profit to Tasmanian shippers. A continued search has been made for gold within the colony; but although much of the country is, like Victoria, evidently auriferous, no available gold-field has yet been met with. At Fingal, in the eastern division of the island, and more lately towards the north-west, upon or near the extensive properties of the Van Diemen's Land Company, gold has been found, and small parties are finding employment in extracting it. In 1857 the export of gold had fallen to 399 ounces, but 300 ounces were of colonial produce.

We shall briefly conclude by a sketch of the political history of the colony. For reference or convenience it may be desirable to give here the various governors who have officiated in the colony. The first, Collins, who died in 1810, has already been alluded to. Three acting governors successively officiated until the arrival of Col. Davey, 1813–17. Sorell succeeded Davey as third governor, and after him Col. George Arthur (1824–36), who occupies a conspicuous position, energetic and despotic, amongst his mixed subjects. After a short interregnum, Sir John Franklin (1837–43) assumed the government, and with much more acceptance than his predecessor. Sir J. E. E. Wilmot (1843–46) arrived in troublous times, when the evils of the convict system were beginning to irritate the colonists, and to cause opposition and unpopularity to the local government. Under some charges, which seem to have been unfounded, Wilmot, who died in the colony shortly after, was superseded by Mr La Trobe from Port-Phillip (1846–7), who reported to the home government so unfavourably of the convict system, as to induce a change of the imperial system, or rather to induce a desire for such a change, even to the entire abolition of the system of penal transportation; but these intentions have been as yet only partially carried out. Sir William Denison

Tassie. (1847–55) succeeded La Trobe, who returned to Port-Phillip. Sir William had many differences with the colonists during the increasing agitation for the cessation of convictism. Whether from personal views on the subject, or more likely, perhaps, from a sense of the duties of his official position, he soon arrayed himself against the colonial views, and contended for the continuance of the obnoxious system. He lost the day however; but since his transfer to Sydney, where the transportation question does not now arise, and where the colony was just entering upon a constitutional self-government, his administration has been successful and satisfactory. Sir Henry Young, who succeeded Denison, and arrived after the pacifying settlement of the transportation question, still enjoys the government (1860), and appears to administer it successfully under the free system.

This system came into operation in 1856. In prompt response to imperial invitation to this and the adjacent colonies two years previously, the Tasmanian legislature embodied its views as to a new constitution in an act passed on 1st November 1854, which in the following year received the royal assent. We should here remark, however, that an alteration in the constitution of the colony had already taken place from that of the council of crown nomination, appointed in 1825. This alteration was introduced by the Australian Colonies Act, of 5th August 1850, of the imperial parliament, which took effect in Tasmania in 1851, and called forth there a legislature consisting of sixteen members elected by the colonists, and eight nominated by the crown. To this intermediate legislature was committed the duty of framing the constitution for self-government. The constitution which came into operation in 1856 consisted of two houses of legislation—a form which the other colonies have all agreed in adopting. The council and assembly, as they are respectively named, are both elective—the former requiring for voters a L.50 freehold rental, and the age of thirty years for a member; the latter a L.10 rental, or a freehold of L.100 value. The council consists of 15 members, 5 of whom retire every 3 years; the assembly consists of 30, who are elected for 5 years, unless intermediately dissolved by the governor. In carrying out the principle of self-government, this colony, with a judicious reserve under the circumstances, has not adopted the extreme democratic "platform" of its sister colonies. The ballot, however, has been adopted under the common example, and as yet has worked with acknowledged success. There has also been, as in the adjacent colonies, the agitation for the purpose of freeing religion from all state connection. The new Constitution Act had continued the old system, by providing out of the public revenue L.15,000 a year towards support of churches and ministers of the "Christian" bodies. This clause of the act the colonial parliament repealed in 1859, awarding a compensation of L.100,000; but the imperial government, in the succeeding year, refused its sanction to this measure. (W–M W–H.)

TASSIE, James, modeller, whose history is intimately connected with a branch of the fine arts in Great Britain, was born of obscure parents at Pollockshaws, near Glasgow, about the year 1735. He began life as a country stonemason, without the expectation of ever rising higher. Going to Glasgow on a fair-day, to amuse himself with his companions, at the time when the celebrated printers, Robert and Andrew Foulis, were attempting to establish an academy for the fine arts in that city; he saw their collection of paintings, and felt an irresistible impulse to become a painter. He removed to Glasgow, and in the Foulis' Academy acquired a knowledge of drawing which unfolded and improved his natural taste. Resorting to Dublin for employment, he became known to Dr Quin, who was amusing himself in his leisure hours with endeavouring to imitate antique gems in coloured pastes, and take accurate impressions of the engravings that were on them. Dr Quin, in looking out for an assistant, soon discovered Tassie to be one in whom he could place perfect confidence. Tassie.

That art was known to the ancients, and many specimens from ancient gems are now in the cabinets of the curious. It seems to have been lost in the middle ages; was revived in Italy under Leo X. and the Medici at Florence; became more perfect in France under the regency of the Duke of Orleans, by his labours and those of Homberg. By those whom they instructed as assistants in the laboratory, the art continued to be practised in Paris, and was carried to Rome. Their art was kept a secret, and their collections were small. It is owing to Quin and to Tassie that the art has been carried to such perfection in Great Britain, and has attracted the attention of Europe.

The doctor committed his laboratory and experiments to his care. The associates were fully successful, and found themselves able to imitate all the gems, and take accurate impressions of the engravings. As the doctor had followed the subject only for his amusement, when the discovery was completed he encouraged Tassie to repair to London, and to devote himself to the preparation and sale of those pastes as his profession. In 1766 Tassie arrived in London. Diffident and modest to excess, he was very unfit to introduce himself to the attentions of persons of rank and affluence; besides, the number of engraved gems in Great Britain was small, and those few were little noticed. Gradually he emerged from obscurity and obtained competence; and, what was to him much more, he was able to increase his collection, and add higher degrees of excellence to his art. His name soon became respected, and the first cabinets in Europe were made accessible to him. He uniformly paid the greatest attention to the exactness of the imitation and accuracy of the engraving; so that many of his pastes were sold on the continent by fraudulent persons for real gems. His fine taste led him to be peculiarly careful of the impression; and he always destroyed those with which he was in the least dissatisfied.

To the ancient gem engravings he added a numerous collection of the most eminent modern ones; many of which approach in excellence of workmanship, if not in simplicity of design and chastity of expression, to the most celebrated of the ancient ones. Many years before he died, he executed for the Empress Catherine II. of Russia a commission consisting of about 15,000 different engravings from gems. At his death, in 1799, they amounted to nearly 20,000—a collection of gem engravings unequalled in the world. Every lover of the fine arts must be sensible of the advantage of such a collection for improvement in knowledge and in taste. The collection of Feloix at Paris consisted of 1800 articles, and that of Dehn at Rome of 2500. In private life Tassie was universally esteemed for his uniform piety, and for the simplicity, modesty, and benevolence that marked his whole character.

James Tassie's nephew, William, carried on the business in London after his uncle's death, and who still survives (June 1860) as an octogenarian. William Tassie has a capital portrait of his uncle, painted by David Allan. During the elder Tassie's life several catalogues of his collection were published. The two most important of these were drawn up by Rudolph Eric Raspe, F.R.S., a German. Their titles are: *Account of the Present Arrangement of Mr James Tassie's Collection of Pastes and Impressions, from Ancient and Modern Gems:* London 1786; *A Descriptive Catalogue of a General Collection of Ancient and Modern Engraved Gems, Cameos, as well as Intaglios, taken from the most celebrated Cabinets in Europe, and cast in Coloured Pastes, White Enamel, and Sulphur, by James Tassie, with Plates.* In English and French, London, 1791, 2 vols. 4to. This last is a curious and valuable work.

Tasso. TASSO, TORQUATO, one of the most celebrated of modern poets, was the son of Bernardo Tasso, himself eminent in the same path of literature. Bernardo, a native of Bergamo, noble but poor, published in 1560 his chivalrous poem of the *Amadigi*, which forms the link between the wild and half-burlesque school, in which Ariosto was the chief, and the serious epic given to Italy by his own son.

Torquato was born in 1544, at the beautifully situated town of Sorrento, on the southern shore of the Bay of Naples; but his father having been involved in the misfortunes and exile of a distinguished patron, the son's education was conducted in the north. At Padua, when he had scarcely completed his eighteenth year, he published his romantic poem called *Rinaldo*, which, aided by other compositions, soon spread his fame over the peninsula, and introduced him into the service of the house of Este, princes of Ferrara. His next work of importance was the *Aminta*, a pastoral drama, in which, although having no claim to rank as the inventor of that faulty species of poetry, he exhibited it in a height of excellence neither attained before nor since. But, in the midst of studies, minor compositions, and travels which carried him as far as Paris, his mind was mainly occupied in elaborating his great work, the *Gierusalemme Liberata*, which he had planned and partly executed before leaving the university. Though the youthful sketch is still extant, the work was afterwards rewritten, and did not reach its close till 1575. The poet, now more than thirty years old, had already displayed those infirmities of character which made him, during the remainder of his life, the helpless victim of envious enemies, or of mean and heartless patrons. The tale which Goethe and Byron have made the theme of poetical invention, represents Tasso as the lover of Leonora d'Este, or, according to some biographers, of Lucretia her sister; but the story is neither sufficiently vouched, nor in itself either probable or consistent; and the real cause of the persecution to which he was subjected remains, after all investigations, as obscure as ever. We know, however, enough to show that his mind was but ill qualified to stand the shock and tumult of the world. That exquisite sensibility which reigns in his poetry was never dormant in any action of his life: deficient in moral courage, and acutely sensitive in taste, he hesitated for years to give his great poem to the public; his imagination, overwrought and undisciplined, filled him with exaggerated suspicions of all who were around him, and superstitious terrors completed his misery. He surrendered himself to the Inquisition, confessing, as heretical doubts, what the inquisitors had sense enough to consider as illusions of hypochondria; and, after an unlucky quarrel had brought on him a temporary imprisonment at Ferrara, he fled secretly from that city in 1577, and, crossing the central Appenines by unfrequented paths, sought refuge with his sister at Sorrento. For a year and a half after this period he wandered through Italy, alternately abandoning himself to fanciful despondence, and arousing his mind to the composition of some of his minor works. In 1579, returning to Ferrara for the second time since his flight, he was treated with neglect by the duke and his sisters, and insulted by the retainers of the court; he broke out, it is said, into violent reproaches against his alienated patrons; and, seized by order of the Duke Alfonso, he was immured in the hospital of Sant' Anna, a public madhouse. In this prison he remained more than seven years, receiving at one time permission to see his friends, and even to pay visits in the city, but treated during the greater part of the period with all the severities which in those days fell to the lot of ordinary maniacs. In the earlier years of his imprisonment, his mind seems to have gathered, from solitude and reflection, a strength of resolution which it had not before possessed, while his literary genius was undecayed and constantly active; but at length the horrors of his situation increased his constitutional tendency to mental disease, and there is little ground for doubting that, in the latter period of his confinement, he laboured under a partial alienation of reason. Tasso.

At length, however, the solicitation of powerful friends procured his release, which took place in 1586; and although his after years present us with several stories of new misfortune and neglect, he found some patrons both kind and judicious. His *Jerusalem Delivered* had been published repeatedly during his imprisonment, in spite of his earnest remonstrances; and now, weaned alike from chivalrous enthusiasm and from the wish to flatter princes, he rewrote the whole poem, and published it anew at Rome in 1562, under the title of the *Gierusalemme Conquistata*. In this altered shape the work was a religious allegory, and the Ferrarese princes were never named in it; but the original editions of the poem have kept their place in general favour, and the alteration is universally and not unjustly neglected. Except the tragedy of *Torrismondo*, all his other extensive compositions after his release were of a devotional cast. In the spring of 1595, while preparations were making for conferring on him the honours of that triumphal coronation in the Roman capitol, which had been invented in favour of Petrarca, he felt that his end was approaching, and retired to the convent of Saint Onofrio, on the brow of the Janiculan Mount. He there expired placidly, having just completed his fifty-first year; and his body still lies beneath the pavement of the little church.

Tasso's works are very numerous, both in prose and verse; and recent examinations of libraries, both in Italy and France, especially that of Alfieri, now preserved at Montpellier, have added to the list many pieces, though without throwing any decisive light on the mysterious portions of his history. One of the most curious of the discoveries is a *Discorso intorno alla Sedizione nata nel regno di Francia*, which was published in an Italian periodical in 1817. It was written during his residence of twelve months at Paris, and is a bigoted argument for the use of extreme severities against the Huguenots. This performance, with other treatises and letters, was reprinted by the Abate Mazzuchelli in 1822. Rosini's edition of the poet's works contains a volume exclusively devoted to letters and poems not previously published; and several separate collections have appeared, the most important being the *Trattato della Dignità ed altri Scritti*, by Gazzera, Turin, 1838; and the *Manoscritti inediti* of Count Alberti, Lucca, 1837–8.

Tasso's prose dialogues and moral treatises, and his minor works in general, have scarcely received, even from his own countrymen, that attention which they fairly deserve; and Monti had some reason for declaring, that the poet's shade has been appeased but in part for the insults offered to him in his lifetime by Salviati and the other academicians of the Crusca. Many of his lyrics are exceedingly beautiful, and none of them more so than those gems which stand as choruses in the *Torrismondo*, atoning by their pathetic sweetness for a bad plot and a want of all dramatic vigour in the tragedy itself. But the *Jerusalem Delivered* will always continue to be its author's title to immortality; and, whatever its faults may be, there are assuredly no two epics of modern times that deserve to be placed above it. Regarded in comparison with other chivalrous poems of the fifteenth and sixteenth centuries in Italy, it distinguishes itself by two prominent features; its perfect regularity and simplicity of plan, and its lofty and single seriousness of temper. No preceding poem in the language had both these qualities; and Ariosto's, the masterpiece of the series, and in some respects the masterpiece of modern Italian literature, was possessed of neither. The completeness of finishing in the *Gierusalemme* is another excellence, in which it stands perhaps higher than any poetical work that

Tassoni || Tatianus.

has been composed since the days of Virgil: and the antithetical quibbles and plays upon words which descended from the Troubadours to Petrarca, from Petrarca to Tasso, and from Tasso (though not through him directly) to our own poets of the Elizabethan age, are faults more than balanced by the chivalrous sentiment, the picturesqueness of natural descriptions, the fanciful beauty of the supernatural machinery, and the tenderness which so often melts into irresistible pathos. We must not look, in that picture of the Crusades which Tasso has painted, for the stern and vigorous truth which such a mind as Shakspeare's would have incorporated in essential harmony with the poetical elements: we must not look even for that inferior kind of fidelity to historical features which gives so strong a charm to some poems of our own time; but we must view in it, with thankful admiration, a panorama of poetically romantic incident, and poetically chivalrous character, as delightful as anything which genius has ever presented. Tasso's great work has been rendered into most European languages. There are English translations of it by Fairfax, Hoole, Broadhead, Hunt, and Wiffen. The version of Fairfax is one of the very best translations in any language. Serassi, *Vita di Torquato Tasso*, Roma, 1785, 4to; Black's *Life of Torquato Tasso*, Edin. 1810, 2 vols. 4to. (W. S.)

TASSONI, Alessandro, who was born at Modena in 1565, and died in 1635, ranks as the best of those Italian writers who, in the seventeenth century, made the burlesque epic a remarkable branch of literature for their nation. His work of this class, *La Secchia Rapita*, or *The Rape of the Bucket*, commemorates an incursion which, in the middle of the thirteenth century, the Modenese made into the town of Bologna, carrying off as a trophy the bucket of a public well. Much of the wit has perished with the remembrance of the persons satirized, and much more is too local to be relished or understood except in Italy; while the alternation of serious and lofty feeling with broad buffoonery necessarily disgusts those who take their poetical creed from the hands of the French. But, in spite of Voltaire's contempt for the poem, it is one which must not be neglected by any systematic student of Italian literature. Another work equally characteristic is Tassoni's *Pensieri Diversi*, a collection of ingenious and outrageous paradoxes, founded on a complete scepticism, real or pretended, as to the merits, not only of the great names in literature, but as to the uses of literature itself. A similar production, the *Considerazioni sopra il Petrarca*, was an attack made in the same spirit upon the poetical idol of the author's countrymen. Walker's *Memoirs of Alessandro Tassoni*, Lond. 1815, 8vo.

TATE, Nahum, a poet and dramatist, the son of Dr Faithful Tate, was born in Dublin in the year 1652. He was educated in Trinity College, but did not betake himself to any profession. Upon the death of Shadwell in 1692, Tate succeeded him as poet laureate, and held that place until the reign of George I., whose first birth-day ode he lived to write, and executed it with unusual spirit. He died in the Mint, a privileged place for debtors in those days, in 1715. He was the author of ten dramatic performances, a great number of poems, and a version of the Psalms in conjunction with Dr Brady, which was a slight improvement on the bathos of Sternhold and Hopkins. A list of his plays may be found in the *Biographia Dramatica*, vol. i. p. 703.

TATIANUS, a Greek writer of the primitive church, was a native of Syria, and by profession a rhetorician. He was educated in paganism, but became a convert to Christianity, and a disciple of Justin Martyr, whom he attended at Rome. After the death of Justin, in the year A.D. 165, he adopted some very unsound opinions, and appeared as the author of a new sect, condemning marriage, enjoining abstinence from wine and animal food, and suffering only water to be used in the holy mysteries; whence his followers were called *Encratitæ*, *Apotactites*, and *Hydroparastatæ*. From Rome he returned to the east, and opened a school in Mesopotamia; but when or where he died we do not find recorded. His only work, *Oratio ad Græcos*, was first printed at Zürich in 1546. An elaborate edition was published by William Worth, A.M., Oxon. 1700, 8vo.

Tatius || Taunton.

TATIUS, Achilles, a Greek writer, is supposed by Fabricius to have flourished in the third or fourth century. His age seems however to be very uncertain. Suidas, who gives him the name of Achilles Statius, informs us that having originally been a pagan, he was converted to Christianity, and at length became a bishop. He is best known as the author of a romance, in eight books, *De Leucippes et Clitophontis Amoribus*. From the strain of the work, it may perhaps be supposed to have been written before his conversion. It first appeared in a Latin translation, executed by Annibal Crucceius; a portion of which was printed at Lyon in 1544, and a complete edition at Basel in 1554. The Greek text was first committed to the press by Commelin [Heidelbergæ], 1601, 8vo. Another edition was published by Salmasius, Lugd. Bat. 1640, 12mo. After several intervening editions, followed that of Mitscherlich, which occupies the first volume of his *Scriptores Erotici Græci*. Biponti, 1792–4, 3 tom. 8vo. But the most elaborate and valuable edition that has yet appeared was published by Jacobs, Lipsiæ, 1821, 8vo. This romance has been translated into English, and other modern languages. A composition of a very different nature has likewise been ascribed to Achilles Tatius; but it may perhaps be considered as doubtful whether they were both written by the same individual. This is a fragment of a treatise on the sphere, Περὶ Σφαίρας, and comprises an introduction to the *Phænomena* of Aratus. It was first published by Victorius, with his edition of Hipparchus, Florent. 1567, fol. The Greek text, accompanied with a Latin version, was inserted by Petavius in his *Uranologion*, Paris, 1630, fol.

TATTA. See Sindh.

TAUNTON, a market-town and parliamentary borough of England, Somersetshire, in a beautiful and fertile valley on the Tone, 46 miles S.W. of Bath, and 141 W.S.W. of London. It is about a mile in length, and consists for the most part of broad well-paved streets, lined with large and handsome brick houses. There is a large open space called the Parade, in which stand the old brick market-house, containing also the town-hall and assembly rooms; and a modern building in the Grecian style, the upper part of which contains a library, reading-room, and museum, and the lower part fish and poultry markets. At the west end of the town stands the castle, erected in the time of Henry I. on the site of a still more ancient edifice, and containing a hall in which the assize courts are held. The churches of Taunton are noteworthy, especially that of St Mary Magdalen, which is perhaps the most conspicuous building in the town. It is a richly decorated specimen of the perpendicular style; and has a nave with four aisles, a chancel, and a square pinnacled tower 153 feet high. The tower and some other portions belong to the latter part of the fourteenth century; but the church was much improved and adorned in the time of Henry VII. The church of St James and the district church, though inferior to this edifice, are both substantial and handsome; and Taunton has other places of worship belonging to the Independents, Wesleyans, Baptists, Quakers, Roman Catholics, Unitarians, and other sects. Among the educational institutions there are a free grammar school, national, British, and infant schools. A Wesleyan Methodist college, mechanics' institute, and philharmonic society, have been established at Taunton; and the Somerset Archæological Society possesses a museum, and holds its meetings here. The town

Taunton ‖ Tauromenium.

contains also an hospital, eye-infirmary, several alms-houses, a jail, a theatre, and baths. The woollen manufacture was early established, and long flourished here; but it has now given place almost entirely to that of silk, which now forms, along with lacemaking, the chief occupation of the inhabitants. Taunton has also some breweries, and its ale is highly esteemed. A considerable trade is carried on,—the produce of the surrounding country being exported, and coals from Wales imported. Weekly and monthly markets, and annual fairs are held. The river, which is here crossed by a bridge of two arches, is only partially navigable; but the Taunton and Bridgewater Canal, and the Bristol and Exeter Railway afford ample facilities for communication with other parts of the country. The borough is governed by 2 bailiffs, 2 constables, and 2 portreeves; and it returns 2 members to the House of Commons. Taunton is a very ancient town; it was probably a Roman station, and had a castle during the time of the Saxon dominion. The Norman Castle, which still exists, is frequently mentioned in early English history; and in the time of the civil war it was defended by Blake for ten months against the royal forces. In 1685, Taunton was seized by the unfortunate Monmouth, who here proclaimed himself king; and after the defeat of his attempt, the castle of Taunton was one of the places where Judge Jeffries held what have been called "the bloody assizes." Pop. 14,176.

TAUNTON, a town of the United States of North America, Massachusetts, on the river of the same name, 35 miles S. of Boston, and 30 E.N.E. of Providence. It is generally well built; and has in the centre an enclosure called Taunton Green. The chief buildings are the town-hall, court-house, jail, and numerous churches. Various manufactures are extensively carried on here, especially those of paper, leather, hardware, and machinery. The river is navigable up to the town for small vessels; and some coasting trade is carried on here. Pop. (1850) 10,431.

TAURIDA, a government of European Russia, bounded on the N. by those of Kherson and Ekaterinoslav, E. by the Sea of Azoph, S. and W. by the Black Sea. Length from N. to S. 220 miles; average breadth, 170; area, 24,617 square miles. The southern portion of this government consists of the peninsula of the Crimea, and is fully described under that article. The northern part consists almost entirely of vast steppes, or rather of a single steppe, raised on a base of granite, and consisting for the most part of a dry sandy soil, destitute of wood, but containing in some places hollows clothed with rich grass. The only important river is the Dnieper, which forms the north-eastern boundary of the government; but the lakes are numerous, and some of them large, that of Molotschnaia having an area of more than 100 square miles. The climate is on the whole mild; although during the short winters the cold is intense. Large herds of horses and sheep are kept by the Tartars on the steppe; but the productions of the country are few and insignificant. Pop. (1856) 659,509.

TAUROMENIUM, an ancient Greek city in Sicily, on the east coast of the island, about halfway between Messana and Catana. It stood on a hill about 3 miles N. of the site of Naxos; and it was not till after the destruction of that city that Tauromenium was founded. In 403 B.C., Naxos was destroyed by Dionysius of Syracuse, and its territory was given to the Sicilians in the vicinity. They did not rebuild the former city; but in 396 established on the neighbouring hill of Taurus, a camp which afterwards grew into the city of Tauromenium. In 394 Dionysius besieged the new city, and spent the greater part of a winter in an unsuccessful effort to take it. A peace was concluded in 392, in terms of which Tauromenium became subject to Dionysius, who immediately expelled the former inhabitants, and supplied their place by mercenaries of his own. This state of affairs seems to have continued till 358, when Andromachus collected the survivors of the original Naxians from different parts of the island, and settled them at Tauromenium, which now first became a Greek city, and was regarded as taking the place of the fallen Naxos. Andromachus governed well and wisely; and under him the city made rapid progress. He assisted Timoleon in his expedition to Sicily, and was allowed by him to retain his power in Tauromenium. At a latter period, however, the city was conquered by Hiero of Syracuse, and it remained subject to that city until, with the whole of Sicily, it passed into the power of the Romans. Under them it enjoyed great privileges, being an allied city, and thus having at least a nominal independence. But in the Servile war in Sicily (134–2 B.C.), it was captured by the insurgent slaves, and held by them till the last extremity, suffering the utmost calamities, until the citadel was betrayed to the Romans. Augustus made it a colony; and under his successors, and even after the fall of the Western Empire, it continued to be one of the most important cities in Sicily. It was one of the last in the island that the Greek emperors lost; and was not totally destroyed till the Saracens took it in 906 A.D., after a siege of two years. From this blow it never recovered. The modern Taormina, a small village, occupies the site; and in its vicinity a theatre and some other remains are to be seen.

Taurus ‖ Tavistock.

TAURUS. See ASIA MINOR.

TAVERNIER, JEAN BAPTIST, a French traveller, was born in 1605. In the course of forty years he travelled six times to Turkey, Persia, and the East Indies, and visited all the countries in Europe, travelling mostly on foot. His travels have been frequently reprinted in six volumes 12mo. He died, on his seventh journey to the east, at Moscow, in 1689.

TAVIRA, a seaport of Portugal, in the province of Algarves, at the mouth of the Seca, 21 miles E.N.E. of Faro. It is well built, with regular streets and several handsome squares; and it contains a governor's palace, several churches, and hospitals. Many of the people are employed in fishing; and there is a considerable coasting trade, as well as some traffic with the interior by means of the river. Pop. 8640.

TAVISTOCK, a parliamentary borough and market-town of England, Devonshire, in the beautiful valley of the Tavy, which is here crossed by two bridges, 11 miles N. of Plymouth. It covers the sides and bottom of the narrow valley, and is very irregularly laid out. Some remains are still to be seen of an ancient abbey; but most of them have been built into other edifices. A hotel occupies part of the site, and some portions of the old building have been removed to make way for it; one of the gatehouses is now occupied by a public library; the refectory forms a Unitarian chapel, and the abbot's lodge is made use of as a stable. The parish church of Tavistock is a handsome building in the perpendicular style, with a tower and triple chancel. The other places of worship in the town belong to Independents, Methodists, Quakers, and Unitarians. There are here a literary and scientific institution; a grammar school, national, British, and infant schools; alms-houses, &c. Serge and woollen cloth are manufactured in the town; and there is also an iron-foundry. Copper mines are worked in the neighbourhood; and abundance of lead, tin, manganese, and iron are found. Weekly markets, chiefly for corn, are held here, as well as several cattle fairs. Tavistock is connected by canal with the river Tamar, and by it with the port of Plymouth. The borough is governed by a portreeve, and is represented in Parliament by two members. The abbey was originally founded in 961, and rebuilt on a larger scale after its destruction by the Danes at a subsequent period. In 1539 it was confiscated by Henry VIII., and bestowed on Lord Russel, the ancestor of the Duke of Bedford, to whom the ruins still

Tavoy ‖ Taxation.

belong. Sir Francis Drake was born in the neighbourhood of Tavistock. Pop. of the parliamentary borough 8086.

TAVOY, one of the Tenasserim provinces in British India, lying between N. Lat. 12. 44. and 14. 50.; E. Long. 98. 30. and 99. 30.; bounded on the N. by the province of Amherst; S. by that of Mergui; E. by Siam; and W. by the Bay of Bengal. Area, 4920 square miles. It is for the most part occupied by mountains, which are covered with dense forests and jungles, and intersected by many valleys watered by streams. The range nearest the sea has a height of 3000 feet; and those further east attain a still higher elevation. The principal crop raised is rice, for which the land is well suited; but there is much ground which is at present waste that might be brought into cultivation. Cotton, indigo, and tobacco are cultivated, but only to a very small extent. Various kinds of palms, fruit-trees, and timber trees grow here in large numbers. The mineral wealth of Tavoy, which consists principally of iron and tin, is very great; the mines of these metals are abundant, and the ores of the best quality. Pop. 37,354.

Tavoy ‖ Taxation.

TAVOY, the capital of the above province, stands on the river of the same name, about 35 miles above its mouth. It is walled, and defended on three sides by a ditch, and on the fourth by the river. The streets are broad, and there is a good bazaar. The river is navigable up to the town for vessels of 120 tons; and a considerable trade is carried on between this place and the ports on the Mergui Archipelago. Pop. about 10,000.

TAWING. See LEATHER.

TAXATION.

Definition.

A TAX[1] is a portion of the property of individuals which is taken from them by Government, and disposed of by it.

A tax may be either *direct* or *indirect*. It is said to be *direct* when it is taken immediately from income or capital; and *indirect* when it is taken from them by making their owners pay for articles on which it has been laid, or for leave to use certain articles, or exercise certain privileges.

A tax may be either *general* or *particular;* that is, it may either affect all classes indiscriminately, or only one or more classes.

Taxation is the act of laying on or assessing taxes. It is sometimes, also, employed to express their aggregate amount; and is the name given to that branch of the science of political economy which explains the mode in which they may be most advantageously imposed and collected.

PART I.

GENERAL OBSERVATIONS ON TAXATION.

Necessity of taxation.

The necessity of raising a revenue for the service of the public is so very obvious, that to attempt to prove it by lengthened statements or reasonings would be worse than superfluous. It is enough to observe, that the ability to repel and avenge external attacks, the maintenance of internal tranquillity and good order, with the speedy and impartial administration of justice, are indispensable to the comfort and wellbeing of every man, as well as to the advancement of nations in population, civilization, and wealth.

Means by which security and order are effected.

But the means by which these great ends are effected are not supplied gratuitously. The ships and fortresses, the sailors and soldiers, the judges, magistrates, and other functionaries necessary to provide for national independence and private security, cost large sums. And being required for the common benefit of all classes and individuals, it follows that these sums should be furnished by their united contributions. Hence the cardinal principle, that taxation should be equal and universal; that none should be so high or so low as not to feel its full pressure. It is contradictory to pretend that any man has any good ground for complaining that he is made to pay his fair share, be it great or small, of the public outgoings.

It may no doubt happen, from the impossibility of exactly apportioning the burden of taxation to the means of individuals, that some may be more or less heavily taxed than others. But at present we are only stating what is the general principle or rule with regard to taxation. And it will be afterwards seen that the unequal pressure of certain taxes is of less consequence than might be previously supposed, and is commonly balanced, either in whole or in part, by countervailing circumstances.

It is farther true that the public is frequently called upon to contribute larger sums than are required for the ends of good government. But, when such is the case, the abuse must originate either in the misconduct of administration, or in the defective organization of the state, and does not properly come within the scope of our inquiries. In treating of taxation, the political economist has not to inquire whether the revenue raised by the state exceeds its necessary wants, or is judiciously expended. His object is to point out the effect of taxation on the wealth of individuals and of the public; and, by analysing and comparing the various methods in which a revenue may be raised, to show which is most advantageous, or rather, which is least injurious.

Present system of taxation rose out of the decline of the feudal system

The scheme of taxation now subsisting in modern Europe had its origin in the decline of the feudal system. According to its principles, the lands of a country were held as fiefs of the crown, on condition of their possessors performing certain stipulated services, of which the obligation to support the sovereign when he took the field, with a body of retainers armed and maintained at their own expense, was by far the most important. The tenants in chief of the great fiefs, or those who held directly under the sovereign, were either originally invested with, or subsequently usurped, the prerogative of distributing justice in their respective lordships; and in those days the administration of justice, instead of being a source of expense, became, in consequence of the abuses with which it was infected, a considerable source both of influence and emolument. The clergy were partly provided for out of their own estates, and partly by a tithe levied on the estates of others. And the labour of the peasantry, during a few days before and after harvest, sufficed to put the roads and bridges into that state of repair which the depressed situation of commerce, and the little intercourse between the different parts of the country, seemed to require. It was not even necessary to levy a tax for the support of the monarch and his court. The rents of the crown estates, or of those portions of the royal demesnes, which not having been granted

[1] Tax, from the Latin *taxo, taxare,* to estimate, appreciate, or value, and also, to charge with; the value of lands, houses, rents, &c., being usually ascertained or estimated before they are charged with a payment or tax. Ducange defines a tax as follows, viz.:—"*Taxa, exactio, impositio, certum pretium, seu certa pecuniæ quantitas, per vim exacta; nostris* taxe, *Italis* tassa." (*Voce Taxa.*)

General Observations on Taxation.

to others, remained in the immediate possession of the sovereign, were generally sufficient to defray this part of the public expenditure. When the feudal system was in its vigour, the demesnes of the crown were, in most countries, very extensive; and the alienations occasioned by the profusion and facility of some princes, were compensated by the forfeitures and escheats that were always taking place.

The vicious nature of this system is too obvious to require being pointed out; and it exercised, for a long series of years, a fatal influence over the peace and prosperity of Europe. But the progressive though slow advance of civilization ultimately occasioned its overthrow. Money payments were gradually substituted for personal services. And the establishment of standing armies in France[1] by Charles VII., and their introduction into other countries, entirely broke the power and spirit of the feudal aristocracy; and enabled the different governments to introduce a regular plan of administration, and to enforce that system of pecuniary contribution now universally established.

Taxes estimated by values, and not by quantities.

The amount of a tax is not estimated by the *bulk* or *species* of the produce which it transfers from individuals to government, but by its *value*. When a fall takes place in the cost of producing an article, its price eventually declines in an equal degree; and its producers (supposing the value of money not to vary) are obliged to dispose of proportionally larger quantities to obtain the means of paying the same amount of taxes. But it is an obvious error to suppose, as is very commonly done, that the burden of taxation is consequently increased. If, owing to improvements in agriculture, machinery, or any other cause, *two* quarters of wheat, or *two* yards of cloth, were produced with the *same* expenditure of capital and labour that are now required to produce *one* quarter or *one* yard, it would be no hardship to have to give *double* the quantity of these commodities in payment of taxes.

Improvements enable a country to pay additional taxes.

The want of attention to the principle now stated has led to much erroneous reasoning on the subject of taxation. Even Smith made no sufficient allowance for the influence of improvements in enabling a country to bear additional burdens. Nothing, however, is better ascertained than that the portion of the produce of industry taken by the government as revenue, may be continuously increased in all countries in which the arts are progressive, without adding to the burdens of the people. Such new inventions and discoveries as facilitate the production of commodities and reduce their value, enable individuals to spare a larger quantity for the use of the state. The sacrifice incurred in the paying of taxes is not to be measured by the amount of money or of produce required for their payment, but by the amount of labour—that is, of toil and trouble—required to obtain the money or the produce. To pay L.100 or L.1000 to government, at this moment (1860), will cost a cotton manufacturer not less, perhaps, than forty or fifty times the quantity of cottons that would have sufficed to make the same payment in 1760. But as this reduction in the value of cottons has been occasioned by an equivalent reduction in the cost of their production, the manufacturer is not thereby placed in a worse situation, nor is he, in so far at least as cottons are concerned, making a greater sacrifice now than he did a century ago. And thus it appears, that governments have the same interests as their subjects in whatever tends to facilitate or lessen the expense of production; for, when it is lessened, they may make corresponding additions to the produce at their disposal, without really adding anything to the weight of taxation. And, on the contrary, a diminished facility of production must either diminish in an equal degree the produce appropriated by governments, or compel them to lay heavier burdens on their subjects. Public wealth is merely that portion of the wealth of individuals that has been transferred, by taxation or otherwise, from them to the government; and the greater the amount of such individual wealth, the greater will be the magnitude of the portion that may be conveniently spared for national purposes.

General Observations on Taxation.

Taxes fall either on revenue or capital.

Though necessary taxation should always be kept within the narrowest limits possible. The most popular taxes are those which are lightest; but there are none so light as not to occasion an increase of toil, or a diminution of enjoyments or of fortune. All taxes must ultimately be paid from the *revenue* of a country, or from its *capital* or stock; and there are very few, if any, whose produce is not partly derived from both these funds. No doubt, however, the greater part by far of all taxes which are judiciously imposed, and not carried to an oppressive height, is paid out of revenue. The desire which every one has to preserve his place in society stimulates most people to exert themselves to defray the taxes with which they are charged, either by increased industry or by curtailing their expenditure, without allowing them to encroach on their capitals. But the power to make increased exertions, and to save from expense, though not easily defined, is not illimitable. And whenever the burden of taxation is not fully compensated by increased production or increased saving, it must necessarily encroach on the means of future production, and the country will begin to retrograde. It is doubtful, however, whether any well-devised scheme of taxation ever had the effect now supposed, except, perhaps, during the heat or crisis of some great national struggle. It is obvious, indeed, that were it continued for any considerable period, it would, by diminishing capital, or the funds applicable to the support of industry, lessen the national revenue, the only fund out of which taxes can be permanently paid; and lay the sure foundation of public poverty and disgrace, in the destruction of individual fortunes. Like falling bodies, which are precipitated with a constantly and rapidly increasing velocity, a system of taxation acting on capital multiplies pauperism and distress in a geometrical proportion, and destroys alike the desire and the means of reproduction.

It would, however, be an error to suppose that a tax is necessarily a tax on capital, because it is laid on capital, or a tax on income, because it is laid on income. A moderate tax laid on capital may be, and generally is, defrayed out of a saving of income; whereas an oppressive tax laid on income has in most cases to be, in part at least, paid from capital. But of all species of taxes, those are plainly the most injurious which necessarily fall on capital, without giving the contributors an opportunity to defray them from revenue. By diminishing the funds for the maintenance of labour, they in so far diminish the future taxable income of the country. The legacy-duty, as we shall afterwards see, has been supposed, though without sufficient reason, to be censurable on this ground.

Different effects of moderate and heavy taxes.

The writers on finance, patronized by government, have sometimes evinced their gratitude, by endeavouring to show that taxation is never a cause of diminished production; but that, on the contrary, every new tax creates a new ability in the subject to bear it, and every increase of the public burdens becomes the cause of a proportional increase in the industry of the people. The fallacy of this opinion, when advanced thus absolutely and without reservation, has been exposed by Hume in his *Essay on Taxes*. But it is certainly true, as has been already stated, that the desire to preserve their fortunes unimpaired, and to improve their condition, stimulates most men to endeavour to defray a moderate increase of taxation,

[1] It was on this occasion that the *taille* was first imposed in France. (Hallam's *View of the Middle Ages*, vol. i., p. 118.)

General Observations on Taxation.

by increased industry and economy, without allowing it to encroach on their fortunes, or even to lessen the rate at which they may have been increasing. And occasionally these efforts much more than countervail the influence of the additional taxation, and the public wealth is consequently augmented through its increase. We have seen in the article POLITICAL ECONOMY, that this was strikingly shown during the progress of the war which grew out of the French Revolution. To the desire of rising in the world, the greater pressure of taxation superadded the fear of being cast down to a lower station; and the combined action of the two principles produced results that could not have been brought about by the unassisted operation of either. But we must beware of the abuse of this doctrine. An increase of taxation will not stimulate to new efforts unless the contributors believe that it is in their power to defray the whole or the greater part of its amount by additional industry and economy. The effect of exorbitant taxes is not to stimulate industry, but to destroy it. Were taxation carried so high as to swallow up the whole, or even the greater part, of the earnings of the people above what is required to furnish mere necessaries, it would, by destroying the hope and the means of rising in the world, take away the most powerful motive to industry and frugality, and, instead of producing increased exertion, would produce only despair. The stimulus given by excessive taxation to industry has been not unaptly compared to that given by the lash to the labour of the slave; and the experience of all ages and nations has proved that the latter is as ineffective as it is inhuman, when compared to the stimulus which the expectation of improving his condition, and enjoying the fruits of his industry without molestation, gives to the productive energies of the moderately-taxed citizen of a free state.

Effect of heavy taxes in Spain.

It would be easy to illustrate the disastrous influence of oppressive taxes over industry, by references to the history of most European nations.[1] In Spain they have been particularly fatal. The decline of that country has been commonly ascribed to the expulsion of the Jews and Moors, and to the emigrations to America. But had the policy of her government been otherwise sufficiently liberal—had industry been properly protected, and moderate and equal taxes levied, the losses occasioned by the expulsion of so many of her most industrious citizens would have been gradually repaired, and the emigration to America would have acted only as a stimulus to population. Oppressive taxes, however, not only prevented Spain from recovering from the wounds inflicted by the bigotry of her rulers, but went far to extinguish the very spirit of industry. Of the taxes most instrumental in producing this effect, the *alcavala* is justly entitled to the pre-eminence. This was a tax originally of *ten*, but subsequently of fourteen *per cent.*, charged on all commodities, whether raw or manufactured, as often as they were sold, and rated always according to their selling price. Such a monstrous impost was of itself sufficient to annihilate industry. The manufactures of Castile and the other provinces subjected to its destroying influence were ruined. And Ustariz, Ulloa, and Campomanes, Spanish authors of the highest credit, agree in opinion with Mr Townsend, that it was to their exemption from this odious tax that the comparatively flourishing state of industry in Catalonia and Valencia previously to the French Revolution, was entirely to be ascribed.

Taxes do not revert to the contributors.

Besides contending that new taxes uniformly create a new ability in the people to bear them, the government financiers have also contended that taxes are not really lost to the contributors, but are restored to them through the expenditure of government and its agents! And notwithstanding the gross and almost obvious fallacy which this statement involves, it still not unfrequently occupies a prominent place in the answers made to those who complain of the pernicious influence of exorbitant taxes. To show its absurdity, let it be supposed that a farmer is taxed L.50, and let us endeavour to ascertain whether the expenditure of this sum by the public functionary, or individual to whom it has been paid, affords any compensation to the farmer for its loss. If the receiver of the tax do not lay it out on commodities produced by the farmer, it cannot return to him, and he can derive no possible advantage from its expenditure. But let us suppose, which is the most favourable hypothesis for the argument we are combating, that the tax-receiver comes to the farmer to buy his produce, and let us trace the successive steps and effect of the whole transaction. First of all, then, the farmer sold as much corn or other produce as was worth L.50; he next paid away these L.50 to a tax-gatherer, and the latter, or the person who received the L.50 from him, comes to the farmer and says, "You may have your money back on your paying me an *equivalent* in corn or other produce." This is the way in which the money drawn from the pockets of the public by taxation always reverts to them; and if it enrich any one, it is obvious it must do so by making him pay *twice* for the same sum of money! It is to no purpose to endeavour to escape from this *reductio ad absurdum*, by telling us that industry is benefited by every extension of the market, and that the consumption of soldiers and sailors is advantageous, because it increases demand. To benefit industry a market must be a *real*, not a *nominal* one; it must be one in which the buyers have supplied themselves, through their own industry or resources, with the money or other equivalents they offer for commodities. It is contradictory to suppose that either individuals or states can receive the smallest benefit from selling to persons to whom they have previously furnished the means of buying. This, however, is always the case with buyers who live on the produce of taxation. And to keep up useless regiments and overgrown establishments, on pretence of encouraging industry by increasing demand, is to the full as irrational as if a shopkeeper were to attempt to increase his business and get rich by supplying his customers with money to buy his goods.

"To argue," says Dr Hamilton, "that the money raised in taxes being spent among those who pay it is, therefore, no loss to them, is no less absurd than the defence of a housebreaker, who, being convicted of carrying off a merchant's money, should plead that he did him no injury, for the money would be returned to him in the purchase of the commodities in which he dealt."[2]

Hence, it results that the services of the functionaries to whom taxes are paid form the only compensation received in their stead by the tax-contributors. And it is undoubtedly true that these services are most valuable; and that when neither the numbers nor the salaries of the functionaries by whom they are rendered are too great, they are an ample return for the sums expended upon them. But whatever is laid out in maintaining unnecessary functionaries, or in overpaying them, is wholly lost, or yields no sort of equivalent to the contributors.

That security, protection, and good government, which it is the object of taxation to procure, are highly valuable, or rather indispensable, cannot be disputed; but like all

[1] For an instructive account of the effect of heavy taxes on the commerce and industry of Holland, see the second volume of the work of M. Luzac, *De la Richesse de la Hollande.*

[2] This sophism is equally well exposed in the *Lettres d'un Citoyen sur les Vingtièmes*, &c. (p. 113), published in 1768.

General Observations on Taxation.

other values, the smaller the sacrifice for which they may be obtained so much the better. A diminution of taxation, or of the expense of government, benefits the public precisely in the same way that a diminution of the cost of food, or of any useful or desirable commodity, benefits individuals. There is no mystery in the manner in which government is supported and taxation operates. Government is not a producer: its expenditure is not defrayed out of its own labour or property, but out of that of its subjects. It is obvious, therefore, that the greater its expenses, the deeper must they encroach on the means of those by whom they are paid, unless, as previously stated, they be met by increased industry or saving, or both. But this last, though a powerful resource, is one which is not always to be depended upon, and hence the paramount duty of enforcing economy in the public expenditure.

Erroneous opinion of Locke and Quesnay respecting the incidence of taxes on the land.

Various and very discordant opinions have been entertained respecting the ultimate incidence and effect of taxes. Locke in England, and Quesnay and his followers in France and Italy, contended that all taxes, however imposed, fell ultimately on the land. This erroneous opinion proceeded from their supposing that agriculture is the only productive species of industry, whereas it is in no respect more productive than others. The truth is, that all burdens which directly or indirectly affect the producers of any article, fall ultimately on its consumers. A tax on hats, for example, raises their price, and a tax on leather raises the price of shoes; for, were it otherwise, the profits of the hatters and shoemakers would be reduced below the general level, and as they would not be satisfied with smaller profits than their neighbours, they would withdraw their capital from such losing businesses till, through the diminished supply of hats and shoes, their prices had been raised to their proper height, that is, to such a height as would yield the hatters and shoemakers the average profits of stock exclusive of the tax. There are natural limits, however, to the extent to which taxes on commodities can be carried; and their effects differ when they are laid on commodities required for the consumption of the labouring classes, and on those exclusively consumed by the higher classes. But before proceeding to inquire into the influence of particular taxes, we shall make a few observations on the maxims laid down by Adam Smith with regard to taxes in general, which are drawn up with singular judgment and comprehension.

Smith's maxims.

First maxim. "The subjects of every state ought to contribute towards the support of the government as nearly as possible in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the state. The expense of government to the individuals of a great nation is like the expense of management to the joint-tenants of a great estate. In the observation or neglect of this maxim consists what is called the equality or inequality of taxation."

Second. "The tax which each individual is bound to pay ought to be certain, and not arbitrary. The *time* of payment, the *manner* of payment, the *quantity* to be paid, ought all to be clear and plain to the contributor and to every other person. When it is otherwise, every person subject to the tax is put, more or less, in the power of the tax-gatherer, who can either aggravate the tax upon any obnoxious contributor, or extort, by the terror of such aggravation, some present or perquisite to himself. The uncertainty of taxation encourages the insolence and favours the corruption of an order of men who are naturally unpopular even where they are neither insolent nor corrupt. The certainty of what each individual ought to pay is, in taxation, of so great importance, that a very considerable degree of inequality, it appears, I believe, from the experience of all nations, is not near so great an evil as a very small degree of uncertainty."

Third. "Every tax ought to be levied at the time and in the manner in which it is most likely to be convenient for the contributor to pay it. A tax upon the rent of land, or of houses, payable at the same term at which rents are usually paid, is levied at the time when it is most likely to be convenient for the contributor to pay, or when he is most likely to have wherewithal to pay. Taxes upon such consumable goods as are articles of luxury are all finally paid by the consumer, and generally in a manner that is very convenient for him. He buys them by little and little, as he has occasion to buy the goods; and as he is at liberty, too, either to buy or not to buy as he pleases, it must be his own fault if he ever suffers any considerable inconveniency from such taxes."

General Observations on Taxation.

Fourth. "Every tax ought to be so contrived as both to take out and to keep out of the pockets of the people as little as possible, over and above what it brings into the public treasury of the state." (*Wealth of Nations*, M'Culloch's ed. 1 vol. 8vo, p. 371.)

Observations on Smith's maxims.

In a theoretical point of view these maxims are alike comprehensive and accurate; and it follows, were it practicable, that the burden of taxation should be made to press on individuals in proportion to their respective revenues. A, with an income of L.1000 a-year, ought to pay ten times the tax paid by B, who has only L.100 a-year, and the latter ten times as much as C, who has only a pittance of L.10.[1] The state has been ingeniously compared by M. Thiers to a mutual insurance company, where the payments by the members are exactly proportioned to the sums they have insured, or to their interest in the company. And so it should be with the subjects of government. It is established for the common benefit of all—of those who labour, whether with the hand or the head; of those to whom property has descended, and by whom it has been acquired; and is indispensable to their wellbeing and to that of every one else. And being so, it results that all individuals should contribute to its support according to their stake in society or to their means.

Practically, however, it is not possible to attain to anything like perfect equality in taxation; and provided no tax be imposed in the view of trenching on this principle, or of making one class or order of people pay more in proportion to their means than others, equality of pressure is of inferior importance. In this, as in most departments of politics, we have only a choice of difficulties; and what is absolutely right must often give way to what is expedient and practicable. It is the business of the legislator to look at the practical influence of different taxes, and to resort in preference to those by which the revenue may be raised with the smallest inconvenience. Should the taxes least adverse to the public interests fall on the contributors according to their respective abilities, it will be an additional recommendation in their favour. But in this, as in every similar matter, the *salus populi* should be the prime consideration; and the tax which is best fitted to promote, or least opposed to that great end, though it may not press quite equally on the different orders of society, is to be preferred to a more equal but otherwise less advantageous tax. Were Smith's first maxim restricted to taxes on property or income, it would be as true in a practical as in a theoretical point of view. Equality is of the essence of such taxes; and whenever they cease to be equal, they become partial and unjust. But in laying down a practical rule that is to apply to all taxes, equality of contribution is a minor consideration. The distinguishing characteristic of the best tax is, not that it is most nearly proportioned to the means of individuals, but that it is easily assessed and collected, and is, at the same time, most conducive or least opposed, all things considered, to the public interests.

The truth is, that the greater number of taxes, including, we believe, every one that is least injurious, are imposed without any regard to their equally affecting different classes. They consist of duties payable by those who use certain articles, or exercise certain privileges, and by those only. Taxes of this sort, though not proportioned to the abilities of the consumers, are neither partial nor unfair; and pro-

[1] It is perhaps needless to say, that the incomes of the different parties are supposed to be perpetual, or of the same duration.

General Observations on Taxation.

vided they be imposed on proper objects, and kept within reasonable limits, they are not open to any good objection.

We may refer, in illustration of this statement, to the duties on malt, spirits, wine, and tobacco. These produce a very large annual revenue, and though some of them might, perhaps, be advantageously reduced, they appear, supposing them to be properly assessed, to be, in all respects, unexceptionable. Other duties of this description, such as those on saddle-horses, carriages, and livery servants, fall only on the more opulent classes. But this is not the case with the more productive duties, and it must be admitted that the largest portion of the revenue derived from them is paid by the lower and poorer orders. This, however, is not, as has been often alleged, a consequence of the latter being overtaxed, but of their being so very numerous that the produce of the moderate duties to which they generally contribute, invariably exceeds the produce of the heavier duties that fall principally on the richer classes. The duties now under consideration act as a species of improved sumptuary laws, having all the useful, with few or none of the injurious, influences of these regulations. The articles on which they are imposed are rarely, if ever, indispensable; so that the duties may be partially or wholly evaded by those who prefer exercising a little self-denial to making the increased exertion necessary for their payment. But in nine instances out of ten the influence of the duty is of a compound description, infusing at one and the same time a greater spirit of industry and economy into the contributors. A taste for spirituous liquors, by the idleness and dissipation to which it leads, and the sacrifice of the immense sums expended in its gratification, is most injurious to the labouring classes. And hence the duties on such liquors are probably the best of any; for while they bring large sums into the public treasury, they help to repress vicious indulgences, improve public morals, and save the money of the poor.

Duties on necessaries neither unfair nor unjust.

But though it will, perhaps, be generally admitted that reasonable duties on spirits, tobacco, and such like articles, cannot be justly objected to, it may be contended, with some show of reason, that duties on necessaries, or on bread, butcher's meat, salt, tea, sugar, &c., are unjust and unfair, because of their being indispensable to the consumption of the poor as well as of the rich. The injury, however, which is done to the poor by reasonable taxes on necessaries, is much more apparent than real; for, as will be afterwards shown, wages, in the great majority of cases, are increased in proportion to the amount of such taxes. And it commonly also happens, that the quantity of an article used previously to its being burdened with a moderate duty, may be diminished, or something else be substituted in its stead, or the duty be defrayed by the exercise of greater economy or industry, without entailing any very serious privations on the consumers.

Without, however, insisting on these considerations, we deny that taxes on necessaries can be fairly objected to on the ground of their being unjust. They may, if carried to too great a height, be oppressive, and they may sometimes, perhaps, be inexpedient; but the charge of injustice is not one that can ever be truly made against them. Government has nothing to do with the means of the parties who buy taxed articles. It has done its duty when it has imposed equal and moderate taxes on the articles best suited to bear them. Providence has not been charged with injustice because the corn and other articles used indifferently by the poor and the rich, cost the one class as much as they cost the other; and when such is the case, how can it be pretended that governments, in laying equal duties on these articles, commit injustice? A rich man will of course pay taxes, and everything else, with less inconvenience than one who is poor. But is that any reason why he should be unfairly treated? or mulcted of a part of his fortune by being subjected to peculiarly high rates of taxation? Riches are an evidence of superior good conduct; for, in the vast majority of cases, they are the result either of their possessors having themselves been, or of their having succeeded to progenitors who were comparatively enterprising, industrious, and frugal. The distinction of rich and poor is not artificial. It originates in, and is a consequence of, differences in the character and economy of individuals. A government which should attempt to obliterate this uneradicable distinction by varying duties so as to increase their pressure on the more opulent classes, would be guilty of flagrant injustice. And would, by discouraging the exercise of those virtues which are most essential to the public welfare, do its best to sap the foundations and weaken the springs of national prosperity.

General Observations on Taxation.

Although, however, it be no valid objection to a large class of taxes that they are not proportioned to the means of the contributors, it may be laid down as a general practical rule that no tax, whether it be proportioned to their means or otherwise, can be a good tax unless it correspond pretty closely with the last three maxims of Smith. The great defect, for example, in the system of taxation in France under the old *regime*, did not consist so much in its magnitude, or in the vexatious manner in which it was collected, as in its inequality. Instead of the whole body of citizens contributing to the wants of the state in proportion to their respective abilities, the *privileged classes*, consisting of the nobility and clergy, or those who had the largest fortunes and engrossed every situation of power and emolument, were entirely exempted from all the most burdensome direct taxes, which were contrived so as to fall with undue severity on the other, or inferior classes. The latter were truly hewers of wood and drawers of water, a *misera contribuens plebs*. And it is no longer a question, that the disgust occasioned by the unequal pressure of the public burdens, the impatience of the feudal privileges of the nobility, and of the abuses connected with the venal, partial, and infamous administration of justice, were the leading causes of those revolutions which have made so much havoc amongst the ancient institutions of the continent.

Old French taxation inconsistent with the first maxim.

The system of taxation generally established in eastern countries has the defect of not corresponding with the second maxim of Smith. The amount of the contribution is fluctuating and arbitrary, not fixed and certain. In despotical countries, the various agents of government are despots in their peculiar spheres; and though the sum demanded by the sultan should be defined and ascertained, there are no limits to the extortion and rapacity of his agents. An individual who has paid the tax imposed by government, may be called upon to pay as much, or more, to the pacha of the province. The security of property is thus completely subverted. And the arbitrary nature of the public burdens is entirely destructive of that spirit of industry which might support and extend itself under a far greater weight of equable and well-defined taxes.[1]

Taxation of eastern countries inconsistent with the second maxim.

The establishment of the *warehousing* system, or the granting of liberty to the merchant, on payment of a moderate rent, to deposit imported goods in public warehouses, under the king's lock and his own, without being obliged to pay the duties until he find it convenient to withdraw the goods for consumption, has made an important branch of our taxation correspond very closely with the third maxim of Smith; that is, it has made a large class of duties be levied at the time and in the manner most convenient for the contributors. Previously to the act of the 43d of George

Warehousing system agrees with the third maxim.

[1] For a good account of the effects of the arbitrary nature of eastern taxation, see Volney, *Voyage en Syrie*, tom. ii., cap. xxxiii. xxxvii.

General Observations on Taxation.

III. cap. 132, establishing this system, the customs-duties on imported articles, which amount to an immense sum, had either to be paid at the moment when the goods were imported, or a *bond*, with sufficient security for their future payment, had to be given to the revenue officers. The hardship and inconvenience of an arrangement of this sort are obvious. Sureties were often difficult to be obtained; and the merchant, in order to raise funds to pay the duties, was frequently reduced to the ruinous necessity of selling his goods immediately on their arrival, when perhaps the market was already glutted. Neither was this its only injurious consequence. For the duties being payable at once, and not by degrees, as the goods were sold for consumption, their price was raised by the amount of the profit accruing on the capital required for their payment. Competition, too, was diminished, because of the greater command of funds required to carry on trade under such disadvantages; and a few rich individuals were thus, in great measure, enabled to monopolize the business of importing commodities charged with heavy duties. The old plan had, besides, an obvious tendency to discourage the carrying trade of the country, and to endanger the security of the revenue. For the necessity of paying import-duties even on those commodities which were destined for re-exportation, deprived us of all chance of ever becoming considerable as an *entrepôt*. It also prevented the importation of most foreign commodities, except those colonial products of which we had a monopoly, that were not likely to be speedily required for home consumption; at the same time that the difficulties attending the granting of a really equivalent drawback to the exporters of such as had paid the duty, opened a door for the commission of every species of fraud.

Sir R. Walpole's excise scheme.

Sir Robert Walpole appears to have had a very clear conception of the injurious operation of the old system; and it was the object of the famous *Excise Scheme*,[1] proposed by him in 1733, to make the importers of tobacco and wine deposit them in public warehouses, and to relieve them from the necessity of paying the duties chargeable on these articles till they withdrew them for home consumption.

Nothing can be clearer or more explicit than the statement made by Walpole, in vindication of his plan, when he submitted it to the House of Commons, and no doubt can now remain in the mind of any one, that its adoption would have been of the greatest advantage. But such and so powerful was the delusion generated in the public mind with respect to it, that its proposal nearly caused a rebellion. Most merchants had availed themselves of the facilities which the then customs' regulations afforded of defrauding the revenue; and they dexterously endeavoured to thwart the success of a scheme which would have given a serious check to such mal-practices, by making the public believe that it would be fatal to the commerce of the country. The efforts of the merchants were powerfully assisted by the spirit of party, which then ran very high. The opponents of the ministry, anxious for an opportunity to prejudice them in the public estimation, contended that the scheme was only the first step towards the introduction of such an universal system of excise as would be subversive alike of the well-being and liberty of the subject! In consequence of these artful misrepresentations, the most violent clamours were everywhere excited against the scheme. On one occasion the minister narrowly escaped falling a sacrifice to the fury of the mob, which beset all the avenues to the House of Commons, and after many violent and lengthened debates, the scheme was ultimately abandoned.

The disadvantages of the old plan, and the benefits to be derived from the establishment of the warehousing system, were very clearly pointed out by Dean Tucker in his *Essay on the Comparative Advantages and Disadvantages of Great Britain and France with respect to Trade*, published in 1750. But so lasting was the impression made by the violent opposition to Walpole's scheme, that this signal improvement—the greatest, perhaps, that has been made in our financial and commercial policy—was not adopted till 1803.

General Observations on Taxation.

Expense of collecting taxes.

The comparative facility and cheapness with which taxes may be collected should be particularly attended to in their selection. The nett produce of a tax, or its produce after the expenses of collection are deducted, being alone applicable to national purposes, taxes which cost a great deal to collect impose a heavy burden on the people, for the sake of a small advantage to government. And hence they should be contrived, as Smith has stated in his fourth maxim, so as to take out, and keep out, of the pockets of the people as little as possible above what they bring into the public treasury. Sully states, in his *Memoirs*, that the expense of collecting a nett revenue of *thirty* millions of livres in France in 1598 cost the enormous sum of 120,000,000; or, in other words, that of a sum of 150,000,000 taken from the people by means of taxation, only *thirty* millions found their way into the coffers of the treasury! Under the administration of M. Necker, a revenue of about 557,000,000 of livres was collected at an expense of fifty-eight millions, being about 10⅜ per cent.

The expense of collecting the public revenue of the United Kingdom, excluding the Post-Office, for the year ended 31st March 1857, amounted to L.4, 0s. 1½ per cent. on the gross produce. The portion raised in Ireland is collected at a much greater proportional expense than that raised in Britain. Most part of this excess of expense must be ascribed to the different situation of the two countries; but a good deal is owing to the more defective system of taxation which, till recently, was established in Ireland, and perhaps, also, to the greater corruption of the officers. The difference in the cost of collecting the post-office revenue of the two countries is the greatest.

Mode of collecting taxes.

Taxes may be collected by officers employed by government for that purpose; or government may let them *in farm* to individuals for a rent certain, giving to the lessees or their servants power to collect them. The question, which of these modes of collection should be adopted, depends on a variety of circumstances, and does not admit of any general solution. Where a tax is well defined, and may be collected without requiring any very minute inspection of the private concerns of individuals, it may generally be farmed with advantage. In such cases the proceedings of the farmers do not excite the prejudices of the contributors; and the greater skill and economy with which businesses are usually conducted by individuals who carry them on for their own behoof, would most likely enable the farmers to pay a larger sum to government on account of the tax, than it would have much chance of receiving from its own agents. But when a tax is not well defined, or requires a close examination of the affairs of individuals to assess it fairly, it should be collected by the servants of government. It is probable, indeed, that such tax might be more productive were it farmed; but this, though an important consideration, is not the only one to be attended to. All taxes which occasion any investigation into the private concerns of the contributors are necessarily unpopular; and this unpopularity will be sure to be greater when these investigations are conducted by parties who have a personal interest in prosecuting them with the greatest strictness, than when they are conducted by the

[1] The compulsory nature of the project was a mistake; had it been permissive merely (as is now the case), its beneficial influence would have been about equal, and the opposition, no doubt, a good deal less.

General Observations on Taxation.

agents of government, who in most cases derive none, and in all cases only a very slender benefit from the increased productiveness of the tax. The mass of the people would assuredly ascribe much of the hardship of such taxes to the vigilance and keenness of the farmers; and would be disposed to believe that a considerable portion of their produce went into their pockets, and that they were not only assessed to defray the charges of the state, but to add to the fortunes of a class who are universally disliked. We admit that these suspicions and complaints are in most cases destitute of foundation. The farmers in enforcing payment of a tax must proceed according to the provisions of the law imposing it; and if its pressure be unequal or severe, or the mode of its collection vexatious and troublesome, the fault lies with the government, and not with the farmers. But, however groundless, the prejudice against the latter is one which will always exist, and should be respected. Perhaps we overrate its influence; but we have little doubt that an income-tax of 5 or 6 per cent., let in farm, would be generally considered as more oppressive and vexatious than a tax of twice that amount collected in the ordinary way. Although, therefore, we cannot concur with Smith in his opinion that *all* taxes should be collected by the officers of government (p. 409), still less can we concur with Bentham, who has endeavoured to prove that farming is in every case the preferable mode of collection. (*Théorie des Peines et des Récompenses*, tome ii., p. 203.) Taxes on stamped paper, houses, windows, horses, carriages, &c., and perhaps also the customs-duties, might be advantageously collected by letting them to farmers; but any attempt to farm taxes on income, excise-duties, or taxes which require an examination of and interference with private affairs, would excite the most violent clamour and irritation, and could not be otherwise than pernicious.

Corvées.

The *corvée* system, or the compelling of individuals to execute public works by requisitions of labour, is one of the worst species of taxation. Those who get no pay for their labour, and are made to work against their will, waste their time and industry; and there is, besides, a very great loss incurred by the interruption of the regular pursuits of the labourers. When Turgot entered on his administration, he sent a circular-letter to the road-surveyors and engineers of the different provinces of France, ordering them to transmit estimates, framed on the most liberal scale, of the sums of money for which the usual repairs might be made on the old roads, and the ordinary number of new ones constructed. The aggregate of the different estimates showed that a money contribution of about *ten* millions of livres a year would suffice for the repair and construction of all the roads in the kingdom; whereas Turgot showed that the execution of these repairs and constructions by contributions of forced labour, or *corvées*, cost not less than *forty* millions, or four times as much as the other! (Say, *Traité d'Economie Politique*, tom. ii., p. 345.)

The method of repairing roads by contributions of labour instead of money was at one time general throughout Europe, and is still acted on in many countries. In Scotland the agricultural population of the country were compelled, by an act passed in 1669, to work *six* days each year at the public roads. This contribution was denominated statute-labour, and was commuted, in the early part of the reign of George III., for a tax on land, rated according to its valuation in the cess-books. This commutation has been productive of the greatest advantage. Previously to its taking place, our roads were, perhaps, the very worst, and they have since become among the very best in Europe.

PART II.

Direct Taxes.

DIRECT TAXES.

Direct taxes.

It is difficult, for the reasons stated in the previous section, to regard such taxes as are continuously paid out of capital as permanent sources of public income. Capital being the fund which maintains and assists those who are engaged in the great work of production, whatever tends to diminish its amount tends at the same time to diminish the means of employing and facilitating labour. And this being the direct and ordinary effect of taxes on capital, they should be regarded, like the treasure accumulated in the temple of Saturn at Rome,[1] as an extraordinary resource, to be used only in cases of the greatest emergency. The misapplication and destruction of the means of production which such taxes, provided they were carried to any considerable extent, could hardly fail to occasion, would not only defeat any attempt to render them permanent, but would, most likely, by impoverishing the contributors, make other taxes comparatively unproductive.

It is not from capital, therefore, but from revenue, that all permanent taxes should be derived. And as the revenue of all individuals not dependent on charity must be drawn from one or more of the three sources of rent, profit, or wages, it is plain that all taxes which do not fall on capital, must, however imposed, ultimately fall on one or other of these sources. Without further preface, therefore, we shall proceed to trace the incidence and effect of taxes laid *directly* on rent, profit, and wages. When we have ascertained the way in which they operate, it will be comparatively easy to investigate the effect of taxes meant to fall equally on the various sources of income.

SECT. I.—*Taxes on Rent.*[2]

Taxes on rent.

a. Taxes on the Rent of Land.—Adam Smith held that taxes on the rent of land, taking the term in its popular and broadest sense, fell wholly on the landlords. But this is an error. The sum paid to the landlords for rent properly so called—that is, for the use of the natural powers of the soil, might be entirely swept away by a tax, without their having it in their power to throw any portion of the burden on any one else; but in so far as the rent of land consists of the interest of capital expended on improvements or buildings, it could not be taken from the landlord by a tax on rent.

Impossibility of distinguishing between the sums paid for the use of the soil and for the capital expended upon it. A tax on rent properly so called would not raise prices, and would fall wholly on the landlords.

1. Practically it is impossible to separate the gross rent of land in an old-settled and highly improved country into its component parts, or to distinguish between the sums paid for the use of the soil and for the capital expended upon it. But supposing this separation to be effected, then, as the former portion, or that paid for the soil only, forms a surplus over and above the cost of production, it might be entirely carried off by a tax, without affecting any class other than the landlords. The heaviest tax on it would not raise the price of raw produce; since nothing can affect its price which does not affect the cost of its production. Now, the real rent of land is extrinsic to, and independent on, that cost, and cannot, indeed, have any existence until the cultivators have been fully indemnified for the expense incurred in bringing produce to market, including the ordinary rate of profit on the capital vested in buildings, fences, &c., and in seed, labour, and implements. The prices of all sorts of farm produce would, consequently, continue unaffected, though a tax were imposed absorbing all the real rent of land—that is, the sum paid for the soil only.

[1] See the description of this treasure in Lucan III., lin. 115–158, &c.

[2] Before perusing this section, the reader will do well to glance at the chapter on rent in the article POLITICAL ECONOMY in this work.

Direct Taxes.

Injustice and impolicy of taxes on the gross rent of land.

2. It would not, however, be possible for government, even if it were disposed to make the attempt, to appropriate, by means of direct taxes, the gross rent of the landlords, or the total sum paid them, as well for buildings, fences, drains, &c., as for the inherent powers of the soil. And in whatever degree the rent of land may consist of a return to, or interest upon, the capital laid out upon it, in that degree would a tax on it raise the price of raw produce, and fall eventually on the public.

Payments made to landlords for the use of the natural capacities or powers of the soil, or for unimproved land, depend entirely on their being its owners; whereas such further payments as may be made them, for or on account of improvements upon the land, do not depend on that circumstance, but on their being producers—that is, on their having capital employed in agriculture. And it is easy to see that such taxes as affect the profits of this capital must necessarily also affect the price of farm produce. Suppose, for example, that the gross rental of a farm is L.500 a year, a half, or L.250 thereof, being really paid as interest of capital laid out on improvements. If, in such case, a tax of 10 per cent. were laid on rent, only a half, or L.25, of this tax would be permanently paid by the landlord. In the first instance, no doubt, the whole L.50 would fall upon him; but L.25 of this payment would, it is plain, be a deduction from the profits of the capital vested in improvements, and not from rent properly so called. And landlords being thus placed in a comparatively unfavourable situation, no more capital would be expended upon the soil, until the price of corn, and other raw produce had been raised, by the gradual diminution of its quantity, or the increase of demand, so as to place them in the same situation as other producers—that is, until they obtained the ordinary rate of profit from the capital laid out on improvements.

It appears, therefore, that although it might be possible to draw into the coffers of the treasury, by an exclusive tax, all that portion of the rent of land which is paid for the use of the original powers of the soil, the other portion, or that which is paid on account of improvements made on it, would not be permanently affected by an exclusive tax; and could, speaking generally, only be taxed to the same extent that the profits of capital employed in other industrial departments are taxed.

In a practical point of view, taxes on the rent of land are among the most unjust and impolitic that can be imagined. It is, as already stated, quite impossible to separate rent into its elements, or to say how much is paid for the soil and how much for improvements. No two agriculturists ever arrive, in any case of this kind, unless by accident, at the same conclusion; and the best judges affirm that, generally speaking, the distinction is utterly impracticable. When, therefore, a tax is laid on rent, it is necessarily proportioned to its gross amount, or to the total sum paid to the landlords, without regard to the sources whence it is derived. But any such tax has always been, and will unavoidably continue to be, a formidable barrier to improvements. For the return paid to a landlord for capital expended on the soil being included in the rent, a tax on it discourages or prevents all fresh outlays of capital, lest they should occasion a corresponding increase of the tax. The injustice of this impost is not less obvious. Two landlords are each in the receipt of an equal sum, say L.1000 a year; the estate of one consisting of naturally fine land, on which but little capital has been laid out; and that of the other of very inferior land, on which a great deal of capital has been expended. A tax on the former merely abstracts a portion of what is, in fact, the spontaneous gift of nature, and costs nothing; whereas a tax on the latter abstracts a portion of what has been mainly produced by the labour and industry of man. Hence the injustice and oppressiveness of taxes on rent. We doubt, indeed, whether it be possible to suggest any tax more decidedly at variance with every sound principle, or more adverse to the progress of improvement.

Direct Taxes.

Effects that would follow from government reserving to itself the property of land.

The circumstance of rent unavoidably arising in the progress of society, has inclined some speculative individuals to think that it would be good policy for the governments of countries like the United States, which possess large tracts of fertile and unappropriated land, to retain it in property, letting it by public auction, in such portions, and for such number of years, as might be deemed advisable. This, however, is a very questionable position. The probability seems to be, that it would hinder the undertaking of many of those expensive improvements in drainage, and in the construction of houses, roads, and bridges, the formation of plantations, &c., necessary to the full development of the productive energies of the soil, that are entered into by individuals who have the absolute property of the land, and can bequeath it to their successors. It is true that these consequences might be, in part at least, obviated by increasing the length of the leases, so as to encourage a liberal outlay of capital. But, on the whole, there can be little, if any, doubt, that a right of private property in land is the best stimulus to its improvement. And it may further be observed, that where such right is established, the landlords prescribe and enforce such conditions for the management of the land, as, speaking generally, are effectual to hinder it from being worn out and impoverished previously to the expiration of leases. But it is easy to see that no such power of regulation and superintendence could be safely intrusted to government officers. And owing to the disinclination to make costly improvements on lands that are not one's own, and the deterioration of the land, originating in the want of the superintendence of landlords, there can be little question that a country would lose incomparably more in respect of wealth by adopting the project referred to than it would gain; at the same time that it would exert a most unfavourable influence over the conduct and character of the population.

And apart from these considerations, it is, at all events, clear that, wherever a right of private property in land is established, any attempt to impose peculiar taxes on its owners would subvert every principle of justice. All classes are bound to contribute, in proportion to their means, to the wants of the state; but the sources whence these means are derived are immaterial.

Eastern land-taxes.

The principal part of the revenues of India, and of all the great monarchies of Asia, has, in all ages, been derived from the soil. The land has been mostly held by the immediate cultivators, generally in small portions, with a perpetual and transferable title; but under the obligation to pay annually the government demand, which might be increased at the pleasure of the sovereign, the real proprietor of the soil. And, as might have been anticipated, this demand has everywhere been carried to an extravagant height, and is the principal cause of the poverty and barbarism in which the countries referred to have been and continue to be involved.[1]

Disastrous influence of Indian land-tax.

Lord Cornwallis, when Governor-General of India, endeavoured to obviate some of the defects of this system by making the land of Bengal private property. But though the principle of the measure which he introduced was unexceptionable, the perpetual payment or quit rent which he imposed on the land was a great deal too heavy, and the interests of the ryots or cultivators were sacrificed in an attempt

[1] See the work of Goguet, *De l'Origine des Loix*, &c., I., liv. § 4; and the Appendix ii. to the treatise *On Taxation* by the author of this article.

Direct Taxes.

to introduce a body of large proprietors.[1] Since this epoch attempts have been made in different parts of India to improve the methods of letting land to the cultivators, without, however, relinquishing its property. Some of these have succeeded better than others; but they all labour under the incurable defect of requiring too much interference and *surveillance* on the part of the agents of government, at the same time that the rents are everywhere much greater than they ought to be. And hence there is little, or rather no prospect of any real improvement being effected in India without an entire change in the present system of holding land. The grand object should be to give the ryots or cultivators a right of property in their holdings, and to absolve them from all tutelage or dependence on the collectors or other functionaries of government. But the difficulty is to reconcile a policy of this sort with the maintenance of a sufficient amount of revenue. Probably, on the whole, the better plan would be to assess a low, fixed, perpetual rent on the land; and then to sell it in convenient portions, as opportunities offered, to private parties. We have been assured, by gentlemen well acquainted with India, that a plan of this sort might be adopted without any obstruction that might not be easily surmounted. It was approved by the late Mountstuart Elphinstone,[2] than whom none was better qualified to give an opinion on such a point. And were it once introduced and acted upon, it would do ten times more than anything else that appears practicable to promote the improvement of India, and the wellbeing of the population.

Land-taxes in England.

The scutages on knights' fees, the assessment of hydage on other lands, and the subsidies chargeable on the proprietors of estates, so often referred to in the history of England were, to all intents and purposes land-taxes. (Blackstone, i. p. 312.) But the existing land-tax has supplanted all those more ancient assessments. This tax was first imposed in 1693, a rude valuation of the lands in the kingdom having been made in the previous year. It resulted from it that a tax of one shilling on the pound of the ascertained rental afforded an annual clear revenue of L.500,000. No change has since been made in the valuation of 1692. The tax, which was at first an annual one, has been generally as high as four shillings a pound of the valued rent. In 1798 it was made perpetual at that rate, leave being, at the same time, given to the proprietors to redeem it.

The land-tax was very unequal at its first imposition; for such proprietors as were friendly to the revolutionary establishment generally returned their estates at a much higher value than those attached to the Stewarts. The different degrees of improvement that have since taken place in the various districts of the country, have in some instances tended to correct the inequalities in the original imposition of the tax, and in others to increase them.

Taxes on the rent of houses.

b. Taxes on the Rent of Houses.—The principal part of the rent of houses usually consists of the return to the capital laid out in their construction, or, as it is more commonly termed, of *building* rent, a small part only, except in comparatively advantageous situations, being *ground* rent, or rent payable for the soil on which they are erected. It is evident, therefore, from the principles already established, supposing the supply of houses could be as easily diminished and increased as the supply of farm produce, that a tax on their rents would fall on the occupiers and ground landlords, in the proportion that the return to the capital laid out on them bore to the rent of the land on which they stood. But as the supply of houses is not susceptible of speedy diminution, a longer or shorter period would elapse, dependent principally on the growth of population and the demand for houses, before the builders would be able to relieve themselves of a tax on them. Houses, however, though slowly, are yet certainly perishable; and as no more of them would be built after they had been taxed, until the increasing demand had raised their rents so as to indemnify the builders for the tax, and to elevate their profits to the common level, it is clear that in the end the tax would fall wholly on the occupiers and ground-landlords in the proportions already mentioned.

Direct Taxes.

Inasmuch as a tax on houses may in most cases be readily and fairly assessed, and as it cannot be evaded, and does not in anywise interfere with the plans of the builder, it would seem, while kept within due bounds, to have most part of the qualities that are desirable in a tax. It is certainly in all respects preferable to a duty on windows, which, however, has sometimes been substituted in its stead. The builders and proprietors of houses subject to the latter endeavour to reduce its amount by restricting the number of windows, though in doing so they seldom fail to make the houses gloomy, uncomfortable, and detrimental to the health of the occupiers. In Great Britain the existing house-tax affects those houses only that rent for L.20 a year and upwards. But there is no good or even plausible reason for this restriction. The tax should undoubtedly extend to all houses; or if any exceptions be made, they should be confined to houses worth under L.4 or L.5 a year.

Sect. II.—*Taxes on Profits.*

Taxes on profits.

A tax proportioned to the nett profits realized in *all* departments of industry, provided it could be imposed, would fall wholly on profits.

An equal tax on all profits would fall wholly on profits.

Such a tax would affect all capitalists to precisely the same extent. When 5 or 10 per cent. was laid on the profits of farmers or manufacturers, an equal 5 or 10 per cent. would be laid on those of merchants, ship-owners, and other employers of capital. It is evident in such case, that no individual could hope to evade the burden of the tax by changing his business; and it would not, therefore, occasion any transfer of capital from one employment to another. Neither would it occasion any variation in the supply and demand of commodities, or in their money prices. For, as the tax does not fall on capital, but on profits, the means of producing would not be impaired by its imposition; the means of purchasing possessed by those who live on profits would indeed be diminished; but as the means of purchasing possessed by the government and its agents who receive the tax would be proportionally augmented, the aggregate demand of the society would continue the same; and hence, as the tax would neither lessen the capital of the country nor the power to purchase its produce, it is obvious it would not occasion any variation in the prices of commodities.

The immediate effect of an equal and universal tax on profits would therefore be to sink them in the same proportion. And as the power to accumulate capital, and

---

[1] This error appears to have been very recently repeated in Oude.

[2] "As regards Indian measures, he advocated in stronger and more decisive language than was customary with him the gradual liberation of all land from government rent tenure, and the conversion of all into fee-simple; as far as government was concerned, he thought all lands belonging to government, whether under cultivation or not, should be sold in fee. He thought that taxation by rent, though originally the only practical resource—a necessity adopted by us at first as the only prevailing method—was in principle wrong, and became inappropriate as the country advanced in prosperity,—that the system stagnated the sources of wealth and the working of capital. He conceived that a cautious but definite course should be pursued of abolishing the relation of landlord and tenants between the Indian Government and its subjects, and that other sources of taxation should be gradually resorted to." (Letter in *The Times*, December, 1859.)

Direct Taxes.

consequently to feed and employ additional people, must ever be in direct proportion to the rate of profit, it follows that the tendency, and, when they are carried to such a height as to prevent their being balanced by increased exertion and economy, the ultimate and necessary effect of such taxes, is to check the accumulation of capital and the progress of population.

Profits cannot be equally assessed.

But it is material to bear in mind, that these conclusions are true only on the supposition that the tax is assessed so as to affect all profits to precisely the same extent. Practically, and in fact, however, this is an impossible condition. There are no means whatever by which to measure the rate of profit in different businesses, or even in any single business. Generally, indeed, it can only be guessed at, even by those engaged in carrying them on; and were an attempt made to tax profits, the great majority of individuals would underrate their amount, and, in the far greater number of businesses, it would be quite impossible for government officers to come to anything like an accurate conclusion as to their magnitude. It would, in consequence, be necessary to adopt some general rules for assessing the tax; and the vice of these is, that, being bottomed on supposed averages, they invariably make those engaged in unsuccessful speculations pay a great deal too much, while those engaged in peculiarly successful speculations pay only a comparatively small portion of what they should pay were they fairly assessed. In truth and reality, profits never have been and never can be taxed in proportion to their amount. And though it be important to know how a tax on profits would operate were it equally imposed, it must be kept in mind that this is altogether impracticable, and that the supposition is made merely to illustrate a principle.

A tax on the profits of a particular class of capitalists would raise prices and fall on the consumers.

A tax laid only on the profits of a particular business would have a different effect: it would raise prices, and would not, therefore, fall on the capitalists, except in as far as they were themselves consumers of their own produce. Suppose, for example, that an exclusive tax of 10 per cent. is laid on the profits of the shoemaker. The slightest consideration will show that such tax must make an equivalent addition to the price of shoes; for, if it did not, the shoemakers would gain less profit than those who carry on other businesses, and they would, in consequence, gradually withdraw from their employment until, through the diminished supply of shoes, their price had risen so as to yield them the average rate of profits, exclusive of the tax. For the same reason, exclusive taxes on the profits of hatters, clothiers, farmers, &c., would make proportional additions to the prices of hats, cloth, agricultural produce, &c. In these cases the producers have the power to raise prices, and consequently to throw the burden of the tax on the consumers; because they may withdraw from businesses in which profits are taxed, and engage in those in which they are not taxed. But were the profits of all sorts of businesses equally taxed, the producers would be deprived of this resource, and would have no means of raising prices or evading the tax.

An equal and general tax on profits would not affect rent.

It is easy to see, from the principles already established (provided they could be carried out in practice, which is rarely the case), that an equal tax on the profits of agricultural and other capital would not occasion any diminution of rent. When farmers are taxed equally with other producers, they have no motive to withdraw capital from the land, and no variation will take place in the price of corn; nor, as rent consists in the excess of the produce obtained by the capital first applied to the land over that which is obtained by the capital last applied, would it be affected by such tax. But if the tax, instead of being general and equal, were laid exclusively on the profits of the farmer, it would cause, provided foreign corn were excluded, an increase of rent. Rent, as has been seen in the preceding section, never enters into the cost of producing that portion of the required supply of raw produce which is raised by the agency of the capital last laid out on the land. It is impossible, therefore, that its producers could indemnify themselves for any burdens laid on them by making an equivalent deduction from rent. And hence, when a tax is laid exclusively on the profits of agricultural capital, the price of raw produce would in the end sustain a corresponding rise; for in the event of its not rising, the producers of that portion which pays no rent would abandon their business, and the necessary supplies would not be obtained. Inasmuch, however, as that rise of price which is required, after a tax is imposed on profits, to remunerate those who raise corn that pays no rent, extends to all varieties of corn, however produced, it necessarily raises rents. Thus, on the supposition that *five* equal capitals applied to soils of various degrees of fertility, respectively yield 100, 90, 80, 70, and 60 quarters, their *corn* rents would be 40, 30, 20, and 10 quarters; and if the price required to remunerate the cultivators of the *fifth* and worst quality of land, which pays no rent, were L.2 a quarter, the *money* rent of the *first* quality would be L.80, of the *second* L.60, of the *third*, L.40, and so on. Suppose, now, that an exclusive tax is laid on the profits of agricultural capital, and that, to remunerate the cultivators of the worst land, the price rises from L.2 to L.2, 10s. a quarter, it is plain the rent of the *first* quality of land would be raised to L.100, the second to L.75, the third to L.50, and so on; being an increase of L.20 on the rent of the *first*, of L.15 on the rent of the *second*, of L.10 on the *third*, &c.

Direct Taxes.

A tax on the profits of the farmer only would raise rent.

This is a principle to which considerable importance has been attached. "That the profits of the farmer," says Ricardo, "only should be taxed, and not the profits of any other capitalist, would be highly beneficial to the landlords. It would, in fact, be a tax on the consumers of raw produce, partly for the benefit of the state, and partly for the benefit of the landlords." (*Principles of Political Economy*, 3d edit. p. 241.)

Ricardo should, however, have added, that this statement is not true even in theory, unless foreign corn be excluded, or admitted under a duty equal to or exceeding the amount of the tax on the profits of the farmers. If foreign corn were freely admitted, or burdened with a less amount of duty than is laid on the agriculturists, it would follow, inasmuch as the market is in part supplied by parties not subject to the tax, or to an equivalent impost, that prices would not rise in proportion to its amount. Under these circumstances, the occupiers of the poorer land would inevitably be driven from their business, and rents would be in consequence proportionally reduced. And hence, in the event of a peculiar tax being imposed on the land, it is necessary, if we do justice to all parties, that an equivalent duty be laid on the importation of foreign agricultural produce.

These, however, being mere theoretical conclusions, are much modified in practice. Thus, it is evident, supposing the insuperable obstacles in the way of fairly assessing the profits of the farmers to be overcome, that the influence of a tax on them would not be nullified, or even materially affected by a duty on imported corn. The operation of the latter is indirect, remote, and in some measure doubtful; whereas the operation of the former is direct, immediate, and certain. And the desire to escape the pecuniary payment which it involves never fails, by generating an indisposition to undertake improvements, to be prejudicial alike to the landlords and the public. Those who, in matters of this sort, neglect or overlook these and similar considerations, may arrive at conclusions which, though correct enough under the assumed circumstances, are not really, in one case in ten, of the smallest value in a practical point of view.

Direct Taxes.

Taille, account of the.

The *taille*, such as it subsisted in France at the epoch of the Revolution, was intended to be a tax on the profits of the farmer. But the difficulties in the way of estimating these from the amount of rent, or of the produce that had been raised, are too obvious to require being pointed out; and to avoid them, the French authorities were accustomed to resort to a different, and, if possible, a still more objectionable criterion, that is, to the amount of the capital or stock employed by the farmers. It is, however, all but needless to add, that it is practically impossible to ascertain, in one case in a hundred, the amount of such stock or capital with anything like precision. And as the decision really depended on the judgment or caprice of the assessors, they could at pleasure increase or diminish the burden of the tax. And besides the inequality, and consequent injustice, of the assessment, it tempted the farmers to counterfeit poverty, even when they were not poor; to employ the smallest possible quantity of capital; and to abstain from making any considerable or expensive improvement. The *taille* was also injurious in another respect; for, as it did not affect nobles who farmed their own lands, but fell exclusively on those who rented lands of another, or who possessed lands held by a base tenure, it was considered as a degrading tax, and as a mark of the ignoble, or rather servile, condition of those by whom it was paid. All who made anything by farming were thus rendered anxious to withdraw from so degraded a business; while rich merchants and capitalists were prevented from becoming tenants. Not only, therefore, did the *taille* hinder the greater part of the capital generated on the land from being laid out on it, but it turned from it all the capital that had been accumulated in other employments. It is very difficult to suppose that any tax could have been devised better calculated to retain agriculture in a rude and infant state, and to extinguish all emulation and enterprise among farmers. And considering the long period to which France was subjected to this tax, our wonder is, not that her agriculture was in a very backward and depressed condition at the Revolution, but that it was so far advanced as it really was.[1]

Contribution foncière.

The present French land-tax—*contribution foncière*—equally affects all lands, however occupied. It amounts, according to the best authorities, to from about a *seventh* to a *fifth* part of the *nett produce* of the land—that is, of its produce, exclusive of the expenses of cultivation, but inclusive of rent. It is assessed with as much fairness as possible, and is moderate compared with the various charges with which landed property is burdened in most other countries. No doubt it is a very great improvement on the old system; but its injurious influence is, notwithstanding, strongly felt, and is dwelt upon by all writers on the agriculture of France.

On the whole, taxes on land, whether proportioned to its rent or its produce, are about the most impolitic that can be imagined. It may, and indeed frequently happens in rude states of society, or in countries where the arts are little advanced, or where the raising of raw produce forms the principal business, that land-taxes are the only or principal available sources of income. But wherever they are not the result of a low state of civilization, or of imperative circumstances, as in India and other eastern countries, ancient Rome, &c., they bear unquestionable evidence of the ignorance and short-sightedness of those by whom they have been imposed. They cannot be fairly assessed; and though this preliminary difficulty were (as it never will be) got over, the desire to escape or elude their pressure, and the practices to which it leads, are such as to render them in the last degree injurious. There are, in truth, but very few cases in which direct taxes, whether on fixed property or anything else, should be resorted to. They rarely fail to obstruct improvement, to promote fraud, and to retain the population in the barbarism in which they most commonly originate.

Direct Taxes.

Sect. III.—*Taxes on Wages.*

Taxes on wages.

The ordinary effect of taxes on wages, or on the commodities necessary for the subsistence of the labourer, is to cause a corresponding increase of wages.

In every discussion respecting the effect of taxes on wages, or on the necessaries consumed by the labourer, it is of the greatest importance to distinguish between the *natural* or *necessary* rate of wages; that is, between the rate required to enable the labourers to subsist and continue their race, and the *market* rate, or the rate paid them at any particular period.

Natural price of labour.

The natural or necessary price of labour, like that of everything else which may be indefinitely increased or diminished, is determined by the cost of its production. The capacity of the labourer to support himself, and to rear as many children as may be required to keep up the supply of labourers, does not, it is plain, depend on the amount of money he receives as wages, but on the quantity of food, necessaries, and conveniences essential to his support which that money will exchange for or buy. The natural rate of wages depends, in fact, on the cost of the food, and other necessaries, required for the maintenance of the labourer. A rise in the market rate of wages does not always coincide with a rise in the price of necessaries; but they can seldom be far separated. Whatever may be the cost of the latter, work-people must always receive a quantity sufficient to enable them to support themselves and continue their race. If wages fell below this necessary level, they would be left destitute; there would, in consequence, be a rapid diminution of their numbers, which would necessarily raise wages; and if, on the other hand, wages were to rise considerably above this necessary level, a proportional stimulus would be given to population, and the increase of hands would, in the long run, lower wages.

Agreement of the market rate of wages with the natural rate.

The opinion of those who contend that the rate of wages does not depend on the cost of the subsistence of the labourers, but on the demand for their services compared with their numbers, has obviously originated in their confounding the principles which determine the market price of labour, at particular periods, with those which determine its natural or necessary price. It is undoubtedly true, that the market price of labour at any specified term depends on the state of the supply as compared with the demand; but it is easy to see that the supply would not, and, indeed, could not, be continuously brought to market unless the rate of wages were such as sufficed to maintain and bring up labourers—that is, if we may so speak, unless the cost of their production were paid. From whatever point of the political compass we may set out, this is the principle to which we must always come at last. To illustrate its operation, suppose that, owing to a scarcity, the price of the quartern loaf rises to four or five shillings: it is plain, inasmuch as the same number of labourers would be seeking for employment after the rise as before, and as a scarcity would not increase the demand for labour, that wages would not be advanced; and the labourers being, in consequence, forced to economise, the rise of price would lessen consumption, and distribute the pressure equally throughout the year. But suppose that the rise, instead of being occasioned by a deficient crop, has been occasioned by an increased difficulty of production, or by

[1] For a farther account of the *taille*, the reader is referred to Forbonnais, *Recherches sur les Finances de France*, tom. i., p. 107; *Wealth of Nations*, p. 385; and the treatise *On Taxation* by the author of this article, 2d ed., pp. 77–88.

Direct Taxes.

a tax, and that it will be permanent, the question is, will wages continue at their former rate, or will they rise? And in this case it is all but certain that they will rise: for the comforts of all classes of labourers would be greatly impaired by the rise of prices, and those who, previously to its taking place, could barely subsist, would be reduced to a state of destitution, or rather, we should say, of absolute famine. Under such circumstances, an increase of mortality could hardly fail to take place; while the greater difficulty of providing subsistence would interpose a powerful check to the formation of matrimonial connections and the increase of population. By these means, therefore, the amount of the population, or the ratio of its increase, or both, would in all likelihood be diminished; and this diminution would continue till, owing to the smaller supply of labour in the market, wages were raised to their natural rate; that is, as Adam Smith has defined it, to such a rate as would enable the labourers to obtain "not only the commodities which are indispensably necessary for the support of life, but whatever the custom of the country renders it indecent for creditable people, even of the lowest order, to be without."

Variations in the natural rate of wages.

If a specific quantity of certain articles were necessary to the subsistence of the labourers, it would directly follow that the rate of wages could not be reduced for any considerable period below what would procure these articles. But there is no such absolute standard of natural wages. Their amount depends in great measure on custom and habit. The articles considered as necessaries are perpetually changing. The labourers of Hindostan principally subsist on rice, those of Ireland on potatoes, and those of England on bread and beef. In one country it is discreditable for the lower classes to be destitute of comfortable clothing, and of shoes and stockings, while in others shoes and stockings are looked upon as luxuries to be used only by the rich. In many provinces of France and Spain a certain allowance of wine is considered indispensable; and in England the labouring class entertain nearly the same opinion with respect to beer and porter. Nor have the habits of the people, and the standard by which the rate of wages has been regulated at different periods in the same countries, been less fluctuating and various. The articles which custom and habit render necessary for the comfortable subsistence of the English and Scottish labourers of the present day, are as widely different from those which were judged necessaries by their ancestors in the reigns of Elizabeth, James I., and Charles I., as they are from those which form the ordinary subsistence of the labourers of France and Spain. The standard of wages has happily been raised, and the poor have been taught to form much more elevated notions respecting the quantity and the species of the articles which it would be discreditable for them to be without.

Supply of labour not speedily accommodated to variations in the rate of wages.

The natural or ordinary rate of wages is not, therefore, a fixed and unvarying quantity; and though it be strictly true that the market rate of wages can never, when reference is made to periods of considerable duration, be sunk below its contemporary natural rate, it is no less true that the one has a tendency to rise when the other rises, and conversely. The reason is, that the supply of labour can neither be speedily increased when wages rise, nor speedily diminished when they fall; and it is on this circumstance that the powerful influence which fluctuations in the market rate of wages have over the condition of the labouring classes principally depends. If the supply of labour were suddenly increased when wages rise, that rise would be of little or no advantage to the existing labourers. It would increase their number, but it would not enable them to mount in the scale of society, or to obtain a greater command of necessaries and conveniences. And, on the other hand, if the supply of labour were suddenly diminished when wages fall, that fall would merely lessen the number of labourers, without having any tendency to lower the habits or the condition of those who survived. But in the actual state of things no rise of wages can be countervailed by an increased supply of workmen coming into the market until some sixteen or eighteen years after it has taken place; for there are few branches of industry in which an active and skilful labourer can be bred in a shorter period. During all this interval, therefore, the labourer is placed in an improved situation. He has a greater supply of wholesome and nutritious food; he has better clothes and a better habitation; he is rendered more attentive to cleanliness; and as he rises higher in the scale of society, he learns to use more prudence and circumspection in forming matrimonial connections. In short, his opinions respecting what is necessary for his decent and comfortable subsistence are raised, and the natural rate of wages is proportionally augmented.

Direct Taxes.

Advantages of a rise of wages.

Disadvantages of a fall of wages.

But it is equally impossible rapidly to diminish the number of labourers when wages fall. Such diminution cannot, as already stated, be effected otherwise than by the operation of increased mortality, or by a decrease in the number of births, or both. But unless the fall were sudden and heavy, it would require a considerable period to render the effects of an increase of mortality very apparent; and it is so difficult to change the habits of a people, that, though the demand for labour were to decline, it would, notwithstanding, continue for a while to flow into the market with nearly the same momentum as before. Nor would the proportion of births to the population be materially diminished, until the misery occasioned by the restricted demand on the one hand, and the undiminished supply on the other, had been generally and widely felt. But if the country, instead of being stationary, were increasing in wealth and population, the result would be different, and a fall of wages would then be obviated with comparatively little inconvenience to the labourer.

In whatever way, therefore, wages may be restored to their natural level, when the market rate declines, whether it be by an increase of demand, by an increase of industry, or by a decrease in the number of births, it can never be the work of an instant. More or less time is always required, in which to allow the new circumstances to operate, and the new habits to be formed. And there is, in consequence, an obvious risk, if the fall of wages be considerable, lest the opinions of the labouring class, in regard to their condition and place in society, should be lowered in the interval. When wages are reduced, the poor are obliged to economise; and should the coarse and scanty fare, which may in the first instance be forced upon them by necessity, become congenial from habit, there would be no longer a motive to occasion increased exertion, or the exercise of a greater degree of moral restraint, so that the natural rate of wages would be reduced. This, however, is seldom or never the case in improved and prosperous communities. In these the labourers are always in the enjoyment of various conveniences and luxuries; and they generally contrive, by refraining from some of them and becoming more industrious, to meet and defeat a fall of wages, or to hinder it from having any permanently disastrous influence over their condition.

It is true, indeed, as is stated by Malthus, that to whatever extent wages fall, the labourers have the means, in every state of society, of raising them in the end, to their former, or even to a higher level; for if they understock the labour market, wages will continue high, notwithstanding the means of employment should be diminished; while, if they overstock that market, wages will be low, how much soever those means may be increased. But a mechanical theorem of this sort is more easily laid down than acted upon. It is very difficult to change the

Direct Taxes.

habits of a people with respect to marriage, and material alterations in this respect are seldom brought about except by slow degrees. Prudential considerations always operate with the greatest force on the middle and upper classes. Wherever, indeed, the bulk of the people are depressed and ignorant, these considerations have little or no practical effect. But in countries like England, Scotland, Holland, and the United States, where they are for the most part well instructed and well off, they exert a powerful influence over all but the very dregs of the population.

Taxes on the articles consumed by the labourers rarely injurious.

These considerations are of paramount importance in estimating the influence of taxes on tea, sugar, tobacco, and other articles consumed by the labourer. That they are paid by him, in the first instance, is obvious; but the question is, are they not really reimbursed to him, partly by increased exertion and economy, and partly by a rise of wages? And that such is really the case, is, we think, sufficiently evident. Sugar and tea having become necessaries, and the taste for tobacco, and, we regret to add, spirits, being generally diffused, an increase in their price, occasioned by a tax, operates in the same way, though not perhaps to so great an extent, as an increase in the price of bread, of houses, or of clothing; that is, it tends to make the labourers more thrifty, and less improvident in entering into matrimonial connections; and in this way it contributes to improve their habits, and to raise wages. Hence, it is found, that their condition is rarely, if ever, changed for the worse by the imposition of reasonable duties on the articles in greatest demand amongst them. The duties referred to above have been largely increased in Great Britain since the American war, and yet the condition of the poor has been greatly improved in the interval. And though other causes have co-operated to bring about this desirable result, there can be no doubt that their improved circumstances and conduct are, to some considerable extent, owing to the greater economy and prudence inspired by the increase of taxation.

The like results are seen in other countries. The lower classes are extremely well off in Holland, and yet they are apparently very heavily burdened with taxes. We say *apparently*, for, owing to the circumstances now explained, their habits have been improved, and their wages raised, through the agency of these taxes.

The truth of these statements will appear still more obvious, if we compare the condition of the lower classes in England and Holland with their condition in the great continental monarchies, in which the revenue is principally derived from direct taxes on lands, houses, trades, &c. Their superior wellbeing in the former is a fact not to be denied. They are better lodged, better clothed, and better fed; and though they work harder, that has no injurious influence over their health. On the contrary, the chances of life in England are at least 33⅓ per cent. greater than in the countries referred to; and such, but for its humidity, would also be the case in Holland.

No doubt, therefore, there is a vast deal of fallacy in the statements so frequently put forth in regard to the operation of taxes laid on the articles principally consumed by the working classes. Their mischievous influence has been grossly exaggerated; sometimes through ignorance, and sometimes, and more frequently perhaps, from less excusable motives. In the great majority of cases, these taxes, provided they are kept within reasonable limits, and judiciously assessed, are countervailed, or more, by a corresponding rise of wages, or by increased industry and economy, or both. And instead of being injured, the condition of the labourer has, in truth, been materially improved through their instrumentality.

The want of providence, and the dissipated habits that are, unhappily, so very widely spread, are the real sources of the destitution and misery that prevail among the poor. It is mere driveling, or worse, to ascribe them to taxes on gin, tobacco, or beer, or even to those on tea and sugar.

Direct Taxes.

Adam Smith's opinions in regard to tax on wages.

Adam Smith has said, that "while the demand for labour and the price of provisions *remain the same*, a direct tax on the wages of labour can have no other effect than to raise them somewhat higher than the tax" (p. 390). And he further supposes, that to whatever extent the wages of manufacturing labour may be increased by a tax, the burden will not fall on the manufacturers or merchants, but on the consumers, by an increase in the price of commodities; and that to whatever extent the tax may raise the wages of agricultural labour, it will not really fall on the farmer or the consumer, but on the landlord.

None of these conclusions are correct. The immediate effect of a direct tax on wages does not depend on the circumstance of the demand for labour continuing stationary, but on the mode in which the produce of the tax is expended. And the principles established in the article POLITICAL ECONOMY show, that when wages are raised, either through their being taxed, or otherwise, that rise does not tend to raise the price of commodities or lower rent, but forms a deduction from that portion of the produce of industry that would otherwise go to the capitalists and other employers of labour.

Operation of a tax on wages.

To illustrate its operation, suppose that a tax of 10 per cent. is imposed on wages, or that all labourers are made to hand over 10 per cent. of their earnings to collectors appointed by government. Since no part of this tax is taken from the capitalists, it cannot in any way diminish their means of employing labour; and its effect will entirely depend on the mode in which it is expended. If the produce of the tax be laid out on additional troops or sailors, it is easy to see that it could not be productive of any immediate injury to the labourer; for were such the case, the agents of government would enter the market for labour with means of purchasing, derived, not from the capitalists, but from the labourers themselves; and in consequence of this greater competition, wages would be raised in exact proportion to the additional means in the hands of government, or, in other words, to the amount of the tax. An example will render this apparent. Suppose that the work-people in a particular country receive as wages L.2,000,000 a year; and suppose further that government wish to increase the military force, and that to get the means of doing so, a tax of 10 per cent., or of L.200,000, is laid on wages. The consequence will be, that the capitalists will still come into the market for labour with the L.2,000,000 employed by them in the payment of wages, while the agents of government will also come into the same market with the L.200,000 derived from the tax; so that, between the two, wages will be raised in proportion to the tax.

But if the tax were not laid out, as has been supposed, in paying the wages of additional troops, but in increasing the pay of those already embodied, or of the other functionaries employed by government, its effect would be different. In this case there would be no additional demand for labour. The individuals receiving the tax would, indeed, have a greater demand for the produce of labour; but their greater demand being merely equivalent to the diminished demand of the labourers by whom the tax had been paid, would make no real addition to the total demand of the country. And thus it appears, that when the produce of a direct tax on wages is employed to hire fresh individuals for the service of government, it raises, by taking so much labour out of the market, the price of the remainder in proportion to its amount. But when its produce is employed to increase the wages of public functionaries or troops already embodied, the quan-

Direct Taxes.

tity of labour in the market is not lessened, and it must in consequence fall, in the first instance, wholly on the labourers. But, even in this last case, it is most probable that a tax on wages would not continue to be entirely or principally paid by them. Such tax, when first imposed, could hardly fail, by lessening the comforts, and perhaps also the necessaries, of the labourer, to stimulate economy and check the progress of population; and in this way its deleterious influence might be eventually neutralised.

But it is needless to dwell on theoretical and impossible questions of this sort. No government has ever attempted to lay direct taxes on wages; and were such an attempt made it would be sure to fail, inasmuch as the tax could neither be assessed nor collected. It is otherwise, however with indirect taxes on wages—that is, with taxes on articles consumed by work-people. Such taxes may, when the articles on which they are laid are judiciously selected, and they are kept within proper limits, be easily imposed and collected. And we have seen that, while they produce a large revenue, they improve the habits, increase the energies, and generally raise the condition of the class.

Impossible to estimate the amount of taxes falling on the work-people.

It has sometimes been attempted to divide the population into classes, and to estimate the amount of taxation falling on each class, and on the individuals comprised in such classes. But conclusions of this sort, even when arrived at with the greatest care, are little better than mere rough guesses. It is not possible to draw any distinct line of demarcation between the different classes of the community, nor, supposing that to be done, to compute the income of each class. And though these results could be learned with considerable precision, the considerations now laid before the reader show that the information would be worth little or nothing. For it would be impossible to say, or even conjecture, with any considerable show of probability, how much that taxation, of which we were endeavouring to estimate the apparent influence, may have raised the incomes of the lower and depressed those of the upper classes. In such a vast and complicated system no one needs attempt to estimate the action or influence of any single portion as if it were separate and independent; and it were equally vain to attempt to trace and exhibit the reciprocal influence of the different parts of the machine on each other.

Having thus endeavoured to set before the reader the effects that would most likely result from the imposition of taxes separately affecting rent, profits, and wages, we shall now briefly inquire into the effects resulting from the imposition of a tax proportioned to the incomes of individuals.

Sect. IV.—*Taxes on Income.*

Taxes on income.

The reader may perhaps be disposed to regard this section as superfluous. All incomes being derived from rent, profit, or wages, it may seem that the previous discussions have exhausted the subject; and that, to estimate the operation of the tax in any particular instance, we have merely to ascertain the source whence the income of the party is derived, and then to apply the principles already laid down. But this would be a fallacious conclusion. Taxes on professional incomes, or on the wages of professional men, differ widely in their operation from taxes on the wages of common labourers. And besides this, there are many nice and difficult questions to be examined before we are in a condition satisfactorily to appreciate the operation of taxes on income.

An income-tax apparently an equal, but in reality a most unequal tax.

In considering this question, we may begin by admitting that an income-tax is, at first sight, apparently the fairest of all taxes. It seems to make every one contribute to the wants of the state, in proportion to the revenue which he enjoys under its protection; while, by falling equally on all, it occasions no change in the distribution of capital in the natural direction of industry, or in the prices of commodities. It were much to be wished that any tax could be imposed having such effects; but we are sorry to be obliged to state that none such has hitherto been discovered, and those who believe that they may be expected to result from the imposition of taxes on income are very wide indeed of the mark. An income-tax would, no doubt, have the supposed effects, were it possible fairly to assess it. But the practical difficulties which hinder this being done are not of a sort that can be overcome. So much is this the case that taxes on income, though theoretically equal, are, in their practical operation, the most unequal, oppressive, and vexatious of any that it is possible to imagine.[1]

Direct Taxes.

Impossibility of fairly assessing incomes.

The difficulties in the way of assessing income are of two sorts:—1*st*, The difficulty of ascertaining the incomes of different individuals; and, 2*d*, Supposing them to be known, the difficulty of laying an equal tax on incomes derived from different sources.

1. It would be useless to dwell at any considerable length on the first of these heads. Incomes arising from the rents of land and houses, mortgages, funded property, and such like sources, may be learned with tolerable precision; but it has not been, and, we are bold to say, never will be, possible to determine the incomes of farmers, manufacturers, dealers of all sorts, and professional men, with anything like even the rudest approximation to accuracy. It is in vain to attempt to overcome this insuperable difficulty by instituting an odious inquiry into the affairs of individuals. It is not, indeed, very likely that any people, not altogether enslaved, would tolerate, in ordinary circumstances, such inquisitorial proceedings; but whether they did or did not, the result would be the same. The investigations would be worthless; and the commissioners of the income-tax would in the end have nothing to trust to but the declarations of the parties. Hence it is that the tax falls with its full weight upon men of integrity, while the *millionaire* of "easy virtue" may wellnigh escape it altogether. It operates, in fact, as a tax on honesty, and a bounty on, and an incentive to perjury and fraud; and if carried to any considerable height—to 10 or 15 per cent., for example—it would undoubtedly generate the most barefaced prostitution of principle, and do much to obliterate that nice sense of honour which is the only sure foundation of national probity and virtue.

2. But supposing it were possible (which it is not) to get over this fundamental objection, and that means were devised for ascertaining the incomes of individuals with facility and precision, we should have made but a very small progress towards the fair assessment of the tax. On one point, indeed, there can be no difficulty. Property-taxes ought undoubtedly to be laid on all sorts of property, and income-taxes on all sorts of income. But the question immediately occurs, whether the tax should be of the same magnitude on all incomes, how different soever their sources? And if this question be answered in the negative, we have next to inquire into the principle on which distinctions are to be made.

Those who affirm that an income-tax should be laid equally on all incomes, from whatever source derived, contend that the hardship of such a proceeding is not real, but apparent. According to them, the incomes of lawyers, physicians, clergymen, and other professional men, always bear a certain relation to the incomes of the other classes of the community; but if the former were not taxed to the same extent as the latter, this relation would be subverted;

[1] Dupuynode, speaking of the income-tax, calls it "*Ce tribut détestable ou tous les principes sont faussées, toutes les regles detruites.*" (*De la Monnaie, du Credit, &c.*, ii. 122.)

Direct Taxes.

the condition of professional men would be relatively improved; and it is alleged that, under such circumstances, there would be a greater influx of members into professional businesses, whose competition would depress the incomes of those engaged in them, so as to place them once more on a level with landlords, capitalists, &c., on whom the full weight of the tax is supposed to fall. On this ground it is contended that the tax should be made to press equally on all incomes, and that there is no injustice in making the same deduction from the fees of a lawyer or physician that is made from the rent of a landlord, or the profit of a capitalist; for the former would be as much injured by the greater competition that would grow out of his exemption from the tax as he would be were he subjected to its full amount.

But these statements, though in some degree true, are in the main fallacious. Professional fees, when once fixed, are not easily altered. Notwithstanding the heavy fall of rents and profits after the peace of 1815, the fees of professional men did not materially vary; nor did they vary materially during the previous period of depreciation. We doubt whether the imposition of a peculiar tax, of a moderate amount, on professional incomes, or their total exemption from such tax, if laid on incomes arising from other sources, would have any sensible influence over fees. If it were very heavy it might, and most probably would, in the long run, affect them to a greater or less extent; but its operation could not be in any case immediate; and unless the tax exceeded all reasonable bounds, there is but little ground for thinking that it would very materially affect them.

But suppose it were really true that professional incomes vary at the same time and in the same degree as other incomes, that would not justify the laying an equal tax on them all. A landlord receives L.500 a year of rent, and an attorney or an apothecary makes L.500 a year by his business. But though the income of each be at present the same, their ability to pay taxes is materially different; for the income of the first arises from a comparatively lasting source, whereas that of the latter is dependent on his life and on his health. And hence, in order to lay the same burden on both parties, we must calculate the *present value* of the income enjoyed by each, and lay the same tax on it; or, which would come to the same thing, we must deduct from the income of the professional man such a portion as would effect an insurance on his life for a sum equivalent to the present value of his income, and assess the tax on the remainder. This is the only way in which, supposing incomes to be known, it is possible fairly to tax them. In point of fact, however, it would be all but impracticable to proceed in this way. To illustrate the principle, suppose that a clergyman (A) is forty years of age; that he has an income of L.1000 a year, and that it is required to decide how much he should contribute to a tax of 10 per cent. on all incomes considered as perpetuities. Here we are met at the very outset by the difficulty of deciding as to the standard by which to estimate A's expectation of life. If we take the Northampton table we shall obtain a certain result, if we take the Carlisle table we shall have another, and if we take Mr Finlaison's table we shall have a third result, all differing widely from each other. But suppose that the Carlisle table is selected, A's expectation will be 27·61 years. Having got thus far, we have next to decide upon the rate of interest at which the present value of A's annuity or income is to be estimated. Every body knows that the answer to the question which we are endeavouring to solve depends materially on the assumed rate of interest; and there would be endless disputes as to which rate should be fixed upon. In the event, however, of 4 per cent. being selected, the present value of A's income would be L.16,500, yielding a perpetual revenue of L.660; so that he ought to contribute L.66 annually to the tax.

Direct Taxes.

This is the way in which taxes on income must be assessed, if they be imposed with any pretensions to fairness. It may be objected, perhaps, that the fundamental supposition on which the income is valued and the tax imposed, viz., that A being at present forty years of age, will live twenty-seven and a half years longer, is quite gratuitous; that it is merely an average rule deduced from observations made on a large number of individuals; and that for any thing we can affirm to the contrary, A may die to-morrow. But all this may be admitted without impeaching the principle laid down above; for the difference between A's actual income of L.1000 and the corresponding perennial income of L.660, that is, L.340, will, if accumulated for twenty-seven years and a half at 4 per cent., produce L.16,500, and an insurance office would transact with A on that footing, or on one not very different.

These statements show how taxes on professional incomes ought to be imposed; and they also show how very difficult, or rather how impossible, it would be fairly to assess such incomes even if there were any means of learning their amount with so much as an approach to precision. It is to no purpose to talk about establishing uniform rates of deduction. Unless wholesale injustice is to be perpetrated, all uniformity in cases of this sort must be rejected. Each case must be judged of separately. The incomes of two lawyers may be the same, but if their ages differ, they cannot be taxed to the same amount without trampling on every principle of justice; nor when interest is 4 per cent. is the tax to be the same as when it is 3 or 5 per cent.

But it is said that the difficulty of taxing professional incomes is a good reason for exempting them wholly from the tax, which should fall only on the incomes of those possessed of real property. We take leave, however, to dissent entirely from this conclusion. The difficulty of assessing professional incomes may be a sufficient reason for rejecting an income-tax altogether; but it is assuredly no reason for making it partial, and consequently unjust. Professional men contribute to taxes on commodities; and if these be repealed, and an income-tax from which professions are exempted be imposed in their stead, an obvious injustice will be done to the other classes, who will be saddled with the whole of a burden of which they have hitherto borne a part only, and which should press equally on all ranks and orders.

And it is farther to be observed, were professional incomes exempted because of the difficulty of fairly assessing them, that the principle would require to be carried a great deal farther; for many incomes derived from real property are quite as evanescent as those of professional men, and must be computed in the same manner. It is needless to say that no proposal for exempting the owners of cotton or flax mills, ships, warehouses, houses, &c., from taxes laid on the property or incomes of landlords, fundholders, mortgagers, &c., would either be tolerated or, indeed, thought of for a moment. But in assessing the incomes of the owners of ships, mills, and similar property, most part of the difficulties would have to be encountered that make the taxing of professional incomes so impracticable. An estate, abstracting from the buildings and improvements made upon it, may be regarded as a lasting source of revenue; but a ship, a house, a mill, &c., are all perishable, and before the latter can be taxed in the same ratio as the former, the *degree of their durability* must be determined, and the income arising from them reduced to a perpetuity. Suppose, for example, that a tax of 10 per cent. is imposed on income arising from lands, funds, and mortgages, and that it is required to lay an equivalent tax on income arising from houses, shops, warehouses, mills,

Direct Taxes.

ships, canals, and such like property: in this case we should be obliged to begin by estimating the present value of the shop, mill, ship, or other property yielding the revenue proposed to be taxed. Having done this, we should next have to estimate the probable duration of such property; and then, in order to get the nett or taxable income, we should have to deduct from the gross income such a sum as would suffice, being accumulated at the ordinary interest of the day, to replace the shop, mill, &c., when it was worn out. If an income-tax be imposed on fair principles, and made to press with the same severity on all classes according to their ability to bear it, this is the mode in which it must be laid on. But the difficulties in the way of such a course are almost as great as those in the way of taxing professional incomes. There would evidently be great room for doubt, evasion, and fraud in the valuation of the property; and though this were got over, how is its probable duration to be ascertained? The power to determine a point of this sort could not be intrusted to officers; for if so, it would open a door to every sort of abuse. Neither is there any standard to which it is possible to refer in estimating durability, seeing that it must vary in every case from a thousand local and almost inappreciable circumstances. Although, therefore, it were conceded that taxes on income are in principle the best of any, the above statements show that this circumstance should go for nothing in the way of recommending them. It is of excessively little consequence whether a tax be theoretically good or bad; it is in a practical point of view only that we have to deal with it; and however well it may look in demonstrations on paper, if it be practically impossible fairly to assess it, it ought, in all ordinary cases, to be rejected without hesitation.

Even as applied to the rent of land, an income-tax is in most instances grossly unfair. Two estates yield the same rent, but one is naturally very inferior to the other,—its deficiencies having been balanced by the execution of expensive improvements. Where, then, would be the fairness or the policy of laying the same tax on the rental of both estates? A half, or perhaps two-thirds, of the rent of the one really consists of the interest of capital laid out on improvements, most of which are even less durable than either shops or cotton-mills. Hence the obvious injustice of laying the same tax on the rent of an improved as on that of an unimproved estate; and yet, as has been already seen, we could adopt no other criterion; for all the tax-collectors of the empire, even if they were assisted by as many farmers, would not be able to resolve the rent of an improved farm into its constituent parts; that is, to separate what is really paid for the natural and inherent powers of the soil from what is paid for the capital laid out in improvements, and to estimate the duration of the latter.

It is unnecessary, we think, to say more on this branch of the subject. It has been seen, in the first place, that it is not possible to acquire any accurate information as to the magnitudes of the incomes enjoyed by some of the largest and most important classes; and it has next been seen, that though such information were obtained, the sources whence different incomes arise are so very various, and they are so very different in their degrees of durability, that all attempts to impose on them a really equal income-tax must prove utterly abortive. The truth is, that an income-tax, pressing equally on all classes, is a desideratum which is not destined ever to be supplied. After the legislature has done all that can be done to make it equal, it will be grossly unequal. To impose it only on certain classes of incomes, or to impose it on all incomes, without regard to their origin, is alike subversive of every principle of justice. Nothing, therefore, remains but to reject it altogether; or, at all events, to resort to it only when money must be had at all hazards,—when it is better that injustice should be deliberately perpetrated than that the public treasury should be empty. An unreasoning necessity of this sort, and nothing else, can ever justify either taxes on income or property.

Direct Taxes.

Pernicious operation of a graduated income-tax.

It has been contended by Say and others, that a tax on income should be imposed according to a graduated scale, and made to increase according to the increase of the incomes subject to its operation. A tax of L.10 is said to be more severely felt by the possessor of an income of L.100, than a tax of L.100 or L.1000 by the possessor of an income of L.1000 or L.10,000; and it is argued, that, in order fairly to proportion the tax to the ability of the contributors, such a graduated scale of duties should be adopted as would press lightly on the smaller class of incomes, and increase according as they became larger and more able to bear taxation. We take leave, however, to protest against this proposal, which is not more seductive than it is unjust and dangerous. No tax can be a just tax unless it leave individuals in the same relative condition in which it found them. It must of course depress, according to its magnitude, all on whom it falls; and it ought to fall on every one in proportion to the revenue which he enjoys under the protection of the state.[1] If it either pass entirely over some classes, or press on some less heavily than on others, it is partial and unjust. Government in such case has stepped out of its proper province, and has assessed the tax, not for the legitimate purpose of meeting the public exigencies by appropriating a certain proportion of the revenues of its subjects, but that it might vary this proportion according to the presumed amount of the latter, that is, that it might depress one class and elevate another. A proceeding of this sort would be destructive of all sound principles. That an equal tax on property or income will be more severely felt by the poorer than by the richer classes is undeniable. But the same may be said of every imposition which does not subvert the relations subsisting among the different orders of society, and of all pecuniary obligations. The hardship in question is, in truth, a consequence of that inequality of fortune and condition which makes a part of the order of Providence; and to attempt to alleviate it by adopting such a graduated scale of duties as has been proposed, would really be to lay taxes on the wealthier part of the community, for the benefit of their less opulent brethren, and not for the sake of the public revenue. Let it not be supposed that graduation may be carried to a certain extent, and then stopped.

Nullus semel ore receptus
Pollutas patitur sanguis mansuescere fauces.

There is no halting-place in the practice of confiscation Having once admitted that greater may be taxed at a higher rate than smaller incomes, on what pretence can you refuse to seize upon all above L.500 or L.600 a-year, before you tax those that are less? And should this not be enough, you will be compelled to fix the limit of immunity at some lower point, at L.300, L.200, or L.100 a-year, and confiscate all larger amounts! Wherever graduated taxes on income or property are adopted, there must be an end of all security. Socialism is in the ascendant. You are at sea without rudder or compass; there is no amount of folly you may not commit; and bankruptcy, or revolution, is the natural and all but inevitable consequence of your proceedings.

Account of the late income-tax.

To furnish the means of defraying the enormous cost of the war begun in 1793, Mr Pitt proposed, in 1797, to treble the amount of the assessed taxes, or duties on houses, windows, horses, carriages, &c. This plan, however, did not

[1] That is, of course, supposing all revenues reduced to the same denomination, or to perpetuities.

Direct Taxes.

answer the expectations of its projectors, and next year it was abandoned, and a tax on income substituted in its stead. According to the provisions of the act imposing this tax, incomes of less than L.60 a year were exempted from assessment; an income of from L.60 to L.65 was taxed one *one hundred and twentieth* part; and the rate of duty increased through a variety of gradations, until the income reached L.200 or upwards, when it amounted to a *tenth* part, which was its utmost limit; a variety of deductions being at the same time granted, on account of children, &c. The commissioners to whom the management of this tax was intrusted were chosen by the freeholders of counties and the electors of boroughs, in the same way as their representatives in parliament, only that a smaller qualification was sufficient to enable any one to be elected a commissioner. The services of these functionaries were gratuitous; and they were sworn to preserve inviolable secrecy with respect to the affairs of individuals. They were authorised to call for returns from every person whose income they supposed to exceed L.60 a year; and in the event of their being dissatisfied with these returns, they were empowered to call for written explanations, and ultimately for the oath of the party. But this examination was rarely necessary, except in the case of incomes derived from professions, manufacturing and commercial businesses, or from interest; the rental of landlords being, in most cases, learned from the terms of the leases held by their tenants; while the profits or incomes of the tenants were estimated to amount in England to *three-fourths*, and in Scotland to *half* the rent paid the landlords. The commissioners were assisted, or rather overlooked, by the tax-surveyors appointed by government, who were required to see the provisions of the act strictly enforced, and whose duty it was to scrutinise all returns of income, to challenge such as they considered fraudulent, to object to the deductions allowed by the ordinary commissioners, and to bring the matter under the review of the commissioners of appeal, whose sentence was final. Infinite fraud and evasion were practised; and nothing could be more palpably unjust than the rule for estimating farmers' incomes. But the peculiar circumstances of the country at the time made this injustice be submitted to with comparatively little reluctance; and, on the whole, the provisions of the act were enforced better than could have been anticipated.

This tax was repealed in 1802, after the peace of Amiens, having produced, at an average, about *five millions and a half* annually.

In 1803, the income-tax, under the name of property-tax, was again revived. The assessment began, as before, on incomes so low as L.60 a year, and gradually increased until the income reached L.150 a year, when it amounted to 5 per cent., which was its highest rate. An addition was made to this tax in 1805; and in 1806, during the short-lived administration of Mr Fox and Lord Grenville, the assessment was raised to 10 per cent. on all incomes, however small, arising from land or capital. Professional incomes under L.50 were exempted from the tax; and incomes of that sort exceeding L.50 and under L.150, the limit at which they became subject to the full assessment of 10 per cent., were allowed deductions, varying inversely as their magnitude. This tax was finally repealed in 1816, and would not, it is probable, have been submitted to but for the conviction that it was indispensable for carrying on the desperate struggle in which we were then engaged.

Direct Taxes.

We subjoin, from a parliamentary paper, a return of the total *gross* and *nett* assessments to the property or income-tax, for the year ending 5th of April 1815:—

	Gross Assessment.	Nett Assessment.
A. Lands, tenements, hereditaments, or heritages	L.5,923,486	L.5,923,189
B. Houses, lands, and tenements	2,734,451	2,176,228
C. Funded and stock properties	2,885,505	2,885,505
D. Profits and gains of trade, professions, &c.	3,831,088	3,146,332
E. Salaries, pensions, &c.	1,174,456	1,167,678
Totals	L.16,548,986	L.15,298,982

The following is the return of the value of the several species of property on which the assessment was made for the years ending the 5th April 1814 and 1815, viz:—

Schedules.	1813-14.	1814-15.
A.	L.56,701,923	L.60,138,330
B.	36,336,883	38,396,144
D.	36,080,167	38,310,935
E.	11,380,748	11,744,557
C. Not stated, but estimated at	30,000,000	30,000,000
Totals	L.170,499,721	L.178,589,966

Existing income-tax.

The present income-tax was originally proposed by Sir Robert Peel in 1842 (5 and 6 Vict., cap. 35). It was organized nearly on the same principle as the previous income-tax, except that it exempted all incomes under L.150 a year, that it amounted to only 7d. in the pound sterling, or L.2, 18s. 4d. per cent., and that the assessment on farms in England was limited to a half, and in Scotland to a third part of their rent. The measure was resorted to, partly to provide for the deficiency of revenue which then existed, and partly to enable its author to undertake those great commercial reforms which he soon after effected. When first imposed, the duration of the tax was limited to three years; and though prolonged by Sir R. Peel, he did not intend that it should be perpetual, but that it should be repealed when the objects in view when it was granted were fully attained.

Although, however, it has undergone various modifications, it has not ceased to exist since 1842; and its repeal appears at present (1859), to be very problematical. In 1853 it was most properly extended to Ireland (16 and 17 Vict., c. 34); and it was at the same time assessed on all incomes of L.100 and upwards, but at a lower rate on those below L.150 than on those above that limit. During the war with Russia it varied on incomes of L.150 and upwards, from 1s. 2d. to 1s. 4d. per pound. It was subsequently reduced to 5d. per pound on all incomes; and is now (1859) 6½d. on incomes under, and 8d. on those above L.150.

The schedules under which the tax is now charged are the same as those in use previously to 1815. We subjoin an

Account showing the Annual Amounts of Property and Income charged under each Schedule of the Income-Tax Act in England, Scotland, and Ireland, during the year ended 5th April 1857–58, *with the Amount of Duty thereon.*

Schedules.	1856-57.				1857-58.			
	Property and Income charged in			Amount of Duty charged.	Property and Income charged in			Amount of Duty charged.
	England.	Scotland.	Ireland.		England.	Scotland.	Ireland.	
	L.	L.	L.	L.	L.	L.	L.	L.
A	94,347,263	11,657,882	11,952,285	7,836,603	101,942,863	12,529,689	12,826,739	3,703,301
B	24,425,964	2,806,855	2,582,538	920,030	26,842,242	3,397,365	2,804,248	446,718
C	26,935,770	...	1,408,980	1,889,650	28,083,017	...	1,432,354	860,865
D	69,110,522	6,856,106	4,280,182	5,171,844	73,106,832	7,107,287	4,510,470	2,392,243
E	15,677,440	818,376	942,340	1,074,226	16,569,055	869,627	989,427	510,127
Total	230,496,959	22,139,219	21,166,325	16,892,353	246,544,009	23,903,968	22,563,238	7,913,254

Direct Taxes.

The expense of collecting the tax varies inversely as the rates of duty. In 1853 it amounted to L.2. 10s. 3d. per cent., and in 1855 to L.1, 16s. 11d. per do. We subjoin an

Account showing the Rates of Duty, and the Gross and Nett amount of Duty, on Property and Income in each year from 1842 *to* 1860 *inclusive.—N.B. From* 1842 *to* 1853, *the Tax affected Britain only, but since* 1853 *it has been extended to all parts of the United Kingdom.*

Yrs.	Rates of Duty.	Gross Amount of Duty. L.	s.	d.	Nett Amount of Duty. L.	s.	d.
1842	7d. in the Pound on Incomes of L.150 and upwards (Great Britain).....	582,656	17	8	582,037	17	11
1843	,,	5,436,365	13	10	5,387,455	9	11
1844	,,	5,448,380	19	6	5,329,600	15	3
1845	,,	5,306,458	15	5	5,182,649	9	9
1846	,,	5,656,528	5	5	5,543,682	8	8
1847	,,	5,703,790	5	5	5,612,654	8	5
1848	,,	5,591,759	7	5	5,485,164	3	0
1849	,,	5,669,876	9	6	5,564,833	7	3
1850	,,	5,617,275	16	2	5,510,859	17	11
1851	,,	5,538,880	2	2	5,440,349	16	10
1852	,,	5,749,336	1	0	5,652,770	8	10
1853	7d. in the Pound on Incomes of L.150 and upwards, and 5d. from L.100 to L.150, and extended to Ireland...	5,816,990	1	0	5,730,457	18	2
1854	1s. 2d. in the Pound on Incomes of L.150 and upwards, and 10d. from L.100 to L.150	11,031,836	7	4	10,922,266	16	9
1855	1s. 4d. in the Pound on Incomes of L.150 and upwards, 11½d. from L.100 to L.150	15,402,901	14	11	15,159,457	14	4
1856	— ,, —	16,384,494	0	0	16,050,670	0	0
1857	Incomes of L.150 and upwards, 7d. per Pound. Incomes between L.100 and L.150, 5d. per Pound from 5th April.....	11,767,306	0	0	11,396,435	0	0
1858	Incomes of L.100 and upwards, 5d. per Pound from 5th April	6,812,232	0	0	6,610,102	0	0
1859	Incomes of L.150 and upwards, 9d. per Pound. Incomes between L.100 and L.150, 6½d. per Pound from 5th April	9,789,483	0	0	9,666,141	0	0
1860	Incomes of L.150 and upwards, 10d. per Pound. Incomes between L.100 and L.150, 7d. per Pound from 5th April.....						

The principal evasions of the tax take place in the assessments under schedule D, that is, on those on trades and professions. And these are quite excessive. It is abundantly certain, were the tax fairly assessed and collected, that schedule D would yield a much larger amount than schedule A, whereas it does not really yield more than about two-thirds the produce of the latter! This fact more than corroborates the statements we have previously made in regard to the extreme difficulty, or rather impossibility, of fairly assessing the tax. The truth is, that it sets the interest of the contributors in direct opposition to their duty; and when such is the case, it is easy to see which will be sacrificed. It may well be doubted whether any attempt to enforce a more correct and general assessment of the tax under schedule D would add anything considerable to the revenue; but there can be no manner of doubt that such an attempt, were it made, would give an enormous stimulus to chicane, fraud, and perjury. And it is better to admit inequalities, than to attempt, and that ineffectually, to obviate them at such a cost.

Direct Taxes.

In further illustration of what is now stated, we beg to subjoin the following classified account of the individuals who were charged and assessed under schedule D, in the year ended 5th April 1856.

A Return showing the number of Persons charged to the Income-tax, under schedule (D), *and other particulars (so far as relates to Great Britain), for the year ended 5th April* 1856.

Classes.	Income on which the Duty is charged. L.	Number of Persons in each class.	Amount of Tax charged upon each class. L.
Under 100 a year.....	1,319,069	20,916	63,205
L.100, and under.....L.150	11,761,920	118,793	634,632
150 ,, 200	6,364,928	40,390	424,329
200 ,, 300	7,224,966	32,511	481,665
300 ,, 400	4,772,654	14,948	318,177
400 ,, 500	3,013,131	7,173	200,877
500 ,, 600	2,785,583	5,414	185,705
600 ,, 700	1,899,610	3,061	126,641
700 ,, 800	1,453,681	2,003	96,913
800 ,, 900	1,393,991	1,703	92,933
900 ,, 1,000	752,406	804	50,161
1,000 ,, 2,000	6,798,676	5,271	453,245
2,000 ,, 3,000	3,488,180	1,503	232,545
3,000 ,, 4,000	2,576,230	781	171,749
4,000 ,, 5,000	1,942,048	434	129,468
5,000 ,, 10,000	5,251,125	701	350,074
10,000 ,, 50,000	8,213,536	445	547,568
50,000 and upwards.....	3,539,312	40	235,954
Total.....	...	256,891	...

Now, it appears from this table that of 256,891 persons assessed under this schedule, no fewer than 212,610 were charged upon incomes of less than L.300 a-year, and 139,709 on incomes of less than L.150 a-year! And can any one doubt when direct taxes are imposed on incomes of L.100 and L.150, that every possible effort will be made to evade them? It may, we believe, be safely affirmed that the aggregate incomes charged with duty under schedule D in the classes rated below L.1000 or L.1500 a-year, do not come up to half their real amount, while many thousands who should pay escape altogether. And yet this portion of the tax gives rise to a great deal of suffering and well-founded complaint. For though vast numbers succeed in eluding its pressure in whole or in part, there are many who, being either more honest or less skilful or successful in their attempts at evasion, feel the full severity of its pressure. The Commissioners of Inland Revenue complain, in their second Annual Report, of the many claims (about 250,000) for exemption from the duty or repayment thereof, and of "the painful appeals that are made to their compassion and forbearance" (p. 28). And these appeals mostly grow out of schedule D, and are inseparable from its existence, or, which is the same thing, from the existence of the tax. Indeed we hesitate not to say that this single schedule produces an incomparably greater amount of fraud, evasion, and dissatisfaction than is produced by the entire duties of customs and excise. And yet, despite the contradiction which it involves, we have latterly busied ourselves in increasing the former and diminishing the latter. This, however, is a policy that will perhaps turn out to be of the *felo de se* variety. Unless some very great change for the worse should unhappily be made in the constitution of parliament, it is not very likely that a heavy income-tax in time of peace will have any very lengthened duration.

And it is not desirable that it should be otherwise; for if a considerable income-tax be maintained during peace, how is the expenditure of a war to be provided for? There is every probability that the occurrence of a contest would

injuriously affect our trade and industry, so that it might neither be advisable nor practicable to raise any considerable amount of revenue by increased customs or excise duties. And if, under such circumstances, the resource of an income-tax were either wholly or to a considerable extent forestalled, we might be compelled to resort to loans, or to some even more ruinous expedient. Hence the advantage of reserving taxes on income as a resource to be brought into the field in seasons of difficulty and danger when the usual sources of revenue are insufficient or dried up. To anticipate a reserve of this sort is extremely bad husbandry, being of a piece with the *post obits* of spendthrifts and prodigals. The income-tax is suited to periods of war, or when money must be had at whatever cost. And those who exhaust it in seasons of tranquillity deprive themselves, when they are especially wanted, of the services of a most powerful engine, whether for defence or offence.

The objections to an income-tax not lessened by its continuance.

It is sometimes said that if the income-tax be maintained, it will gradually become less offensive and less objectionable; and if by that be meant that the public, by becoming more and more habituated to the fraud and injustice that are inseparable from it, will care less about them, the statement may, perhaps, be in some measure true; but otherwise it is, we apprehend, quite unfounded. The great majority of those who either are or ought to be among its contributors will never cease to endeavour, by every means in their power, to defeat its enactments. The schedule D of 1870 or 1880, supposing the tax to last so long, will be as much under the proportion which it should bear to schedules A, C, and E as it is at this moment. If the procedure for its fair assessment be improved, so will the stratagems and devices of those whose object is to make that impracticable, and in a contest of this sort the latter are pretty sure to succeed.

We have seen that, though the annual amounts of all incomes were known, we could not thence deduce their values, which form the only basis on which an income-tax can be fairly placed. One parcel of sugar may be worth 6d. per lb., another 8d. per do., and another 10d. or 1s. per do.; but who would propose subjecting them all to the same amount of duty per lb.? To do so would be flagrantly unjust. And differences of origin and duration have the same influence over incomes that differences of quality have over commodities. They render them, even when of equal amount, of very unequal value. To bring them all to an equality, or to the same denomination, their real values must be ascertained, and the revenue thence arising, considered as a perpetuity, is that on which the tax should be assessed. Unless this course be adopted, wholesale injustice must be committed. What is popularly called income is often no such thing, but a repayment or recovery of capital. If A vest a sum in consols or mortgages, there is no wear and tear of capital, and the dividend or interest which it produces is really income. But if B vest an equal sum in a ship, a mill, in professional education, or in some such way that it will be exhausted in some ten, twelve, or twenty years, a large portion of the annual return which it yields is not income properly so called, but a partial payment to repair the waste of capital; and to tax this portion of the return as if it were so much income, is a proceeding which it is impossible to vindicate.

This statement sets in a clear point of view the injustice that was done in subjecting the terminable and interminable funded annuities to the same rate of taxation. The latter are wholly income, whereas the former are only in part income, and may be, and sometimes are, mainly a return of capital. To subject receipts that are so very different to an equal duty, is in truth to confiscate a portion of the terminable annuities, or, which comes to the same thing, to subject them to a tax on capital as well as on income, whereas the interminable annuities are subjected to the latter only. But, as has been previously seen (*ante*, p. 17), the injustice done to the holders of terminable annuities is but an inconsiderable fraction of the vast mass of injustice that grows out of the circumstances now referred to, when all descriptions of incomes are subjected to the same rate of duty. And hence we are inclined to think that Sir Robert Peel acted wisely in declining to obviate this injustice in one instance, when there were thousands of others of the same sort in which it could not possibly be obviated. It is demonstrable, too, that no length of time can ever in any degree obviate or efface the injustice that is done, first, by imposing, and afterwards by increasing, an income-tax, which makes no distinction between terminable and perennial incomes.

It is, however, true, were an income-tax made perpetual and invariable, that the recurrence of the injustice to which we have referred would be, in some degree, obviated; for, in such case, the greater pressure of the tax on terminable incomes would be taken into account in the employment of capital and labour. Still, however, there would be a prodigious amount of injustice growing out of the circumstances under consideration, which it would be impossible to obviate, supposing the tax to be permanent, by any previous arrangements. All calculations in regard to the investment of capital, whether in businesses or in the education and training of individuals, are liable to be overthrown or modified by thousands of unforeseen circumstances; and practically it is found, that while some turn out to be incomparably more, there are others that prove to be incomparably less advantageous than was expected. And it is plain when such is the case, that a tax which deals with returns derived from investments of all sorts, as if they were universally of the same character and equally productive, must very often be in the last degree unequal and unjust; for though in some cases it will wholly fall on income, in others, and those unluckily not of rare occurrence, there is really no income, properly so called, to assess, so that the tax must wholly fall on capital. But it is needless to insist on what is so very obvious. It were, indeed, as idle to suppose that the continuance of the income-tax should free it from these results, as it would be to suppose that old age in man should bring back the bloom and vigour of youth.

It must not, however, be supposed, that no distinction is ever made, in dealing with the income-tax, between the portion of a return that is really income and that which is a replacement of capital. In very many instances this distinction is made, though with little or no regard to principle. The greater number of those who are engaged in various businesses in which capital is largely employed take especial care, in returning their incomes, to deduct a sum from their amount, which is much more than sufficient to repair the waste of capital. This, indeed, is one of the most efficient and favourite methods resorted to by those who wish to evade the fair pressure of the tax, that is, by the vast majority of those on whom it is assessed. But, though available to many, there are large classes that are unable to profit by this device. This is the case with numbers who derive their incomes from sundry descriptions of invested capital, including the occupiers of land who are assessed on the rent which they pay, and it is almost universally the case with the incomes of professional people. The latter consist in great part of a return, which is in most cases very inadequate, for the sums expended in fitting individuals for the discharge of their functions; and yet the instances are few and far between in which an abatement either is or can be made from their gross incomes on this account; and there is not so much as the shadow of a reason for thinking that it will be in any respect different in time to come.

It is nugatory, therefore, to imagine that the defects of

Direct Taxes.

an income-tax will ever be materially obviated by its becoming older. They are of its essence. Its incapacity of all real amendment is one of its distinguishing characteristics. Some of its more offensive features would be softened were it possible to reduce all incomes to perpetuities, and assess them accordingly. But it is not possible to do this. It would be easier, indeed, to wash the Ethiopian white than to make the tax fair or equitable. The obstacles that hinder this being done are not of a kind that can be either removed or materially diminished. We must take it such as it is, or reject it altogether; and hence its unsuitableness to serve as an ordinary source of revenue.

Incomes should not be disclosed.

The difficulties attending its imposition are not, however, the only ones that encumber an income-tax. It may be objected to the principle on which it is imposed, that government is not entitled to pry into or lay bare the affairs of individuals. Why should those who ask nothing from the public, and who endeavour by rigid economy to make a good appearance on limited resources, be compelled to disclose the meanness of their circumstances? To subject such persons to the *magnum pauperies opprobrium*, is an act which nothing but the most urgent necessity can excuse. When taxes are indirect, people in great measure assess themselves; and if they dispense with taxed articles, they may escape them altogether. But an income-tax treats all classes as if they were mere machines without sentiment or reason. In dealing with it economy and forbearance are of no avail; and the contributors who try to evade its pressure, and to escape sacrifices which they may be unable to afford, are forced to resort to indirect methods, that is, to chicane, fraud, and perjury! And yet this tax, though it has such deplorable consequences, may, like war, be sometimes necessary; but the circumstances that justify an appeal to arms can alone justify recourse to an impost so pregnant with every variety of abuse.

Sect. V.—*Taxes on Property.*

A tax on property nearly identical with a tax on capital. Could not be fairly assessed.

It has sometimes been proposed to substitute a tax on property for taxes on income; but such substitution would, in most respects, be highly objectionable. A tax on property would differ but little from a tax on capital, which we have seen would be about the worst that can be devised. And though such were not the case, all, or nearly all, the insuperable difficulties that have to be encountered in assessing a tax on income stand in the way of an assessment on property. How is the capital of merchants, manufacturers, or farmers to be ascertained? And supposing (which can never be the case) that its amount is learned, is it to be subjected to the same uniform rate of duty? Are the owners of ships in dock or unemployed, of furnaces out of blast and of lands out of lease, are merchants and farmers engaged in unsuccessful speculations, to be all taxed as highly as they would be if their property were employed to the greatest advantage? And if the injustice of subjecting productive and comparatively unproductive property to the same rate of duty be too obvious to be tolerated, on what principle are we to discriminate between them?

Would discourage industry and accumulation.

Property vested in books, pictures, statues, superior houses, ornamental grounds and plantations, and so forth, does not really differ substantially in the manner of its disposal from that which is vested in carriages, horses, wines, and all that is above mere necessaries. And is such property to be treated in the same way as that which is vested in mills, ships, mines, and farms? If so, the tax will discourage accumulation, whatever be the object of the accumulators, for it will equally affect capital whether it be employed to promote industrial undertakings, or be laid out on objects of taste, luxury, or embellishment. Hence, like the *taille* in France, it will make people conceal their wealth and affect poverty; and the reality in such cases soon harmonises with appearances.

Direct Taxes.

Pauper videri vult Cinna, et est pauper.

Would force capital abroad.

In such circumstances people would be tempted, or rather all but compelled, to send their savings abroad. Were Britain subjected to a scourge of this sort, it requires no gift of prophecy to foretell that in a few years she would seem as if she had been visited by the destroying angel. Those noble residences that embellish all parts of the country would be abandoned; the woods by which it is sheltered, and which give it so rich and luxuriant an appearance would be cut down; everything ornamental would be proscribed; and all of the wreck that could be scraped together would be sent across the Channel or the Atlantic, to beautify and fertilise the Continental or American states. And yet, strange to say, this, and the other direct taxes, whose destructive influence we have endeavoured to illustrate, are the nostrums which mob orators recommend as infallible specifics, by which to improve the condition of the working classes! Perhaps, however, they presume too much on the ignorance and gullibility of their auditors. That the paralysing influence of these taxes would be experienced, in the first instance, by capitalists and men of property, is most true; but you cannot injure them without at the same time injuring those who depend upon them. The welfare of the one class rests on that of the other; and to separate them even in imagination, infers a total ignorance of the most obvious principles.

Would be in the last degree unfair and unjust.

It is of little use, after these decisive considerations, to dwell on others. But it is obvious that the project for taxing property, supposing it were to be carried into effect, would entirely subvert the relations that at present subsist among the various ranks and classes of the community. Suppose that the same sums that have been laid out on the education and training of lawyers and physicians, who are making certain incomes by their professions, have been vested by other parties in land or businesses that yield an equal annual rent or profit. Where, may we ask, would be the justice or common sense of taxing the landlords and tradesmen, and exempting the professional men? Because, we shall be told, the property of the former is realised and tangible, which that of the latter is not! But though the best, or rather the only one that can be given, this answer will not bear handling. Probably, indeed, the incomes of the lawyers and physicians may be as well secured as those of the others. They are, no doubt, exposed to accidents and casualties; but so are estates, ships, mines, railways, and most descriptions of property; and the same system of insurance that makes some provision against contingencies happening to the latter, will also help to provide against those that happen to the former. Nothing, therefore, could be more unjust than the proposed plan, were it practicable, which, happily, it is not, to act upon it. It would exempt certain classes of persons from burdens, to impose them on other classes who are equally entitled to protection, and who, it is needless to add, should only bear their fair share of the general burden. A bishop with a palace and L.5000 or L.10,000 a year, a lord chancellor, a chief-justice, or a field-marshal may have no property; and under this precious project these high functionaries would enjoy an immunity from that taxation which is to fall with its full weight on the owner of a cottage or patch of land, the depositor of a few pounds in a savings bank, or the annuitant deriving a pittance from an investment in the funds. But it is needless, even if our space permitted, to dwell further on a quackish scheme of this sort. Its only claim to notice is derived from the eminence of some of those who have condescended to become its apologists. But despite all that rhetoricians may say in its favour, its palpable injustice, and the ruinous consequences which it would not fail to produce, are a sufficient guarantee against its being adopted.

Indirect Taxes.

PART III.

INDIRECT TAXES.

SECT. I.—*Advantages and Disadvantages of Indirect Taxes.*

Reasons recommending the imposition of indirect taxes.

Though most governments have had recourse to direct taxes, they have rarely, at least in Europe, formed the sole or even principal source of their revenue. Indirect taxes have been pretty generally the greatest favourites both of princes and subjects; and there are very sufficient reasons why this should be the case. The burden of direct taxation is palpable and obvious. It admits of no species of disguise or concealment, but makes every one fully sensible of the exact amount of income taken from him by government. We are all, however, extremely averse from parting with property, except we obtain some more acceptable equivalent in its stead. And as the benefits derived from the institution of government, though of the highest importance, are not so very obvious or striking as to be easily and readily felt and appreciated by the bulk of the people, there is, in the great majority of cases, a decided disinclination to the payment of direct taxes. It is principally for this reason that recourse has so generally been had to those that are indirect. Instead of exciting the prejudices of their subjects by openly demanding a specific portion of their incomes, governments have taxed the articles on which these incomes are usually expended. This ingenious plan conceals the amount of taxation, and makes its payment in some measure voluntary. The tax being commonly paid, in the first instance, by the producers, the purchasers confound it with the natural price of the commodity. No separate demand being made upon them for the tax, it escapes their recollection; and the article which they receive seems the fair equivalent of the sacrifice made in acquiring it.[1] Such taxes have also the advantage of being paid by degrees, in small portions, at the time when the commodities are wanted for consumption, or when it is most convenient for the consumers to pay them.

Moderate indirect taxes stimulate industry.

Besides their greater facility of imposition, indirect taxes have the further advantage of acting as a powerful stimulus to industry. "Dans la perception directe," says the Marquis Garnier, "l'impôt se montre sans nul déguisement; il vient sans être attendu, à cause de l'imprevoyance si ordinaire au commun des hommes et il apporte toujours avec lui de la gêne et du découragement. Mais l'impôt indirect, en ajoutant successivement un surcroît de prix aux articles de consommation générale et journalière, au moment où tous les membres de la société ont contracté l'habitude des ses consommations, rend ses divers articles un peu plus couteux à acquerir, c'est-à-dire, qu'il donne lieu à ce qu'il faille, pour se les procurer, un surcroît proportionné de travail et d'industrie. Or, *si cet impôt est mesuré de manière à ne pas aller jusques à décourager la consommation*, ne semble-t-il pas, dans ce cas, agir comme un stimulant universe, sur la partie active et industrieuse de la société, qui l'excite à un redoublement d'efforts, pour n'être pas obligé de renoncer à des jouissances que l'habitude lui a rendues presque nécessaires, et qui, en conséquence, donne un plus grand développement aux facultés productives du travail et aux ressources de l'industrie? Ne doit-il pas en résulter, qu'après l'impôt, il y a la même somme de travail et d'industrie qu'auparavant pour fournir aux besoins et aux jouissances habituelles des hommes qui composent la classe laborieuse, plus la somme de travail et d'industrie qui a dû pourvoir au surcroît de prix destiné à l'impôt? Or, cet impôt, ou ce surcroît de produit que se paye, étant dépensé par le gouvernement qui le recueille, sert à alimenter une nouvelle classe des consommateurs, qui forment des demandes que l'impôt les met à porte de payer." (*Préface à la Traduction de la Richesse des Nations*, tome i. p. 66, éd. 2de.)

Indirect Taxes.

It may, however, be assumed that moderate taxes on income, provided they were fairly assessed, would have about the same influence in stimulating *economy* that Garnier ascribes to taxes on expenditure. But it must be kept in mind that this is their whole effect. It is different, however, with taxes on expenditure, and the difference is of fundamental importance, for they give a strong stimulus to INVENTION as well as economy. When a tax or duty is laid upon a commodity, the wits and energies of its producers, in every part of the kingdom, are forthwith directed to the various methods of its production; they are carefully analyzed and reflected upon in every point of view, and thousands of efforts are simultaneously made to reduce its cost, so that the producers may be able to pay the tax without raising its price or narrowing its supply. It is not easy to exaggerate the influence which judiciously imposed taxes on commodities exert in the way now stated over their production. Everybody knows that it is most powerful; and, in the great majority of cases, they more than nullify the contrary effect of an increase of taxation.

It is not, of course, meant to deny that taxes on commodities labour under certain disadvantages. That, however, is not a defect peculiar to them, but which attaches to all taxes. It is impossible to name one to which objections of one sort or other may not be made. But it is sufficient to vindicate the superiority of indirect taxes, that the injurious influence attributed to them has been greatly exaggerated; that when properly imposed, and confined within reasonable bounds, they act as powerful incentives to invention and economy; and that, when most mischievous, they are innocuous compared with direct taxes on property, income, and so forth.

Disturb the natural distribution of capital.

It is alleged of taxes on commodities, that they alter the natural distribution of the capital and industry of a country, and force them into less advantageous channels; because, as already seen, when a tax is laid on a particular class of commodities, the producers, if they cannot defray it by greater ingenuity and economy, raise the price of the articles by diminishing their supply in the market, and transferring a portion of the capital employed in their production to other businesses. But this effect, if it be ever sensible, is experienced only on the first imposition of a duty; for, after a short while, it is blended with the cost of production, and has no farther influence over the distribution of capital.

Raise the price of commodities to a greater extent than the amount of the tax.

It is, moreover, alleged that duties on commodities being almost always paid by the producers or importers before they sell them to the consumers, the prices paid by the latter are increased not only by the amount of the duties, but also by the profits accruing to the parties by whom they have been advanced. But though this circumstance may sometimes operate to increase prices, its influence in this respect has been absurdly overrated by Richardson, Say, Sismondi, and others.[2] The latter has calculated that a tax of 4000 francs, paid originally by a manufacturer whose profits were 10 per cent., would, if the manufactured commodity only passed through the hands of five different persons before reaching the consumer, cost the latter the sum of 6734 francs. This calculation proceeds on the supposition, that he who first advanced the tax would receive from the next manufacturer 4400 francs,

[1] Nero was supposed to have abolished the duty of 4 per cent. on the slaves sold in Rome, when he really did no more than order it to be paid by the seller instead of the buyer. "*Remissum*," says Tacitus, "*specie magis quam vi; quia cum venditor pendere juberetur, in partem pretii emptoribus accrescebat.*" (*Annal.*, lib. xiii., cap. 32.)

[2] It may be said to have been burlesqued in some statements made by the Liverpool Financial Association, which are so very wide of the mark as not to require any notice.

Indirect Taxes.

and he, again, from the next 4840 francs; so that at each step 10 per cent. on its value should be added to it. "But this," as Ricardo has justly observed, "is to suppose that the value of the tax would be accumulating at *compound* interest; not at the rate of 10 per cent. per annum, but at an absolute rate of 10 per cent. at every step of its progress. Sismondi's statement would be correct, if five years elapsed between the first advance of the tax and the sale of the taxed commodity to the consumer; but if one year only elapsed, a remuneration of 400 francs, instead of 2734, would give a profit at the rate of 10 per cent. per annum to all who had contributed to the advance of the tax, whether the commodity had passed through the hands of five manufacturers or fifty" (*Principles*, &c., 3d edit. p. 459).

May encourage smuggling.

The encouragement they sometimes give to smuggling is the worst effect of duties on commodities. "They tempt," says Adam Smith, "persons to violate the laws of their country, who are frequently incapable of violating those of natural justice, and who would have been in every respect excellent citizens had not the laws of their country made that a crime which nature never meant to be so" (p. 378). In consequence of this tendency, such duties require the employment of a number of revenue officers; and as they expose the producers of the taxed articles to considerable inconvenience and hardship from domiciliary visits, they indemnify themselves by making a corresponding addition to the price of their goods. But these inconveniences are not, after all, a legitimate consequence of duties being laid on commodities: they are occasioned by their abuse, or by their being carried to an oppressive extent; and even when greatest, they are altogether inconsiderable compared with those that attach to the lowest taxes on property or income. So long as duties on commodities are confined within reasonable limits, the temptation which they create to engage in illegal transactions may be very easily obviated. And it will be immediately seen, that duties so restricted are uniformly more productive than those which are carried to such a height as to hold out any great encouragement to smuggling.

It may be said that duties on commodities do not fall on individuals in proportion to their means of paying them; and that, while they press with undue severity on persons with large families, or who occupy prominent stations, they may be almost wholly avoided by rich misers and those in obscure stations. But in taxation we have only a choice of difficulties. However desirable, we have shown that it is quite impossible to tax individuals in proportion to their incomes; and that any attempt to impose an equal income-tax must certainly fail, and be attended with disastrous results. We should, therefore, resort to the best practicable taxes; that is, to duties on commodities. And it does not really appear, for the reasons previously stated, that they can be considered as either unjust or oppressive. If duties be laid on sugar or wine, those who abstain from their use will, of course, escape them; surely, however, those who use such articles have no good right to complain of this, seeing that they may also, by being equally self-denying, exempt themselves from the duties.

Sect. II.—*Inquiry into the Incidence and Effect of Indirect Taxes.*

Taxes on a particular commodity.

1. *Taxes on Commodities.*—It is clear that if a duty be laid on one commodity, and not on others, its price, unless some corresponding facility be at the same time given to its production, will sustain an equal rise; for if it did not so rise, the profits of its producers would be sunk below the common level, and their business would be abandoned. But it depends on the circumstance of the commodity being of the class denominated luxuries whether a tax on it will fall wholly on the consumers. Taxes on necessaries, consumed by landlords and capitalists, or by the wealthier classes, are wholly defrayed by them. This, however, is very rarely the case with taxes on such necessaries as are required for the use of the labourers; for they are generally made up to the latter by a proportional increase of wages, or partly in that way, and partly by infusing a greater spirit of industry and economy into the labourer. Hence it is seldom possible to predicate at the outset what will be the ultimate effect of a tax on such articles as enter into the subsistence of the poor, inasmuch as that depends on a great variety of circumstances, which it is very difficult, if not impossible, to estimate beforehand. But this is never the case with duties on costly articles, such as coaches, race-horses and hounds, pictures, statues, vases, and so forth, or on articles consumed only by the rich and the great. Such duties may, indeed, and most probably will, even in their case, reduce or limit the demand for the articles on which they are laid. But whether this be so or not, the taxed articles being wholly superfluous, and nowise necessary for the subsistence of those by whom they are bought, the latter have no means or power by which to shift any portion of the tax with which they are charged from themselves to any one else. But it is nevertheless indispensable that the greatest moderation be observed in imposing such duties, for otherwise they invariably tempt the wealthier classes to evade them by resorting to other countries; and usually, also, induce some of them to take their capitals along with them.

Indirect Taxes.

2. *Ad valorem Taxes on Commodities.*—An equal *ad valorem* duty, were it laid on all descriptions of commodities would, of course, affect them all to the same extent. And it was universally supposed, down to the publication of the edition of *the Wealth of Nations* by the author of this article, that the imposition of such a duty would in no degree modify or change the relation or proportion which commodities previously bore to each other. But though such a duty would affect commodities in the same proportion, it would not affect the profits of their producers in the same, but in very different proportions; and it is by the degree in which the latter are affected that the relation of commodities to each other is determined. If all classes of producers uniformly employed the same proportions of fixed and circulating capital,[1] an equal *ad valorem* duty would affect them all equally, and the values of their products, as compared with each other, would not be affected by its imposition. But this is not the actual state of things; different sorts of commodities are produced by the agency of very different proportions of fixed and circulating capital; and hence, were an equal *ad valorem* duty laid on them all, it would not affect profits equally, and would consequently cause a transfer of capital from one business to another, and a variation in the value of commodities, raising some and sinking others. To illustrate this, assuming that profits are 10 per cent., let it be supposed, in the first place, that A advances L.1000 in wages at the commencement of the year, and that he receives the produce, which must, by the supposition, be worth, at least, L.1100 at the end of the year; in the second place, let it be supposed that B has a capital of L.11,000 vested in a highly durable machine, which is capable of performing its work without any, or with but very little, manual labour; the annual produce of this machine being, it is obvious, under the circumstances supposed, wholly, or all but wholly, made up of profits, and necessarily selling for about L.1100; and

Ad valorem taxes on commodities.

[1] It is, of course, taken for granted that the fixed capitals are of the same degree of durability, and that the circulating capitals are returnable in the same periods.

Indirect Taxes.

lastly, let it be supposed that an equal *ad valorem* duty of 10 per cent. is laid on commodities. Now, it is plain that in this case A and B will each bring, at the end of the year, commodities worth L.1100 to market, and will therefore be respectively taxed L.110. But L.100 only of the value of A's goods consists of profits, the rest consisting of the capital laid out on wages; whereas the whole value of B's goods consists of profits. Hence it results, that while the duty would swallow up the whole of A's profits and L.10 of his capital, it would only take 10 per cent. of B's profits. We have chosen a case that sets the unequal operation of the tax in a striking point of view. But whenever there was any considerable difference in the proportions of fixed and circulating capital employed in producing different commodities, an equal *ad valorem* duty would operate in the way now pointed out. Such a duty would, therefore, be among the worst that could be imposed. It would cause an immediate derangement in all the channels of industry, and in the value of most descriptions of commodities. Capital would be driven from employments principally carried on by hand to those principally carried on by machinery; and while the value of the commodities produced by the former would rise, the value of those produced by the latter would fall, until they had been adjusted so as to yield the same rate of profit to the producers.

It may, however, be observed, that though the determination of the question, with respect to the incidence of an equal *ad valorem* duty on commodities, be of considerable importance in regard to the theory of the science, it is one that can never be brought to any practical test. An equal *ad valorem* duty might perhaps be imposed with considerable fairness on some commodities imported from abroad; but it is quite out of the question to suppose that such a duty, even were it as desirable as it is the reverse, should ever be imposed on the infinite varieties of commodities produced within any extensive country. The greatest imaginable number of the most skilful and zealous officers would not suffice either to assess or to collect such a duty.

The duties on commodities in this country are divided into those charged on certain articles produced at home, denominated Excise Duties, and those charged on imported articles, or Customs Duties.

Excise duties.

3. *Excise Duties.*—We have given, under this head, in a previous part of this work, some account of the origin of this class of duties, and of the mode in which they are imposed. Here, therefore, it is enough to lay the following statements before the reader:—

Account of the Quantities of the Articles charged with Duties of Excise in the United Kingdom, in the year ended 31st March 1859, with the Rates of Duty, and the Produce of the Duties:—

	Quantities.	Rates of Duty.	Produce of Duty.
Spirits (gallons).....	23,198,984	8s.	L.9,177,667
Malt (bushels).....	42,794,044	2s. 7d. and 2s. *plus* 5 per ct.	5,800,569
Hops (lbs.).....	53,125,101	2d.	464,842
Paper (do.).....	199,015,820	1½d.	1,306,039
		Total.....	L.16,749,117

Exclusive of the above, the duties on licenses, railways, hackney carriages, and race-horses, are usually reckoned among the excise duties. But they have no claim to be so classed, except that they are assessed and collected by the same officers. For full details with respect to these duties, the reader is referred to the treatise *On Taxation* by the author of this article.

Indirect Taxes.

The excise duties that were formerly imposed on salt, beer, soap, glass, leather, candles, bricks, and other less important articles, have been repealed within these few years. And there is not one of the existing duties of which it can be justly said, that it is assessed on an improper article, that it is too high, or that it operates injuriously on the manufacture of the article. Whatever may have been the case formerly, the excise is now fully entitled to the eulogium passed upon it by Arthur Young. "Excises," said he, "are by much the fairest, most equal, and least burdensome of all taxes. They are paid voluntarily. Not a shilling is contributed but in proportion to the free consumption. The Dutch, who have been deservedly esteemed the wisest nation in Europe in all matters of taxation, have been enabled to preserve their industry, under burdens of which we have no experience, and scarcely any conception, principally by their having adopted this mode of taxation. (*Political Arithmetic*, Part II., p. 46.)

It may, indeed, be made a question whether the excise duties have not been too much reduced. Those on salt and soap, for example, had they been properly assessed, and not too heavy, would have produced a large amount of revenue, with but little inconvenience. A duty of 15s. a bushel on salt was, indeed, most oppressive. But nothing of the sort could have been alleged of the duty had it been 3s., or even 5s. a bushel; and yet there is good reason for thinking that the lower would have been more productive than the higher duty. To repeal a tax, especially if it press on an article in general demand, is always an acceptable measure, and is apt to be hastily agreed to by a weak or popularity-hunting government. But before proceeding to repeal any tax, it should be inquired, can its produce be spared? and if not, how is it to be replaced? Nothing can be more futile than the repeal of a tax, if we have to impose in its stead another that is equally, or more than equally, objectionable.

The duty on paper, though in some respects objectionable, is moderate in the extreme. It is also easily collected, and the manufacture is rapidly increasing. Its repeal might be of some little service to booksellers and publishers, who might, perhaps (for even that is doubtful), buy their paper on somewhat lower terms, yet not so much lower as to affect the price of their works.[1] To the public at large the effect of the repeal on the price of paper would be altogether inappreciable. And to enable a futile measure of this sort to be accomplished, a copious source of revenue would have to be sacrificed, and above L.1,200,000 a year added to the income-tax! These results have happily been prevented by the firmness and intelligence of the House of Lords.

Customs duties on exports.

4. *Customs-Duties, or Duties on the Importation and Exportation of Commodities.* — These, like all other duties, are paid by the consumers of the articles on which they are laid. When a government lays a duty on the foreign commodities which enter its ports, the duty falls entirely on its own subjects, by whom they are purchased; for the foreigners would not supply them unless they got their full price, exclusive of the tax. And, for the same reason, when a government lays a duty on the commodities which its subjects are about to export, the duty does not fall on them, but on the foreigners by whom they are bought. If, therefore, it were possible for a nation to raise a sufficient revenue by laying duties on the commodities which it exports, such revenue would be wholly derived from others, while it would be entirely relieved from the burden of taxation. No doubt, however, were a country which has no peculiar facilities of production, to attempt to raise a revenue by laying duties on exports, other states would do the same; and as the imports are almost always as great,

[1] The duty seldom amounts to more than 3d. or 4d. on a 12s. or 18s. volume. On school-books it usually varies from ¼d. to ½d. each, rarely rising to ¾d. or 1d. On Collenso's *Arithmetic*, a popular school-book, which sells at 4s. 6d., the duty is exactly ¾d.

Indirect Taxes.

and commonly, indeed, much greater than the exports, a country which should adopt a system of this sort, would, most likely, lose as much on the one hand as it gained on the other, or more. But when a country has any exclusive advantages in the production of one or more descriptions of commodities, duties on their exportation would seem, if cautiously imposed, to be among the best that can be imagined. They must not, however, be carried to such a height as to equal the peculiar advantages enjoyed in their production, nor to diminish materially the demand for them in foreign countries. But supposing that these limitations are kept in view, they seem to be, in most respects, unexceptionable.

Commodities that might be charged with export duties.

It may be said, perhaps, that there are either none, or but few articles of the kind now referred to. But they are a good deal more numerous than is usually supposed. And in proof of this we may specify the teas of China; the opium of Hindostan; the finer wines of France; the sulphur and olive-oil of Naples and Sicily; and the coal and iron, and perhaps, also, some of the manufactured goods of England.

Tea of China.

The Chinese lay a duty of about 1½d. per lb. on tea when exported; and it has never been alleged that this duty has the smallest influence over its exportation. It might, indeed, be easily raised to 3d. or 4d. per lb. And were the Chinese government as powerful as that of England or France, we have little doubt that this would be done, and the imperial exchequer replenished by the greater duty paid by the "barbarian" tea-drinkers of Great Britain and the United States.

Opium of India.

The tax on the opium sent from India is a still more striking instance of an unobjectionable duty on exports. It yields a large revenue to India, while, by raising the price of opium, it tends to lessen its consumption by the Chinese, to whom, if taken in excess, it would be highly injurious. Hence it is beneficial, alike as a fiscal and a sanitary engine.

Though it be difficult, if not impossible, to find another article so well suited as opium to be charged with a duty on exportation, yet there is probably no country which has not some article of the sort. The superior wines of France seem to belong to this class; and it may be doubted, supposing them to be charged with an *ad valorem* duty of 10 or 15 per cent., whether the quantities of them sent abroad would be materially affected.

Wines of France.

Sulphur and olive-oil of Sicily and Naples.

Few articles seem to be better suited than the sulphur of Sicily and the olive-oil of Naples (Gallipoli) to be charged with duties on being exported. A vague perception of their aptitude to be made productive of revenue in the way now mentioned, and of their importance to the foreigner, seems, indeed, to have made their exportation be frequently interfered with. But unluckily in dealing with them the government, for the most part, acted capriciously and arbitrarily, and, therefore, injuriously. Whereas, had it followed an uniform system, and systematically enforced, moderate duties on their export, they would have produced a considerable amount of revenue, without injuriously affecting the demand for the articles.

Coal of England.

It has been proposed to impose a duty on coal exported from the United Kingdom; and, as the question in regard to the exhaustion of the mines, though of vital importance, needs not be agitated in this place, the policy of such a duty would mainly depend on the fact, whether British coal be necessary, or of considerable consequence, to the progress of manufactures, arts, and navigation in foreign countries. If it be, then certainly it would be good policy to preserve the superiority which we derive from the possession of coal by prohibiting its exportation, or burdening it when exported with a considerable duty. But if the possession of British coal be not necessary, or of considerable importance to the foreigner, such prohibition or duty would encourage the working of foreign mines and discourage our own, without yielding any corresponding advantage. We are told that it is not easy to pronounce positively in regard to this question. On the whole, however, there does not appear to be any ground for doubting that a supply of British coal, though not, perhaps, indispensable, is of the greatest service to the foreigner, and enables him to prosecute with advantage various undertakings in which he could not otherwise engage with much chance of success. France has various coal-mines, but their produce is inconsiderable in quantity, and is, at the same time very inferior in quality, compared with the produce of the mines of this country. Everybody who has ever been in Paris knows that fuel is at least twice as dear in that capital as in London. And hence, notwithstanding coal has been, by a policy which we shall not stop to characterise, burdened with heavy duties on being imported into France, she has for some years drawn large supplies from England, and also from Belgium and Rhenish Prussia. In 1859 we exported no fewer than 1,391,009 tons coal to France. And now that the high duties (in part discriminating in favour of Belgian coal) on English coal are to be reduced, a large increase in the exports to France may be anticipated.

Indirect Taxes.

The produce of the Belgian and Prussian, like that of the French, is in no respect equal to the produce of the English mines; and though it were otherwise, they are too far inland to admit of coal from them coming into successful competition with ours in the markets of the world. The same remarks apply to the coal of the United States. Instead of supplying others with this valuable product, the latter are themselves large importers of English coal, having taken from us in 1858 no fewer than 301,004 tons.

Such being the case, and considering that coal is the mainspring, the *causa causans*, of our manufacturing preeminence, we have always regarded the repeal in 1845, of the duty of 4s. a ton laid on it when exported, as being in all respects a most unwise measure. The retention of the duty would not have materially affected the exportation of coal, at the same time that it would have yielded a considerable amount of revenue, wholly derived from the foreigner. But British coal is, in consequence of the vast extension of steam navigation, of incomparably more importance to our foreign rivals at present than in 1845. Indeed it is difficult to say whether it be now more valuable as a manufacturing or a belligerent agent. Its disposal is consequently a matter of the greatest national interest. And though it might, perhaps, be wrong entirely to prohibit its exportation, there cannot, we apprehend, be a doubt that it should be charged, when exported, with a duty of 5s., or rather of 6s. or 7s. a ton. Such a duty would not be innocuous merely, but highly advantageous; and would probably produce from L.1,500,000 to L.2,000,000 a year.

But, *Diis aliter visum!* A clause in the late commercial treaty with France stipulates that for ten years to come, no duty or restriction of any kind shall be laid on the export of coal from the United Kingdom (§ 11), and that the duties which are at present laid on British coal imported into France shall be reduced. That we should have assented to such an arrangement seems not a little astonishing. We appear, indeed, to have parted with the great instrument of our prosperity without any hesitation, and for even a less consideration than was received by Esau when he sold his birthright for a mess of pottage. And as we have sufficient modesty not to pretend to the gift of prophecy, we take a leap in the dark, and engage, however circumstances may change in the interval, that the free exportation of coal shall continue for a series of years! Nor do we stop even here; for we endeavour to force it upon the French, and stipulate that they shall repeal or reduce the duties by which they sought to lessen its importation. And,

Indirect Taxes.

doubtless, had we been consulting how we might best promote the interests of France, and give new life to her manufactures and industry, this was the precise course to be recommended. But that, to say the very least of it, was no business of ours. The French have shown that they were well able to take care of themselves. The special interests of England were those for which our negotiators were bound to provide, and keep steadily in view. And, though we hope it will turn out differently, we much fear that they have been entirely lost sight of on this occasion.

Iron.

But coal, though the principal, is not the only article that might be advantageously subjected to a duty on exportation. The peculiar advantages we enjoy for the production of pig and bar iron, and most sorts of metallic goods, are such that they might be charged with a duty of 10 or 15 per cent. *ad valorem* on being sent abroad, without sensibly limiting the demand for them. And we have heard it alleged that this, also, is the case with cotton stuffs and yarn. But, without presuming to express any very decided opinion with regard to the latter statement, we are fully satisfied that reasonable duties on coal and iron when exported, are among the least exceptionable which it is possible to suggest.

These observations may perhaps be enough to show under what conditions and limitations duties may be advantageously laid on exports. So long, indeed, as the mercantile or protective system was in the ascendant, any proposal for their imposition would have been scouted on all hands. And since its overthrow, they have been regarded with much jealousy by most writers on finance. But when the articles on which duties are to be imposed are of the proper description, and the duties are properly limited, there can be no better taxes.

Duties on imports; advantages of.

On the whole, however, there is no great reason to think, except in a few anomalous cases, that duties on exports will ever be made productive of any very considerable amount of revenue. Hence it is satisfactory to know that moderate duties on imports are about the most productive and least objectionable of taxes. They are collected with the greatest possible facility, involving no inquiry into the circumstances of individuals, as is the case with taxes on income or property; nor any interference of any sort with the processes carried on in the arts, as is sometimes the case with excise duties. By allowing imported goods to be lodged in bonded warehouses, under the joint locks of the king and the importer, the revenue is protected without its being necessary for the importer to pay the duties till the goods be withdrawn for consumption; so that, as already stated, but little additional capital is required by the importing merchant, and little addition is made to the price of the goods through the previous advance of the duties. The total *gross* receipt of the customs-revenue of the United Kingdom amounted, during the year ending the 31st March 1858, to L.23,603,770, collected at an expense of L.3, 11s. 6d. per cent. on the gross, and of L.3, 12s. 6d. on the nett receipts; and we will venture to affirm that no equal amount of revenue was ever raised in any country, or in any period of time, with so little difficulty and inconvenience.

Impolicy of the late reduction of articles subject to customs duties.

Sir Robert Peel abolished, during the progress of his commercial reforms, a great many customs duties imposed on articles which mostly produced small amounts of revenue; and during the present year this policy has been carried a great deal further. We believe, indeed, that it has been pushed to an injurious extreme; and that it were much better had a good many articles, which may now be imported duty free, continued to be charged with moderate duties. In the aggregate they would have produced a large sum, while their greater number added to the breadth and stability of our customs system. It also often happens, owing to the fluctuations of trade and fashion, that articles which at one time are but little in demand, are much sought after at another and no very distant period; and, in such cases, they furnish, when they are subjected to duties, a proportional increase of revenue. But it is difficult, after a duty has been repealed, to procure its re-imposition; and, therefore, unless there be something otherwise objectionable about them, or the amount they produce be very trifling indeed, the greater the number of articles subject to customs duties the better. When such duties apply to a great variety of articles, it is seen that they directly affect, in one way or other, every class of the community. But when they are confined to a few leading articles, and especially to those which enter largely into the comsumption of the lower classes, a belief is pretty certain to grow up that they are unfair and partial in their operation.[1] And what else can be said of a system such as ours has been rendered? For, at the same time that it admits the luxuries of the rich and the great, including the most *recherché* wines at very low duties, and the finest laces, silks, gloves, china-ware, bronzes, &c., free of all charge, it imposes extremely heavy duties on the tea and sugar, which are indispensable to the labouring poor, and on the tobacco, the spirits, and the beer, which constitute their luxuries. Is not a customs policy of this sort pretty sure to be considered by the mass of the people as alike unfair and offensive? It has indeed been said that the partiality it discovers is not real, but apparent merely; and that, as has been shown in a previous part of this article, wages have been adjusted so as to compensate the labouring classes for the high duties imposed on the products referred to. But admitting the fact to be as stated, this is a case in which, practically considered, appearances are all but everything, and realities little or nothing. That the tobacco of the poor should be subjected to four or five times as high a rate of duty as the claret and champagne of the rich, is, *prima facie*, not a little revolting. And though it may be shown to the satisfaction of a well-informed economist that the poor are not really injured by this flagrant inequality, does any one suppose that they will ever be brought to believe that such is the case? They will see the inequality, but they will see no more. It will be held up to public scorn as a scandalous abuse. A general outcry will be raised against it, which, in the long-run, it will be found impossible to resist.

Indirect Taxes.

And though the defects and inequalities of the existing customs system were less obvious than they really are, yet, when the public attention is fixed on a few great articles, there is every reason to apprehend that the duties on them will, in no long time, come to be regarded as highly objectionable and oppressive. This is the more likely now that the great majority of the electoral body, that is, of the body in whose hands the power to impose taxes either is or is about to be vested, have very little chance of being called upon to contribute to taxes on income or property. And it is astonishing how soon people who have the power find reasons, satisfactory to themselves, for attempting to throw a burden off their own shoulders on to those of their neighbours. There cannot, indeed, be a doubt that attempts of this sort will be made and vigorously prosecuted; and we regret that they should have been provoked and facilitated by the late abolition of so many unexceptionable duties. We have narrowed the area of indirect taxation, when we should have widened it as much as possible; and have made it comprise various articles of export as well as the great bulk of those of import. To give up a tax

[1] See the very able speech of Mr Thomas Baring, *Commons' Debates*, 24th Feb. 1860.

Indirect Taxes.

against which no good objection can be made, is, to a nation situated as we are, as unwise in a financial as the abandonment of a fortress or a fleet would be in a military or naval point of view. It encourages fresh attacks, while it lessens the ability to resist them. Instead of shortening the list of articles subject to excise and customs duties, we should have taken every opportunity of lengthening it. This, at all events, should have been our policy, if we wish the system of indirect taxation to be maintained; and unless it be maintained, and to a very great extent too, a financial convulsion involving the most serious consequences cannot be very far distant. Among the articles the customs duties of which have been repealed in the course of the present year (1860) may be specified—

Butter, producing in 1857-58 about	L.103,000
Cheese,	48,315
Eggs,	21,377
Tallow,	76,222
Oranges and lemons,	39,000
*Silk manufactures, 1859	304,747
*Leather gloves,	64,793
*Platting,	12,585
*Artificial flowers,	19,137
*Toys,	4,569
*Caoutchouc manufactures,	7,144
*Lace,	4,577
*Musical instruments,	12,276
*Watches,	16,242
*Clocks,	8,951

with a host of other articles, some of more and some of less importance. The duties on the articles marked * have been repealed under the treaty with France. The entire duties repealed under that treaty produced in 1859 no less than L.573,447; and the duties reduced under the same improvident arrangement will involve a much greater loss of revenue. (See *Sup. to Com. Dictionary.*)

Now, we are clear that not one of these articles should have been exempted from duty. The duties on butter, cheese, eggs, and tallow, were so very moderate that their influence over the prices of the articles was practically imperceptible; and we have yet to learn that there are any articles better fitted to be taxed than silks, gloves, platting, toys, and so forth. Had the revenue been largely in excess of expenditure, something might perhaps have been found to say in favour of the repeal of these duties; but a measure of that sort, when the revenue was seriously deficient, is one of which we confess ourselves quite unable to perceive either the reasonableness or the expediency.

We may be told, perhaps, that the duties on silks, watches, gloves, &c., have not been repealed from fiscal considerations, but because they were protective, and added proportionally to the price of the like goods produced in this country. But whatever these duties may have been originally, they had long ceased to be of this description. The modifications introduced by Sir Robert Peel had rendered them too low to have the alleged effect. In so far, indeed, as respects silk, the only article to which it is necessary specially to refer, the exports have, of late years, very greatly exceeded the imports, showing that, as a protective engine, the duty must have been in great measure, or rather entirely, inoperative. In the event, however, of the negotiations with France making it desirable to do something in the matter of silk, the duty might have been reduced from 15 to 10 or 12 per cent. *ad valorem.* Such reduction would have had little or no effect upon the revenue, and though we had exported no silk goods, a 10 or 12 per cent. duty on imports could not have sensibly influenced the prices of those manufactured at home.

The reduction of the duties on brandy and wine might, under other circumstances, have been proper enough, but at present it is not more defensible than the repeal of the duties now referred to.

Indirect Taxes.

It is considered by some to be a sufficient reply to statements like those now laid before the reader, to affirm that they are inconsistent with or opposed to what they choose to call the principles of free trade. But it is not too much to say that those who raise a cuckoo-cry of this sort know extremely little of the principles they are so ready to invoke. All who know anything of the matter, know that neither free trade nor protection is, in itself, either good or bad. Everything depends on circumstances, or on its influence over the wellbeing of those by whom it is practised. Speaking generally, freedom of trade is found to be most advantageous, and therefore it should, on the first blush of the matter, be preferred. But when it can be shown, as in the case of the exportation of coal, that it is injurious, then it should be at once suspended, and prohibition or restriction substituted in its stead. It is on what conduces to the *salus populi*, and not on abstract doctrines, that the attention of a prudent statesman should be fixed. And it is further to be borne in mind that the imposition of reasonable duties on imports and (in some cases) exports, is in no respect inconsistent with the freedom of trade. But as this branch of the subject has recently been treated and disposed of by a very high authority, we shall content ourselves with quoting his short, clear, and conclusive statements. "It is important that the country should clearly understand what is the true meaning of *free trade*. It means trade freed, not from those necessary duties which are raised only for purposes of revenue, but trade freed from all charges or duties which arise either from an ignorant jealousy of other countries, or from an equally foolish impression that it is our interest to foster unnatural productions in our own country, rather than to receive them from other countries, whence, being produced under more favourable circumstances, they can be obtained in larger quantities, of better quality, and at a lower price. This I apprehend to be the true meaning of free trade. It was so understood and described in the celebrated petition of the merchants of London, presented to Parliament in the year 1820: 'As long as the necessity for the present amount of revenue subsists, your petitioners cannot expect so important a branch of it as the customs to be given up, or to be materially diminished, unless some substitute less objectionable be suggested; but it is against every restricted regulation of trade not essential to the revenue, against all duties merely protective from foreign competition, and against an excess of such duties as are partly for the purpose of revenue and partly for that of protection, that the prayer of the present petition is respectfully submitted to the wisdom of Parliament.' My Lords, are not the duties now proposed to be repealed, in the full sense of the words, 'essential to the revenue?' And can we consider the substitute suggested, namely, a heavy income-tax, as less objectionable? Every one of the duties proposed to be abolished in consequence of this treaty might be retained without any violation of the principles of free trade." (*Lord Overstone's Speech*, 15th March 1860.)

Customs duties not inconsistent with Free trade.

The customs duties that are still in existence might, perhaps, in one or two instances, be advantageously modified. But in the great majority of cases they are so moderate, that they might be increased so as to produce a large additional revenue, with but little inconvenience either to our trade or to anything else. Such increase will, however, be a much more difficult matter now, when there are but few articles subject to duties, than when they were comparatively numerous. But, despite this disadvantage, it will probably be found, in the event of any considerable increase of revenue being required, that it may be better raised by judicious changes in the duties of customs and excise, than by any other means hitherto suggested.

Duties on imports and exports have been levied in almost

Indirect Taxes.

Customs-duties in Rome.

every country which has had any foreign commerce. The Athenians laid a tax of a *fifth* on the corn and other merchandise imported from foreign countries, and also on several of the commodities exported from Attica.[1] The *portoria*,[2] or customs payable on the commodities imported into and exported from the different ports of the Roman empire, formed a very ancient and important part of the public revenue. They were imposed, as Tacitus has observed, when the spirit of liberty ran highest among the people. *A consulibus et tribunis plebis institutæ, acri etiam populi Romani tum libertate.* (*Annal.* lib. xiii. cap. 50.) The rates at which they were charged were fluctuating and various, and little is now known respecting them. Cicero informs us (in ii. Ver. cap. 75) that the duties on corn exported from the ports of Sicily were in his time 5 per cent. Under the imperial government the amount of the *portoria* depended as much on the caprice of the prince as on the exigencies of the state. Though sometimes diminished, they were never entirely remitted, and were much more frequently enlarged. Under the Byzantine emperors they were as high as 12½ per cent. (Burman. *De Vectigalibus Pop. Rom.* cap. v.)

Customs seem to have existed in England before the Conquest. But the king's first claim to them was established by statute, 3d Edward I. The inconveniences arising from the multiplicity of the various separate acts relative to the customs caused Mr Pitt to introduce a bill, in 1787, for their consolidation. This bill was passed into a law, and several similar consolidations have since been effected. The last was by a statute passed in 1855, to which are subjoined tables, containing lists, ranged in alphabetical order, of the various articles of import and export, with the duties payable on each, and the drawbacks allowed on the exportation of particular kinds of British goods. See these lists, with the subsequent modifications, in the *Commercial Dictionary*, article Tariff.

Taxes on raw produce.

Tithe.

5. *Taxes on Raw Produce.*—The question respecting the ultimate incidence of taxes laid on the raw produce of the soil, is one of considerable nicety and difficulty. If land yielded no surplus to its possessors above the ordinary profit of the capital employed in its cultivation, the imposition of a tax on its produce, such, for example, as tithe, would occasion an equivalent increase of price. The level of profit may be temporarily, but it cannot be permanently elevated or depressed in any particular branch of industry. And as there is no reason why agriculturists should be contented with lower profits than are realised in other employments, as soon as a tithe was imposed they would set about transferring a portion of their stock to some more lucrative business; and this transfer would continue until the diminution of supply raised prices to their proper level, and restored the equilibrium of profit.

Views of Smith and Ricardo in regard to the incidence of tithe.

In such a state of things, tithe would make a precisely equivalent addition to the price of raw produce. But after various qualities of soil have been brought under cultivation, and rents have, in consequence, been generally introduced, it is not so easy to trace the ultimate incidence and effect of tithes. They then appear to occasion a diminution of rent rather than a rise of prices. Farms which are tithe-free always bring a higher rent than such as are subject to that charge; and it is naturally concluded that, were tithes abolished, the depressed rents would be raised to the same level as the others. For this reason, in an advanced stage of society, tithe has not been considered as increasing the price of raw produce to the consumer, but as falling on rent, and as diverting a portion of it into the pockets of its rightful owners, the clergymen and lay impropriators. "Taxes upon the produce of land," says Adam Smith, "are in reality taxes upon rent, and, though they may be originally advanced by the farmer, are finally paid by the landlord. When a certain portion of the produce is to be paid away for a tax, the farmer computes, as well as he can, what the value of this portion is, one year with another, likely to amount to, and he makes a proportional abatement in the rent which he agrees to pay to the landlord. There is no farmer who does not compute beforehand what the church-tithe, which is a land-tax of this kind, is, one year with another, likely to amount to."

Indirect Taxes.

Conclusive, however, as this statement appears on a first view, it is only under certain conditions and limitations that it holds good. It has been repeatedly shown, that a very large proportion of the raw produce raised in every extensive country is produced by means of capital laid out on the land in the view of obtaining the customary profit of the time, and without its yielding any rent. It must also be observed, that the cost of producing this portion of the required supply of raw produce determines the price of the rest: for it is produced under the most unfavourable circumstances; and unless its producers were repaid their expenses and profits, it would not be brought to market, and a scarcity would ensue. But when a tithe is imposed, it affects, of course, the producers of this portion of the required supply in common with the others. Inasmuch, however, as they pay no rent, it is clear they cannot throw the burden of tithe on a landlord; and as they would not continue in their business unless they obtained the same rate of profit as their neighbours, it appears unavoidably to follow, that either the price of corn must rise proportionally to the tithe, or that the former supply will no longer be brought to market.

This last is the view that Ricardo took of the operation of tithe. But, however ingenious, the same remark is applicable to his theory as to Smith's, that it is only under certain conditions and restrictions that it is correct. It is clear, for example, that the effect ascribed by Ricardo to the imposition of a tithe depends, first, on the demand for corn or its consumption remaining about the same after it is charged with tithe as before; and, second, on the tithe being made to affect all, or nearly all, the land of a country, and on its being exacted from such foreign corn as may be imported. If either of these conditions be wanting, Ricardo's conclusions will be more or less vitiated; the tithe will not then occasion an equivalent increase of prices, nor fall wholly on the consumers.

The commutation of tithe, effected some years ago, has made the investigation of these and other questions connected with tithes of comparatively little interest. It is, however, easy to see that when the price of corn, or anything else, is raised by the imposition of a tithe or other tax, its consumption is, *cæteris paribus*, always more or less diminished; and it is equally easy to see that, if a considerable portion of the land in a country be exempted from the tithe which is laid on the residue, or if foreign corn be admitted duty free, the tithe will in the former case be but slightly felt, while in the latter it will have no sensible influence over prices; and that, consequently, it will fall principally or wholly on rent.

Injurious operation of tithes;

The truth is, that tithes or taxes on the produce of land are more injurious from their indirect operation, and more unpopular from the mode in which they are assessed, than from the magnitude of the burden which they lay on the public. They are imposed and collected in a vexatious

[1] Anacharsis's *Travels*, iv., p. 375, Eng. Trans. The quantity of corn usually imported from the countries on the Euxine into Athens amounted to about 400,000 medimni. See Clarke *On the Connection between the Roman and English Coins*, p. 28.

[2] "Huic vero proprie *vectigalis* denominatio convenit, quippe pro vehendis mercibus (unde *vectigal*), soluto." (Burman, *De Vectigalibus Pop. Rom.*, cap. v.)

Indirect Taxes.

and irritating manner; and have, in consequence, an incomparably greater effect in discouraging industry and exciting discontent than many heavier but more judiciously assessed taxes. Tithe is said, by its apologists, to have the same influence, in as far as the interests of the farmers are concerned, as an equivalent amount of rent. But this, though a plausible, is a fallacious statement. Rent, when once fixed, must continue the same during the currency of the lease. Though an industrious and enterprising farmer should raise five or ten times the quantity of produce raised by a sluggard, his rent would not, therefore, be increased; and he would reap, as he ought, all the advantages of his greater industry and intelligence. Such, however, is not the case with tithes. To the sluggard they are invariable; to the industrious man they become more and more oppressive, and increase with every fresh outlay of capital and labour. Hence it is that, practically, tithes operate as a premium on idleness, and as a heavy and constantly increasing tax on industry. By preventing the cultivator from deriving the entire advantage of superior skill and increased exertion, they discourage his efforts, and contribute to render him indolent and indifferent. A farmer pays his rent willingly to the landlord; but he considers the clergyman as an interloper, who, without having contributed in any way to raise the crop, claims a tenth part of its gross amount. The occupier of a farm subject to this vexatious charge seldom believes that he realizes the same profits as his neighbours in tithe-free farms; and we are told by Mr Stevenson, the well-informed author of the *Agricultural Survey of the County of Surrey*, that it used to be the common opinion, that a farm tithe-free was better worth twenty shillings an acre, than a tithed farm equally favoured in soil and situation was worth thirteen shillings. In this way tithes contribute indirectly as well as directly to raise prices; indirectly by generating an indisposition to apply fresh capital to the improvement of the soil, and directly by the positive addition which they make to the expense of cultivating bad land.

a great discouragement to improvements.

Paley, who cannot be reckoned unfriendly to the real interests of the church, says, that "of all institutions adverse to cultivation and improvement, *none is so noxious as that of tithes*. A claimant here enters into the produce who contributed no assistance whatever to the production; when years, perhaps, of care and toil have matured an improvement, when the husbandman sees new crops ripening to his skill and industry, the moment he is ready to put his sickle to the grain, he finds himself compelled to divide the harvest with a stranger. Tithes are a tax not only upon industry, but upon that industry which feeds mankind, upon that species of exertion which it is the object of all wise laws to cherish and promote. (Paley's Works, ii. p. 105, ed. 1809; see also *Wealth of Nations*, p. 377.)

Commutation of tithe.

A just sense of the injurious influence of tithe in obstructing agricultural improvement, and involving the clergy in unseemly contests with their parishioners, had long excited a general wish among well-informed individuals for their commutation; and this has been effected under the provisions of the act 6th and 7th Will. IV. cap. 71. This act directed that the average value of the tithes in each parish, during the seven years ending with 1835, should be ascertained, and distributed into equivalent quantities of wheat, barley, and oats, which are made a fixed and invariable rent-charge upon the land; and the clergy are to receive the value of these quantities, in all time to come, according to the current prices of the day. By this means they are liable only to fluctuations in the value of corn; and to these they would have been liable though no commutation had been effected.

Indirect Taxes.

In countries subject to a tithe, it should be charged on imported corn.

The influence of tithes and such like taxes, in countries where they are imposed, has been urged as a reason for laying equivalent duties on raw produce when brought into their markets; for, if this be not done, it is alleged that the farmers in the importing countries, having to contend with untaxed competitors, will be placed under a disadvantage, and subjected to an unfair competition. But this principle applies more to the case of manufacturers than of farmers. If, to illustrate its operation, it be supposed that a peculiar tax, say of 10 per cent., is laid on the hats produced in the United Kingdom, at the same time that those imported are exempted from duty, in such case the native hatters could hardly escape being ruined. But the free importation of untaxed foreign corn, while that raised at home is subject to a tithe, would not have the same influence over the agriculturists: for while hats, and most sorts of manufactured goods, are produced under the same, or nearly similar circumstances, corn is produced under widely different circumstances, or from lands of very different degrees of fertility. And though its importation free of duty might, and most probably would, in cases like that now supposed, reduce prices and the rents of the superior lands, its unfavourable influence over agriculture would be limited to that carried on upon the worst descriptions of land. And if the country were advancing in population and wealth, it would rather tend to make such land be more slowly taken into cultivation than to make its tillage be relinquished.

It was contended, on the grounds now stated, when the restrictions formerly laid on the importation of corn were repealed, that duties should be laid on all raw produce when imported, sufficient to countervail the peculiar burdens falling on the land. And this, no doubt, was the course which a strict regard to principle would have pointed out as just and proper. But there were practical difficulties in the way which prevented it from being followed. It was denied that the agriculturists were more heavily taxed than the other classes; and though the converse was easily shown, it was difficult to estimate the surplus taxation falling on the land, or to say what would be a fair countervailing duty. And at what rate soever the latter might have been fixed, it would at all times have afforded a convenient handle for misrepresentation and abuse; so that, on the whole, it was best to make an end of the matter by allowing the free importation of corn under a nominal duty.[1]

Taxes on raw produce may raise wages and lower profits.

Taxes on raw produce, when they raise the prices of the articles required for the food of the labourer, tend to raise wages and lower profits; and, by so doing, they have been supposed to be peculiarly disadvantageous. But it does not follow, as Ricardo supposed, that every rise of wages is necessarily accompanied by a corresponding fall of profits. On the contrary, as we have already shown (article POLITICAL ECONOMY), both wages and profits may simultaneously rise; and this is always the case when a rise of wages is accompanied or followed by a corresponding increase in the productiveness of industry. It is found, too, that practically this is the usual effect of an increase either of wages or taxes. Such increase stimulates the producers to endeavour, by fresh displays of industry, invention, and economy, to preserve unimpaired their accustomed profits, and the markets for their goods. And the impetus thus given is, in very many cases, more than enough to secure both results.

Stamp-duties.

6. *Stamp and Legacy Duties.*—Stamp-duties are laid on the paper or parchment on which certain deeds, contracts, legal proceedings, receipts, acquittances, &c., are written. They derive their name from the paper being impressed

[1] For a full discussion of the various questions connected with the incidence and operation of tithes and other taxes on the produce of the land, see the chapter on that subject, pp. 178–203 of the 2d ed. of the *Treatise on Taxation* by the author of this article.

Indirect Taxes.

with a public stamp, stating the amount of the duty. Their ultimate incidence varies according to the nature of the deed or writing for which it is necessary to use stamped paper.

Duties on the sale of land do not fall on the sellers.

Adam Smith has said, that duties on the sale of land, or on the paper used in its conveyance from one party to another, commonly fall on the seller. This arises, he says, from the circumstance of "the seller being almost always under the necessity of selling, which forces him to take such a price as he can get. The buyer is scarce ever under the necessity of buying; he will, therefore, only give such a price as he likes. He considers what the land will cost him in tax and price together. The more he is obliged to pay in the way of tax, the less he will be disposed to give in the way of price. Such taxes, therefore, fall almost always upon a necessitous person, and must, therefore, be frequently very cruel and oppressive" (p. 389). But though Smith's statement may apply in some rare instances, there can be very little doubt that, in the great majority, it is quite inapplicable. Here there are, at all times, large amounts of capital seeking investments; and there is nothing which is so much run upon as land, or which brings so high a price, compared with the rent or profits derived from it. The converse of Smith's statement would, indeed, be much nearer the mark. And there are really no good grounds for thinking, supposing the stamp-duties on conveyances were abolished, that the price of land would be sensibly lessened.

That the existing system of conveying land is injurious, by obstructing its easy transfer from one individual to another, is admitted on all hands. That, however, depends on the difficulty of making up a good title to land, and not on the duty laid on the paper employed. The repeal of the latter would not, in any degree, facilitate proceedings. That must be effected by totally different means—by adopting a system of registration; and perhaps, also, by giving, in doubtful cases, a parliamentary title to land, as has been done with the encumbered estates in Ireland. Like other duties, those on the transfer of property should be reasonable, and they should affect all properties in the same proportion. If the stamp on the transfer of property worth L.1000 be L.10, that on the transfer of property worth L.10,000 or L.100,000 should be L.100 or L.1000; and so for all other amounts, whether greater or smaller.

Taxes on law proceedings.

Taxes on law proceedings fall upon the suitors; and consequently lay obstructions in the way of an injured party seeking redress in a court of justice. The impolicy and injustice of such taxes were ably exposed by Bentham, in his *Protest against Law Taxes*.

Stamp-duties on the voluntary sale of commodities fall, like other taxes on them, wholly on the consumer; for, unless such were the case, the commodities would not be offered for sale subsequently to the imposition of the duties. Thus, the duties on cards and dice, newspapers, &c., are wholly paid by those who use them. Such, too, is the case with the duties payable on licenses, to retail goods, to exercise professions, &c. The taxed party adds as much to the price of the articles in which he deals, or of the services which he performs, as is sufficient to indemnify him for the tax.

Stamp-duties first levied in Holland.

Stamp-duties were first levied in Holland. Most of the accustomed methods of taxation having been resorted to, the republic, in order to provide additional funds for carrying on her contest with the Spanish monarchy, offered a considerable reward to any one who should devise the best new tax. Among others, that of the *vectigal chartæ*, or stamp-duty, was suggested; and having been approved of, it was introduced by an ordinance issued in 1624, setting forth its necessity, and the benefits which it was supposed would result from its imposition.[1] Since that period, stamp-duties have become almost universal, and now form a very prominent branch of the revenue of almost every country; affording a striking example of the justice of Smith's caustic remark, that "there is no art which one government sooner learns of another than that of draining money from the pockets of the people" (p. 389).

Indirect Taxes.

Stamp-duties were introduced into England in 1671, by a statute entitled "An act for laying impositions on proceedings at law." The duties were at first granted for only nine years, and were afterwards continued for three years more, when they were allowed to expire. They were again revived in 1693, and have since been gradually and greatly increased.

Legacy duties in Rome.

Duties on Successions, or on the transfer of property from the dead to the living, are a very common species of tax. The *vicesima hereditatum*, or twentieth penny of inheritances, imposed by Augustus on the Romans, is the earliest example of such a tax. Dion Cassius (lib. lv.) informs us, that this duty was laid on all successions, legacies, and donations in case of death, except upon those to the nearest relations and to the poor. Pliny has given some of the reasons for this exception; in speaking of the *vicesima*, he calls it *tributum tolerabile et facile hæredibus duntaxat extraneis, domesticis grave.* And a little after he adds, *Itaque illis* (that is, strangers) *irrogatum, his* (that is, near relations) *remissum, videlicet, quod manifestum erat, quanto cum dolore laturi, seu potius non laturi homines essent, distringi aliquid et abradi bonis, quæ sanguine, gentilitate, sacrorum denique societate meruissent, quæque nunquam ut aliena et speranda, sed ut sua semperque possessa, ac deinceps proximo cuique transmittenda, cepissent* (*Panegyricus*, cap. 37). In addition to these cogent reasons for exempting the successions of near relations from the *vicesima*, it may be observed, that the death of a father is seldom attended with any increase, and frequently with a considerable diminution, of revenue to such of his children as live in the same house with him; and when this is the case, the burdening of his inheritance with a heavy tax must be a serious aggravation of their loss. But if taxes on successions be always paid with much reluctance by the children and immediate relations of the deceased, it is quite otherwise when they fall to distant relations or strangers. Those on whom an unexpected or remote inheritance devolves, are glad to accept it on any condition; and uniformly pay such reasonable duties as may be laid on it with the greatest goodwill.

In England.

In England a stamp-duty has been charged since 1694 on the probates of wills disposing of personal property, and on letters of administration in cases where the possessors of such property have died intestate. The duties in both cases are as follows, viz.: (See Table, next page.)

Though sound in principle, these duties are assessed so as to be open to two very serious objections. In the first place, those on probates are very decidedly heavier when the successions are small and moderate than when they are large; and in the second place, those on letters of administration are heavier than those on probates.

Unjustifiable pressure of the tax on the smaller class of successions.

In illustration of the first and most important of these objections, the probate duty, as seen above, on a succession of L.1000, is L.30; and it follows, were the duty fairly assessed, that it should amount to L.1500 on a succession of L.50,000, and to L.3000 on a succession of L.100,000; whereas it really amounts to L.750 on the former, and to L.1500 on the latter; that is, to only half what it should be were the larger as heavily taxed as the smaller sums. It is impossible to say a word in excuse of a preference of this sort, which is as scandalous as it is unjust. If the duties on probates for the lower class of successions be too high, let them be reduced; but whether

[1] Beckman's *History of Inventions*, vol. i., p. 479, Eng. Trans.

Indirect Taxes.

Duties on Probates of Wills and Letters of Administration.

Indirect Taxes.

Values.	Probate rate of duty.	Letters of Administration rate of duty.	Values.	Probate rate of duty.	Letters of Administration rate of duty.
Above the value of L.20 and under L.50	L.0 0 0	L.0 10 0	Above the value of L.1500 and under 2000	L.40 0 0	L.60 0 0
50 100	0 0 0	1 0 0	2000 3000	50 0 0	75 0 0
20 100	0 10 0	0 0 0	5000 6000	100 0 0	150 0 0
100 200	2 0 0	3 0 0	8000 9000	160 0 0	240 0 0
200 300	5 0 0	8 0 0	9000 10,000	180 0 0	270 0 0
300 450	8 0 0	11 0 0	10,000 12,000	200 0 0	300 0 0
600 800	15 0 0	22 0 0	20,000 25,000	350 0 0	525 0 0
800 1000	22 0 0	30 0 0	50,000 60,000	750 0 0	1125 0 0
1000 1500	30 0 0	45 0 0	100,000 120,000	1500 0 0	2250 0 0

And so on to L.1,000,000 and upwards, which pays a probate duty of L.15,000, and a duty on letters of administration of L.22,500. (See tables annexed to the act 55 Geo. III. c. 184.)

this be done or not, an end should, at all events, be made of the offensive and contradictory anomaly that now exists, by subjecting all probates, whether the successions be great or small, to the same rate of duty.

The duties on letters of administration and probates should be identical, and should extend to all sorts of property.

The charging letters of administration with higher duties than probates, is equivalent to imposing higher duties on property left intestate than if it were left by will. But it is difficult to discover any sufficient reason for such a distinction. The intestacy of individuals is always prejudicial to their heirs; and to impose a higher duty on property so left appears to be a wanton aggravation of the injury done the latter by accidental circumstances, or by the neglect or carelessness of their predecessors.

But the principal defect of the probate and administration duties does not, after all, consist so much in their inequality, as in the contracted sphere of their operation. They affect only personal property. But there is no ground whatever why it should be subjected to a peculiar tax of this description. The duty should either be repealed or extended to all sorts of property. And supposing the latter alternative is adopted, and the duty made to apply equally to all descriptions and amounts of property, it would not be open to a single good objection, and would yield a large sum. But as at present (1860) constituted, the duties on probates and administrations are partial, unjust, and, in truth, subversive of all sound principle.

Duties on successions.

Besides those on probates and letters of administration, duties are imposed on legacies and successions to real and other property. These vary in amount according to the propinquity of the legatees or heirs to the deceased. They are 1 per cent. on property passing to a child or parent, or to any lineal descendant or ancestor of the deceased; 3 per cent. when it passes to a brother or sister, or their descendants; 5 per cent. when it passes to uncles or aunts, or their descendants; 6 per cent. when it passes to great uncles and aunts, &c.; and 10 per cent. when it passes to other relations or strangers.

This duty was first imposed in 1780. But for a lengthened period it only affected personal property; and it was not till 1853 that it was extended to all sorts of property, whether personal or real (16 and 17 Vict. c. 51). Besides being required to obviate the injustice of exempting one description of property from a duty that was imposed on others, it was supposed that the extended tax would yield a large amount of revenue. But in this respect the anticipations of its projectors have not been realised. Owing, however, to the returns of the tax on real and personal property being mixed up together, it is not possible to specify the exact amount of each. But of L.2,211,822, the entire produce of the succession duty in the year ended 31st March 1859, it is believed that not more than from L.650,000 to L.750,000 was derived from real property. This comparatively limited produce appears to be a consequence partly of fixed property descending more in the direct line than personal property, and of a greater portion of it being in consequence subjected to the low duty of 1 per cent. We believe, however, that the mode of assessing the tax on real property has been mainly instrumental in reducing its produce below what was anticipated. If a stranger were to succeed to L.10,000 personal property, he would be charged with 10 per cent., or L.1000 of duty; but if he succeed to land, or other real property worth an equal sum, he is otherwise treated. In this case he is not regarded as an absolute proprietor, but merely as an annuitant. And the present value of the annuity to which he has succeeded is deduced from a computation founded on the annual value (under certain specified deductions) of the property, the age of the successor or legatee, and the annuity tables appended to the act. We cannot, however, but think that the mode of charging the duty, as well as the duty itself, should be identical on all sorts of property; and that if an individual succeed to an estate or other real property, which is worth, or would sell for a certain sum, the duty should be imposed on that amount. This would be a plain and apparently an equitable proceeding; for it is not easy to see why one variety of property should be dealt with in one way, and another in a different way.

It may be said, perhaps, that the reason of the discrepancy is to be found in the fact that real property is frequently subjected to entails and family settlements, and that its inheritors are then merely annuitants. But, though this be the case, still it is to be borne in mind that a vast deal of property is not subject to such fetters; and that, in the great majority even of the cases in which it is fettered, the heirs are the very parties to whom the holders would leave the property were it at their free disposal; so that, in these instances, it is really equivalent to a perpetuity, and may, without any sort of injustice, be treated as such. On the whole, therefore, and admitting that it might at first occasion some hardship, we are clear that the tax should be imposed in the same way on fixed as on personal property. Its operation, in time to come, being known to all who have settlements to make, their successors could not complain of the tax affecting them injuriously; for, if it really subjected them to any peculiar inconvenience, the blame would not be ascribable to it, but to those by whom the property had been settled.

The result of the present system of assessing the tax on real property is such, that it is not supposed to yield a third part of what it would yield were it assessed in the same way that it is assessed on money and other personal property. And it would require very conclusive reasons to justify a distinction of this sort. But, as we have seen, none such really exist. The sooner, therefore, that this discrepancy is terminated, and the duty assessed in the same

Indirect Taxes.

way on all descriptions of property, the better will it be for all parties. Anything like even the appearance of favouritism in taxation should be carefully guarded against. It is uniformly productive of the worst results; and is especially objectionable when, as in the present case, it is manifested on the side of the richer and more powerful classes.

Objection to legacy duties.

Apart from any inequality in their assessment, it has been objected to taxes on successions, or on the transfer of property from the dead to the living, that they mostly fall on capital, without occasioning any effort to replace it, either by increased exertion or economy. If a legacy of L.1000 be subject to a tax of L.100, the legatee considers, it is said, his legacy as only L.900, and feels no particular inclination to save the L.100 from his expenditure; whereas, had he received the whole L.1000, and been required to pay L.100 in taxes on income or commodities, the desire to preserve his capital unimpaired would have prompted him to endeavour to defray the tax by greater industry and economy. But we doubt whether much weight should be attached to these statements. The great bulk of property goes to immediate descendants; and on that the tax is so inconsiderable, that, though it were doubled, as has sometimes been suggested, it would have but little influence. And as those who leave property to strangers or distant relations know that it will be subject to the tax, that circumstance must have more or less influence in leading them to make some provision for its payment. The tax, too, is charged at the time when it is most convenient for the contributors to pay it, that is, when the legacies, or properties on which it is levied, are acquired. And being easily assessed and collected, it appears, supposing it to be properly limited, and justly imposed, to be in most respects as little injurious as the greater number of other taxes.

Postage of letters.

7. *Postage of Letters.*—The conveyance of letters by post has, in almost all countries, been conducted by the agents of government; and it is one of the few industrial undertakings which appear to be better managed by them than they could be by private individuals. This species of conveyance was originally established by the Roman emperors for the safe, regular, and speedy transmission of the public despatches to the most remote parts of their dominions; and such was also the purpose for which posts were first established in modern Europe by Louis XI. Subsequently, however, private individuals were allowed to avail themselves of this institution for the conveyance of their letters; and governments, by imposing higher duties, or rates of postage, on the letters and packages sent through the post-office, than are sufficient to defray the expense of the establishment, have rendered it productive of a considerable revenue.[1] Nor, while the rates of postage are judiciously restricted, is there perhaps a more eligible species of tax. The English post-office was placed on nearly its present footing in 1649, by the exertions of Mr Edmund Prideaux, attorney-general to the Commonwealth. (Blackstone's *Commentaries*, i., p. 321.)

New system introduced in 1839.

A great change was effected in 1839 in the postage of letters. Previously to that date they were charged at rates varying with the distance conveyed, but so that, at an average, the postage amounted to about 7d. or 7½d. for a single letter. And the fact that the post-office revenue had continued nearly stationary during the twenty years ending with 1838, notwithstanding the vast increase in that period of population and of the intercourse between the different parts of the empire, was a conclusive proof that the rates of postage had been carried to a vicious excess; and that in the arithmetic of the post-office, as well as of the customs, two and two, instead of always making four, sometimes make only two. The effectual reduction of these rates was therefore urgently required, not only because of the importance to a commercial and manufacturing community, of having the charge for the conveyance of correspondence fixed at a moderate amount, but because it was all but certain that moderate rates of postage would be more productive of revenue. It did not however follow that because an average charge of 7d. or 7½d. each, on all letters conveyed by post, was very decidedly too much, that an invariable charge of 1d., whether the letter were conveyed one mile or 1000 miles, was the precise limit that should be adopted. This was to rush from one extreme to another, and to endanger a considerable amount of revenue without any equivalent advantage. It must, indeed, be admitted that the proposal brought forward by Mr (now Sir) Rowland Hill for a uniform penny rate of postage had many recommendations in its favour. Being calculated at once to obviate trouble and save expense, it could not fail to be acceptable (what reduction of taxation is not?) to a large portion of the public, particularly to persons engaged in business. We believe, however, that the scheme was more indebted for its popularity to the oppressiveness of the old rates of postage than to any intrinsic merits of its own. Had these been reduced four or five years previously to a reasonable amount; that is, had letters of ½ oz. weight coming from Scotland or Ireland to London been reduced to 2d. or 3d., and other letters in proportion, and mercantile circulars been allowed to pass under covers open at the ends at 1d. or 2d. each, we venture to say that the clamour for a uniform rate of penny postage would not have made any way. But in this, as usually happens on similar occasions, those who refuse to make reasonable and necessary concessions at the outset, are in the end compelled to concede a great deal more than would at first have been satisfactory. This, at all events, was eminently true in the present instance. The clamour for a uniform penny rate became too powerful to be resisted; and parliament, whether it were so inclined or not, was obliged to lend its sanction to the measure. And under the provisions of the act 3 and 4 Victoria, cap. 96, it has been enacted that all inland letters, without regard to the number of enclosures, or the distance conveyed, provided they be paid when posted or despatched, are—

If not exceeding ½ oz. weight, charged 1d.; 1 oz., 2d.; 2 oz., 4d.; 3 oz., 6d.; and so on, 2d. being added for every additional ounce. At the outset of the system, all packets that weighed more than 16 oz. were sent to the Dead Letter Office, except:—

1. Parliamentary petitions and addresses to Her Majesty.
2. Parliamentary proceedings.
3. Letters and packets addressed to or received from places beyond sea.
4. Letters and packets to and from public departments.
5. Deeds, if sent open, or in covers open at the sides. They may be tied with string and sealed, in order to prevent inspection of the contents, but they must be open at the sides, that it may be seen that they are entitled to the privilege.
6. Bankers' parcels, despatched from London, and specially delivered at the General Post-Office, under certain regulations.

But now (1860) there are no limits to the weight, but merely to the bulk of the parcels sent by the post.

All letters not paid when they are posted or despatched, are charged double the above rates.

All parliamentary and official franking has been put an end to; but members of either house of parliament are entitled to receive petitions and addresses to Her Majesty, and petitions to parliament, free of charge, provided such petitions and addresses be sent in covers open at the ends, and do not exceed 32 oz. weight.

The punctual delivery of letters may be insured by getting them registered when posted. A fee of 6d., in the shape of additional stamps for that amount, is charged for the registration of each letter over and above the rate of postage to which it may be liable.

[1] Bergier, *Histoire des Grands Chemins de l'Empire Romain*, tom. i., p. 199.

Indirect Taxes.

To facilitate the working of the plan, government furnish adhesive stamps of 1d., &c., each, which being pasted on letters, they are of course delivered to those to whom they are addressed, free of any further charge for postage, and it also furnishes stamped envelopes at the low rate of 24 for 2s. 3d.; the 3d. being for the paper and manufacture. Hence, as any quantity of stamps or of stamped envelopes may, in most parts of the country, be procured beforehand, the inconvenience that must otherwise have attended the paying the postage at the moment when letters are posted has been pretty well obviated.

Such are the more prominent features of the new system, and no doubt it has the recommendations of simplicity (if we may apply such a phrase to a uniform charge for services costing widely different sums) and cheapness in its favour, and has greatly facilitated correspondence. But it may, notwithstanding, be easily shown that it should not have been adopted. It is, indeed, very convenient for merchants, bankers, middlemen, retail-dealers, and, in fact, for most persons, to get letters for 1d. that previously cost them 7d. or 7½d.; but this conveniency is not the only thing to be attended to in forming a fair estimate of the measure. The public exigencies require that a sum of about L.70,000,000 a year should be raised one way or other; and so long as we are pressed by an unreasoning necessity of this sort, it is not much to say in favour of the repeal or diminution of any tax, that those on whom it fell with the greatest severity are well pleased with its reduction. Sugar has, in England, become a necessary of life; and its consumption, to say the least, is quite as indispensable to the bulk of the people, and especially to the labouring classes, as the writing of letters. But would it, therefore, be a wise measure to repeal the duty on sugar, or to reduce it to 1s. a cwt.? It has been alleged, indeed, that taxes on the transmission of letters are objectionable on principle, and should be repealed, independently altogether of financial considerations! But it is easier to make an allegation of this sort than to prove it. All taxes, however imposed, if they be carried (as was the case with the old rates of postage) beyond their proper limits, are objectionable; but provided these be not exceeded, we have yet to learn why a tax on a letter should be more objectionable than a tax on the paper on which it is written, on the food of the writer, or on fifty other things.

Indirect Taxes.

It was contended, when the plan was under discussion, that there would be no loss of revenue, and that the increase of correspondence growing out of the reduction of the postage would be so immense as fully to balance the reduced rate of charge! But though there has been a great increase in the number of letters, it has fallen far short of this. Notwithstanding all that has been said about the *furor scribendi*, letter-writing is, perhaps, more generally looked upon as a duty than a pleasure; and it does not follow, when the expense of postage is reduced, that the occasions for writing letters are proportionally increased.

New system has occasioned a considerable loss of revenue.

The total gross receipt of the post-office revenue of the United Kingdom, deducting overcharges and returned letters, amounted, in 1838 (before the changes began), to L.2,346,278, while the expenses of the establishment for the same year amounted to L.686,768, leaving a nett revenue of L.1,659,510. In 1858, however, eighteen years after the new system had been in full operation, and the post-office had been converted into a great carrying establishment for the conveyance of books, &c., its gross revenue amounted to only L.3,087,535, while the expenses of the establishment for the same year amounted to L.1,926,103, leaving a nett revenue of only L.1,161,427, being L.498,083 under its amount in 1838. This, however, is not all. Of the post-office revenue in 1838, L.45,156 consisted of postage paid by public offices, which, being a mere charge by one government department against others, must be deducted in order to learn the nett available revenue produced by the post-office. Owing, however, to the abolition of franking, the postage charged against government departments is now greatly increased, and in 1858 amounted to no less than L.138,631. Hence it will be found, on deducting these sums, that in 1838, the post-office produced to government, over and above all charges, a clear and available income of L.1,614,354, which, in 1858, was sunk to L.1,022,796, being a nett diminution of L.591,558! The subjoined account sets these important particulars in the clearest point of view:—

Account showing the Gross and Nett Post-Office Revenue, and the Cost of Management, for the United Kingdom for the twenty-one years ending 5th January 1859.

Years.	Gross Revenue.*	Cost of Management.	Nett Revenue.	Postage charged on Government Departments.	Nett Revenue exclusive of charges on Government Departments.
	L.	L.	L.	L.	L.
1837	2,339,737	687,313	1,652,424	38,528	1,613,896
1838†	2,346,278	686,768	1,659,510	45,156	1,614,354
1839‡	2,390,763	756,999	1,633,764	44,277	1,589,487
1840§	1,359,466	858,677	500,789	90,761	410,028
Average of five years, 1841–45	1,658,214	1,001,405	656,809	112,468	544,341
" " 1846–50	2,143,717	1,304,772	838,944	110,798	728,146
" " 1851–55	2,569,836	1,441,334	1,128,502	157,003	971,499
1856	2,867,954	1,660,229	1,207,725	154,229	1,053,496
1857	3,035,713	1,720,815	1,314,898	135,517	1,179,381
1858	3,087,535	1,926,108	1,161,427	138,631	1,022,796

* Namely, the gross receipts after deducting the returns for "refused letters," &c.

† 1838 was the last complete year before the general reduction of postage.

‡ On 5th December 1839, the maximum inland postage for a single letter was reduced to 4d.

§ On 10th January 1840, the postage on all inland letters weighing not more than half an ounce was reduced to a uniform charge of 1d.

It is plain, therefore, that the adoption of the new post-office system has occasioned the sacrifice of nearly L.600,000 a year of revenue, as compared with the revenue of 1838. And considering the extraordinary progress of the country in the interval, and especially the increase of population and commerce, the loss will immediately be seen to be very much greater, perhaps more than double that amount. And though it be true that this great sacrifice might not, under other circumstances, have been of much consequence, it is to be borne in mind that it was incurred when the revenue was inadequate to meet the expenditure, and when, consequently, the deficiency had to be otherwise provided for. We should not, however, have thought the loss of revenue, nor even the introduction of a uniform penny rate, a valid objection to the new plan, had there been no means other than its adoption of getting rid of the inconveniences attached to

Indirect Taxes.

the old system. But such was not the case. All its defects might have been effectually obviated without any, or with but a very inconsiderable loss of revenue. Had franking been abolished, and the old rates of postage so reduced that the average charge might have been about 2½d. or 3d. a letter, the revenue would not, probably, have lost anything, while every really advantageous object effected by the present system would have been secured. Indeed, we see no good reason why the present rate of postage should not be considerably increased. Were the 1d., for example, which is now charged upon letters weighing ½ an oz. increased to 2d., the 2d. on letters weighing an oz. to 3d., and so on, adding 1d. to each of the present rates of charge, the revenue would, it is probable, be nearly doubled, with little or no inconvenience to the public.

It redounds nothing to the credit of the new system that the post-office revenue increases while it is maintained, that being a consequence of the increasing population, wealth, commerce, and education of the country. The revenue would increase quite as fast under any reasonably well-contrived system; all taxes on articles in general use are sure, provided they be not excessive, to increase with every increase of population and wealth.

The abolition of franking, which, however, is in nowise connected with a penny rate of postage, was by far the least exceptionable of the alterations introduced in 1839. Franked letters were in most instances addressed to those who could best afford to pay the expense of postage; and who in this way escaped a burden that fell with its full weight on their less opulent and less known neighbours.

8. *License Duties.*—These, as the name implies, consist of duties or charges laid on those persons who exercise certain trades or professions, or who undertake or perform certain works or acts. They are principally levied upon the keepers of hotels and public-houses, brewers, distillers, maltsters, dealers in beer, spirits, wines, coffee, tea and tobacco, bankers, &c.; and during the current year (1860) a variety of petty charges have been imposed in connection with the loading and unloading of goods, their removal when under bond, &c. Though easily imposed and collected, these duties are very often unequal and unfair. It is but seldom that they can be assessed according to the amount of business transacted by those who pay them; and unless this be done, they press very heavily upon those who carry on limited businesses, while they are hardly felt by extensive traders. In all, they have recently produced about L.1,650,000 a year.

The limits within which this article must be confined will not allow us to inquire at greater length into the incidence of duties on commodities. And referring for further details on that matter to our *Treatise on Taxation*, we proceed briefly to investigate the limits within which taxes on commodities should be confined so as to produce the greatest amount of revenue.

Sect. III.—*Circumstances which determine the extent to which Taxes should be laid on Commodities—Causes of Smuggling—Means by which it may be prevented.*

Low duties most productive.

The capacity of taxes on commodities to raise a revenue depends, *first*, on the nature and extent of the demand for the commodities; and, *second*, on the facility with which they may be prevented from being smuggled. Every tax tends, by raising the price of the commodity on which it is laid, to bring it within the command of a smaller number of purchasers, and to lessen its consumption.[1] An individual who might be able and disposed to pay a duty of 1s. a bottle on wine, might neither have the means nor the inclination to pay 2s. or 3s.; and, instead of being augmented, the revenue might be diminished by such increase of duty. And hence, whenever the duties on commodities are carried beyond a certain limit—a limit, however, which it is impossible to define, and which must necessarily vary according to the nature of the commodities on which duties are laid, and the varying tastes and circumstances of society—their effect is to depress consumption to such an extent as to render them less productive than if they were lower.

Indirect Taxes.

Variations in the amount of the duties affecting commodities have exactly the same effect on their price, and consequently on their consumption, as corresponding variations in the cost of their production. But it is clear that a reduction in the price of commodities, whose natural cost is very considerable, and which can, therefore, be used only by the rich, will not have so powerful an effect in increasing consumption as a corresponding reduction would have were it made from the price of cheaply-produced commodities in general demand. A fall of 50 per cent. in the price of coaches would not add greatly to their sale; for, notwithstanding this reduction, they would still be luxuries, which none but the rich could afford to use; whereas a fall of 50 per cent. in the price of spirits, beer, tobacco, sugar, or any article in general request, would extend its sale in a much greater ratio. The reason is, that the middle and poorer classes form by far the most numerous portion of society; and as such commodities are even now extensively used by them, a fall of 50 per cent. in their price would bring them fully within their command, and thereby add greatly to their consumption. The truth of this observation is strikingly exemplified in the case of cotton goods. At the accession of George III. in 1760, the price of cottons, owing to the difficulty of their production, was extremely high, and the value of the cotton goods annually brought to market did not exceed L.200,000. But, thanks to the genius and inventions of Hargreaves, Watt, Arkwright, Whitney, Crompton, and others, the price of cottons has been so far sunk that they have been brought within reach of the poorest individuals; and the increase of demand growing out of this fall of price has been so vast that the value of the cottons annually manufactured in Great Britain, and either disposed of at home or sent abroad, amounts, according to a moderate estimate, to the amazing sum of FIFTY-TWO MILLIONS! It is obvious, however, had cottons been loaded with high duties, and that reduction in their price which has been a consequence of the improvement of machinery been brought about by a reduction of the duties affecting them, the result would have been the same. The demand would have equally increased; and the greater consumption of low-taxed articles would have rendered the reduced duties more productive than the higher. Similar effects have uniformly followed from similar causes; low or reasonable duties on commodities in general demand being invariably found to be more productive than when they are carried to an oppressive height, and more productive than high duties on commodities used only by the rich.

High duties encourage smuggling.

Besides diminishing the revenue by diminishing consumption, too high duties tend to diminish it by encouraging and promoting the ruinous trade of smuggling. The risk of being detected in the smuggling of commodities, under any system of fiscal regulations, may always be valued at a certain rate; and whenever the duties exceed its amount, smuggling will be practised. Now, there are plainly but two ways of checking this nefarious practice—either the temptation to smuggle must be diminished by lowering the duties, or the difficulties in the way of smuggling must be increased. The first is obviously the most

[1] But, as already seen, this tendency may be, and often is, partially, and sometimes wholly, counteracted by the greater economy and invention of the producers.

Indirect Taxes.

natural and efficient mode of effecting the object in view; but the second has been most generally resorted to. In the great majority of cases governments have attempted to suppress smuggling without reducing duties, by establishing a more vigilant system of collection, and by increasing the number and severity of the penalties affecting the smuggler. But these attempts have for the most part proved signally unsuccessful. And it has been almost invariably found, that no vigilance on the part of the revenue officers, and no severity of punishment, can prevent the smuggling of commodities loaded with oppressive duties. The smuggler is generally a popular character; and though we have no desire to become the apologists of those who endeavour to defraud the revenue, and injure the fair trader, it is idle to expect that the bulk of society should regard those who furnish them with cheap tea, gin, whisky, brandy, &c., as guilty of any very heinous offence.

"To pretend," says Adam Smith, "to have any scruple about buying smuggled goods, though a manifest encouragement to the violation of the revenue laws, and to the perjury which almost always attends it, would in most countries be regarded as one of those pedantic pieces of hypocrisy, which, instead of gaining credit with any body, seems only to expose the person who affects to practise them to the suspicion of being a greater knave than most of his neighbours. By this indulgence of the public, the smuggler is often encouraged to continue a trade which he is thus taught to consider as in some measure innocent; and when the severity of the revenue laws is ready to fall upon him, he is frequently disposed to defend with violence what he has been accustomed to regard as his just property; and from being at first perhaps rather imprudent than criminal, he at last too often becomes one of the hardiest and most determined violators of the laws of society" (p. 407. See also Montesquieu, *Esprit des Loix*, liv. xiii., cap. 8.)

A reduction of duties the only effectual means of preventing smuggling.

To create, by means of high duties, an overwhelming temptation to indulge in crime, and then to punish men for indulging in it, is a proceeding completely subversive of every principle of justice. It revolts the feelings of the people, and makes them take an interest in the worst characters—for such smugglers generally are—espouse their cause, and avenge their wrongs. A punishment not proportioned to the offence, and which does not carry the sanction of public opinion along with it, is never productive of any good effect. The true way to suppress smuggling is to render it unprofitable; to diminish the temptation to engage in it; and this is not to be done by surrounding the coasts with cordons of troops, multiplying oaths and penalties, and making the country the theatre of ferocious contests in roads and bye-lanes, and of perjury and chicanery in the courts of law, but simply by reducing the duties on smuggled commodities. We must seek in this, and in this only, for an effectual check to smuggling. Whenever the profits of the fair trader become nearly equal to those of the smuggler, the latter is forced to abandon his hazardous profession. But so long as oppressively high duties are kept up, or, which is really the same thing, so long as a high bounty is held out to encourage the adventurous, the needy, and the profligate, to enter on this career, we may be assured that an army of excise officers, backed by the utmost severity of the revenue laws, will be insufficient to hinder them. The truth is, that the too great severity of these laws prevents their execution. "It stimulates the trader to corrupt the officer to conceal a fraud; and it influences the officer to overlook what he would otherwise discover." (Hamilton *On the Principles of Taxation*, p. 244.)

Heavy duties on any description of commodities will occasion smuggling; but it is chiefly caused by their being laid on commodities in general demand, whose natural or necessary price is not very considerable. It is commonly said, when a proposal is made for laying a heavy duty on a low-priced article, that its lowness of price fits it to bear such a duty, and that, notwithstanding its imposition, it may still be brought to market at a sufficiently moderate rate. But the encouragement of smuggling depends more on the proportion which the duty bears to the price of the commodity than on the circumstance of its being absolutely high or low. To illustrate this principle, let us suppose that a taxed commodity, as soap, costs, exclusive of duty, 10d. per lb. If a duty of a penny per lb. were laid on it, the inducement to smuggle would be equal to 10 per cent. of the value of the article; and if the duty were 2d., the inducement would be 20 per cent., and so on. Now, let us suppose that the cost of producing the soap, or its natural price, falls to 5d.: a duty of a penny per lb. would then make an inducement to smuggle of 20 per cent. of its value, and a duty of 2d. would make an inducement of no less than 40 per cent. And hence it is obvious that, in order to prevent smuggling, a system should be adopted precisely the reverse of that which is generally followed in the imposition of taxes. Instead of making duties vary inversely as the price of commodities; that is, instead of raising them when the cost of producing the articles on which they are laid is diminished, and reducing them when it is increased, they should be made to vary directly as this cost—rising when it rises, and falling when it falls. Disproportionally heavy taxes are the great cause of smuggling; and they have the further and most injurious effect of preventing its being corrected by its natural and proper punishment; that is, by the confiscation of the smuggled commodities. Recourse is, in consequence, had to extraordinary pains and penalties, and all proportion of punishment being done away, "men who," as Montesquieu observes, "can hardly be considered as culpable, must be punished as atrocious criminals" (*Esprit des Loix*, liv. xiii., cap. 8).

Indirect Taxes.

Duties should vary directly as the price of the commodity.

Certain commodities, from their greater bulk, from their susceptibility of being impressed with a permanent stamp, or other cause, are less liable to be smuggled than others, and may therefore be loaded with comparatively high duties. But, as a general rule, it cannot be doubted, that, to prevent fraud, the duties should be proportioned to the cost of the articles on which they are laid.

Sect. IV.—*Comparative Productiveness of High and Low Taxes.*

The arguments adduced in the foregoing section are sufficient to establish the superior productiveness of moderate taxes. But the subject deserves to be treated at greater length; and as the history of taxation furnishes numerous, conclusive, and well-established proofs of the soundness of this conclusion, we shall take this opportunity to bring one or two of them under the notice of our readers. They may be classed under two different heads—the *first* consisting of instances in which a reduction of duty has been followed by an increase of revenue; and the *second*, of instances in which an increase of duties has been followed by a diminution of revenue.

History of the tea duties.

1. The reductions made in the duties on tea in 1745 and 1784 strikingly evince the superior productiveness of low duties on articles in general demand. Previously to 1745, the excise duty of 4s. a lb. on tea yielded, at an average, about L.150,000 a year; showing, had there been no smuggling or adulteration, that the consumption was equal to about 750,000 lb. But it was well known that smuggling was then carried to a great height, and that the real was much greater than the apparent consumption of tea. To put a stop to this clandestine importation, a bill was introduced into Parliament in 1745, in pursuance of the recommendation of a committee of the House of Com-

Indirect Taxes.

mons, and passed into a law, by which the excise duty of 4s. was reduced to 1s., and 25 per cent. *ad valorem*. This measure was signally successful. In 1746, the year immediately subsequent to the reduction, the sales of tea for home consumption amounted to above *two millions* of pounds weight, and the revenue was increased to L.243,309. But to exhibit the effects of this wise and salutary measure in a still clearer point of view, we subjoin an account of the nett produce of the tea duties, from 1743 to 1748 both inclusive. In

1743	it amounted to	L.151,959
1744	„	147,065
1745	„	145,630
1746	(duties reduced)	243,309
1747	„ „	257,937
1748	„ „	303,545

But notwithstanding this unanswerable demonstration of the superior productiveness of low duties, they were again increased in 1748; and fluctuated, between that epoch and 1784, from 64 to 119 per cent. *ad valorem*. The effects which followed this inordinate extension of the duties are equally instructive with those which followed their reduction. The revenue was not increased in anything like a corresponding proportion; and, as the use of tea had become general, smuggling was carried to an infinitely greater extent than at any former period. In the *nine* years preceding 1780, above 118,000,000 lb. weight of tea were exported from China to Europe in ships belonging to the continent, and about 50,000,000 lb. in ships belonging to England. But from the best information attainable, it appears that the real consumption was almost exactly the reverse of the quantities imported; and that, while the consumption of the British dominions amounted to above 13,000,000 lb. a year, the consumption of the continent did not exceed 5,500,000 lb. If this statement be nearly correct, it follows that an annual supply of about *eight* millions of pounds must have been clandestinely imported into this country, in defiance of the revenue officers. But this was not the worst effect of the high duties; for many of the retail dealers who purchased tea at the East India Company's sales, being in great measure beaten out of the market, were tempted, that they might put themselves in a condition to stand the competition of the smugglers, to adulterate their teas by mixing them with sloe and ash leaves. At length, in 1784, after every other resource for the suppression of smuggling had been tried in vain, Mr Pitt resolved to follow the precedent of 1745, and reduced the duty on tea from 119 to 12½ per cent. This measure was as successful as the former. Smuggling and the practice of adulteration were immediately put an end to. The following statement shows that the quantity of tea sold by the East India Company was about trebled in the course of the *two* years immediately following the reduction.

The quantity of tea sold at the East India Company's sales amounted to, in

1781		5,023,419 lb.
1782		6,283,664 „
1783		5,857,883 „
1784	(duties reduced)	10,148,257 „
1785	„ „	16,307,433 „
1786	„ „	15,093,952 „
1787	„ „	16,692,426 „

While the quantity of tea sold at the Company's sales was thus rapidly augmenting in consequence of the reduction of the duty, the quantity of tea imported into the continent from China, which had, in the year 1784, amounted to 19,027,300 lb., declined with still greater rapidity, and, in 1791, was reduced to only 2,291,500 lb.[1]

The duties on tea, at an average of the five or six years preceding 1784, produced about L.700,000 a-year. And, at the same time that they were reduced to 12½ per cent., an additional duty, estimated to produce L.600,000, was laid on windows as a *commutation* tax, to compensate for the deficiency which it was supposed would take place in the revenue formerly derived from tea. But instead of the duties falling off in the proportion of 119 to 12½, or from L.700,000 to L.73,000, they only fell off, in consequence of the increased consumption, in the proportion of about *two* to *one*, or from L.700,000 to L.340,000. The commutation act has been always regarded as one of the most successful financial measures adopted in the course of Mr Pitt's administration. It was generally understood at the time to have been suggested by Mr Richardson, accountant-general to the East India Company. But the popularity of the measure was so great as to induce other individuals to claim this honour, and even to occasion some hot disputes on the subject in the House of Commons. In point of fact, however, the merit of having first proposed the plan did not belong either to Mr Richardson, or to any one of those who then claimed it. Such of our readers as will take the trouble to look into a pamphlet by Sir Matthew Decker (*Serious Considerations on the present High Duties*), published in 1743, will find that the measure adopted in 1784 had been strenuously recommended forty years previously.

Indirect Taxes.

But the principle of the commutation act, and the striking advantage that had resulted from the reduction of the duty, were soon lost sight of. In 1795, the duty was increased to 25 per cent.; and after successive augmentations in 1797, 1798, 1800, and 1803, it was raised, in 1806, to 96 per cent. *ad valorem*, at which it continued till 1819, when it was raised to 100 per cent. on teas above 2s. per lb. The influence of these duties on consumption, and of the many changes that have since taken place, may be seen in the *Commercial Dictionary*, article "Tea."

Effects of the reduction of the spirit duties.

The narrow policy on which ministers have too frequently acted, puts it out of our power to refer to many such conclusive instances as the reduction of the tea duties in 1745 and 1784, in proof of the superior productiveness of diminished taxation. There are, however, some others which deserve to be pointed out. In 1742, the high prohibitory duties upon spirituous liquors, and upon licenses for retailing the same, were abolished, and such moderate duties imposed, to commence after Ladyday 1743, as were expected to increase the revenue, by increasing the legal consumption of spirits. This measure was vehemently opposed by the bishops; but their opposition was ineffectual, and the increase of the duties, and diminution of smuggling which followed, proved that the measure was advantageous alike to the revenue and the morals of the people. (*History of our Debts and Taxes*, part iv., p. 110.)

Reduction of the coffee duties.

Previously to 1732, the duty on coffee amounted to 2s. a pound; but an act was then passed, in compliance with the solicitations of the West India planters, reducing the duty to 1s. 6d. a pound; at which it stood for many years, producing, at an average, about L.10,000 a-year. In consequence, however, of the prevalence of smuggling, caused by the too great magnitude of the duty, the revenue declined, in 1783, to L.2869, 10s. 10½d. And, having been found impossible otherwise to check the practice of clandestine importation, the duty was reduced, in 1784, to 6d. The consequences of this wise and salutary measure were most beneficial. Instead of being reduced, the revenue was immediately raised to above two and a half times its previous amount, or to L.7200, 15s. 9d., showing that the consumption of legally imported coffee must have increased in *a nearly ninefold proportion;* a conclusive proof, as Mr Bryan Edwards has observed, of the effects of heavy taxa-

[1] See *Treatise on Taxation* by the author of this article, 2d ed., pp. 342–346.

Indirect Taxes.

tion in defeating its own object (*History of the West Indies*, vol. ii., p. 340, 8vo. ed.)

The history of the coffee trade abounds with similar and even more striking examples of the superior productiveness of low duties. In 1807, the duty was 1s. 8d. a pound; and the quantity entered for home consumption amounted to 1,170,164 lb., yielding a revenue of L.161,245, 11s. 4d. In 1808, the duty was reduced from 1s. 8d. to 7d.; and in 1809 there were no fewer than 9,251,847 lb. entered for home consumption, yielding, notwithstanding the reduction of duty, a revenue of L.245,856, 8s. 4d. The duty having been raised in 1819 from 7d. to 1s. a pound, the quantity entered for home consumption in 1824 was 7,993,041 lb., yielding a revenue of L.407,544, 4s. 3d. In 1824, however, the duty being again reduced from 1s. to 6d., the quantity entered for home consumption in 1825 was 11,082,970 lb. In 1830 it had increased to 22,669,253 lb., producing a nett revenue of L.579,363. Various changes have since taken place in the rate of duty, which amounts at present (1859) to 3d. per lb. In 1858, no fewer than 35,208,932 lb. were entered for consumption, producing a revenue of L.440,475; and it is to be observed that this great increase in the consumption of coffee has taken place, not only without any diminution, but with a very material increase, in the consumption of tea.

Reduction of the duties on fish sold in Paris.

The history of other countries abounds with equally conclusive examples of the superior productiveness of moderate duties. In 1775, Turgot deducted a *half* from the customs and other duties chargeable on the fish sold in the Paris market; and notwithstanding this reduction, the amount of the duties collected was not diminished. The demand for fish must therefore have been doubled, in consequence of the inhabitants being enabled to buy it at a comparatively cheap rate.[1]

Reduction of the duties on sugar imported into France.

In 1813, all sugar imported into the French empire paid a duty of 1 franc 60 cent. the *livre* or pound. The quantity imported that year amounted to about 14,000,000 of pounds, which, as France, and the countries then incorporated with her, contained about 42,000,000 of inhabitants, gives the *third* part of a pound weight to each. In 1814, this exorbitant duty was reduced to about a *fifth* part, or to 30 cent. the pound; and though the population of France had then been reduced from 42,000,000 to about 28,000,000, the average annual importations of 1814 and 1815 amounted to 44,000,000 of pounds, being upwards of 1½ lb. to each individual, or about *five* times as much as the consumption had amounted to under the high duty. In consequence of this increase of consumption, the low yielded very nearly as large a revenue as the high duty. (*Richesse des Nations*, par Garnier, v., p. 304, 2de éd.)

Salt duty in France.

In France, previously to the Revolution, the average annual consumption of salt in the provinces subjected to the *grande gabelle*, or high duty on salt, was estimated by Necker, who had the best means of coming to a correct conclusion, at 9⅛ lbs. to each individual, and at 18 lbs. in the *pays redimées*, or provinces that had purchased an exemption from the greater part of this hateful tax. (*Administration des Finances*, tom. ii., p. 12.) It is evident, from this well-authenticated statement, that a very great reduction might have been made from the duty paid on the salt consumed in the heavily taxed provinces without occasioning any diminution of revenue; while, besides directly increasing the comforts of the people, it would have relieved government from the necessity of surrounding numerous provinces with cordons of troops, and would have put a stop to that smuggling of salt, which occasioned the sending of between 3000 and 4000 persons every year either to prison or the galleys. (Arthur Young's *Travels in France*, vol. i., p. 598.)

Indirect Taxes.

Reduction of the duties on provisions in Spain.

Ustariz gives a variety of instructive details respecting the disastrous effects which certain taxes have had on industry in Spain, and of the advantages resulting from the repeal and modification of others. We shall give a single example. Valencia, he tells us, though barren of grain and flocks, and not equal in extent to two-thirds of Aragon, paid a much larger revenue to the royal treasury. This, he says, was owing to the comparatively flourishing state of commerce and manufactures in Valencia; and he then adds,—"This increase and improvement in manufactures and commerce is ascribed to the equitable and kind treatment the weavers receive in that province, and to his majesty's goodness in reducing the excessive taxes which were charged upon flesh-meat and other provisions; and his taking off wholly that which was laid on bread in ancient times; as also the imposts known by the name of ancient duties and generalities. These duties were partly replaced by others, but in such a manner that they were rendered much lighter, the people in general eased, and the royal revenue improved."[2]

Effects of the increase of the duties on wine.

2. But the superior productiveness of low duties on articles in general demand may be equally shown from the inconsequences of the attempts to increase them beyond their proper limits. The history of the wine duties is, in this respect, highly important. During the three years ending with 1792, when the duty on French wines was 3s. 9d., and on Portuguese 2s. 6d. per wine gallon, the consumption in Great Britain amounted, at an average, to 7,410,947 gallons a year, producing about L.900,000 of revenue. It is probable, had the increase taken place gradually, that these duties might have been doubled without any material diminution of consumption. But in 1795 and 1796 they were raised to 8s. 6d. per gallon on French, and to 5s. 8¼d. per gallon on Portuguese and Spanish wine; and the consequence of this sudden and inordinate increase was, that the consumption fell from nearly 7,000,000 gallons in 1795, to 5,732,383 in 1796, and to 3,970,901 in 1797. But this unanswerable demonstration of the ruinous effect of heavy and sudden additions to the duties did not prevent their being raised, in 1804, to 11s. 5½d. on French, and to 7s. 8d. on Portuguese and Spanish wine. They continued at this rate till 1825; and such was their influence, assisted, no doubt, by the greater prevalence of temperate habits, that, notwithstanding the vast increase of wealth and population since 1790, and the general improvement in the style of living, the consumption of wine, during the three years ending with 1824, amounted, at an average, to only 5,248,767 gallons a year, being 2,162,180 gallons under the annual consumption of the three years ending with 1792! It may therefore be truly said, making allowance for the increase of population, that the consumption of wine in Great Britain fell off more than 50 per cent. between 1790 and 1824.

Had Mr Vansittart continued in power, it is difficult to say when this system might have terminated; but no sooner had Mr Robinson (late Lord Ripon) become Chancellor of the Exchequer, than he resolved upon the effectual reduction of the wine duties. In pursuance of this determination, he took, in 1825, nearly 50 per cent. from the previously existing duties; and notwithstanding the spirit duties were at the same time reduced in a still greater degree, the consumption of wine was largely increased, while the loss of revenue was but inconsiderable. We are therefore justified in affirming that this measure was entirely successful, and that it is a valuable example of the superior productiveness of low duties.

---

[1] Say, *Traité d'Economie Politique*, tom. ii., p. 339. Lord Kames, in his *Sketches of the Hist. of Man*, states that these duties amounted to 48 per cent. *ad valorem*. Vol. ii., p. 406, edit. 1788.

[2] *Theory and Practice of Commerce*, vol. ii., p. 310, Eng. Trans.

Indirect Taxes.

The duties, as reduced by Mr Robinson, were 7s. 3d. per imperial gallon on French wines, 4s. 10d. per do. on all other foreign wines, and 2s. 5d. on those of the Cape of Good Hope. They continued on this footing till the equalization act (1 and 2 Will. IV., c. 30), which imposed a duty of 5s. 6d. per imperial gallon on all foreign wines, and of 2s. 9d. on those of the Cape.

Reduction of wine duties in 1860.

But, notwithstanding this reduction, the opinion has been gaining ground for some years past, that the wine duties were still too high. And it is not unlikely, had it been possible to assess them on an *ad valorem* principle, that they would have been placed years ago on an entirely different footing. But the difficulties in the way of assessing a duty on wine on the principle referred to were found to be insuperable; and as it was plain that no modification of the duty would be of much consequence which did not permit of the inferior continental wines being introduced at low prices, its reduction to 1s. a gallon began to be strongly recommended. And this project has been in so far adopted, that from and after the 1st January 1861, such wines as contain less than 18 per cent. proof spirit are to be admitted at the low duty of 1s. per gallon; while those that contain more than 18 and under 26 per cent. spirit, are to pay 1s. 6d.; and those that contain from 26 to 40 per cent. spirit, 2s. per gallon. Wine containing above 40 per cent. proof spirit is (as at present) to be excluded. In the meantime, all wines pay 3s. per gallon.

Such is the new measure in regard to the wine duties, and it will not be denied that it is of a bold and decisive character. Almost all the lowest, and many of the higher varieties of wine will be admitted at the low duty; and though the price of the superior wines is naturally so high that they will be but little affected by the reduction of the duty, such is not the case with the lower qualities of wine, of which the consumption will, it is probable, be a good deal increased. We doubt, however, whether it is desirable that they should make, or that they ever will make, any considerable way among the lower classes, or to such an extent as seriously to affect the consumption of beer or spirits. If they did, it would be necessary, to maintain the equality of taxation and do justice to all parties, to make considerable changes in the existing duties on malt and spirits. Experience, however, can alone enable us to form correct conclusions with respect to these matters. It is not possible to estimate beforehand, on anything like satisfactory grounds, what may be the ultimate effect of a measure which, like that now under our notice, involves so many conflicting considerations. We, however, are inclined to think that it will not be nearly so great as many suppose; and that, despite a large increase of consumption, there will be in the end a very considerable loss of revenue.

Duties on spirits.

There are perhaps no better objects of taxation than spirituous and fermented liquors, and none in which the injurious effects of over-taxation have been more strikingly manifested. They are essentially luxuries; and while, in consequence of their being very generally used, moderate duties on them are exceedingly productive, the increase of price which they occasion tends to lessen their consumption by the poor, to whom, when taken in excess, they are extremely pernicious. Few governments, however, have been satisfied with the imposition of moderate duties on spirits; but, sometimes to increase the revenue, and partly to place them beyond the reach of the poorer classes, have very generally loaded them with such oppressively high duties as have entirely defeated both objects. The imposition of duties does not take away the appetite for spirits. And as no vigilance of the officers, or severity of the laws, has been sufficient to secure a monopoly of the market to the legal distillers, the real effect of the high duties has been to throw the supply of a large portion of the demand into the hands of the illicit distiller, and to superadd the crimes and vices of the smuggler to those of the drunkard. Indirect Taxes.

Increase of the duties on spirits in Ireland.

Nowhere, perhaps, have the injurious consequences of the too great increase of spirit duties been more distinctly manifested than in Ireland. In proof of this, we may mention, on the authority of the *Fifth Report of the Commissioners of Inquiry into the State of the Irish Revenue* (p. 19), that, in 1811, when the duty on spirits was 2s. 6d. per gallon, duty was paid in Ireland on 6,500,361 gallons, Irish measure; while, in 1822, when the duty was 5s. 6d., only 2,950,647 gallons were brought to the charge. The Commissioners estimated the annual consumption of spirits in Ireland, at the same time, at about *ten* millions of gallons; and as scarcely *three* millions paid duty, it followed that *upwards of* SEVEN *millions were illegally supplied;* and, "taking *one* million of gallons as the quantity fraudulently furnished for consumption by the licensed distillers, the produce of the unlicensed stills may be estimated at six millions of gallons" (*Report*, p. 8). It is material, too, to observe, that this extraordinary amount of smuggling occurred in defiance of the utmost efforts of the revenue officers, police, and military, to prevent it; the only result of these efforts being the exasperation of the populace, and the committal of atrocities, both by them and by those employed in the collection of the revenue, that are hardly to be matched in the annals of civil warfare. "In Ireland," say the commissioners, "it will appear, from the evidence annexed to this Report, that parts of the country have been absolutely disorganized, and placed in opposition, not only to the civil authority, but to the military force of the government. The profits to be obtained from the evasion of the law have been such as to encourage numerous individuals to persevere in these desperate pursuits, notwithstanding the risk of property and life with which they have been attended" (p. 1).

Increase of spirit duties in Scotland.

The too great height to which the duties were carried, and the injudicious mode in which they were charged and collected, produced similar effects in Scotland. The system of illicit distillation made great progress, and seriously injured the morals and industry of the people in the mountainous districts, where it was principally carried on.

To put an end to such evils, the commissioners recommended that the duty on spirits should be reduced from 5s. 6d. to 2s. the wine gallon (2s. 4d. the imperial gallon); and government having wisely consented to act upon this recommendation, illicit distillation ceased forthwith.

Equalization of the duties on spirits.

Since this epoch, the duties on spirits have undergone many alterations. Down to a late period, the rates to which they were subjected differed in the different parts of the United Kingdom, which necessarily led to the imposition of sundry restraints on their conveyance from the one to the other, and to a great deal of smuggling. The mischievous influence of this differential arrangement was long obvious, but the difficulties in the way of the equalization of the duties were such that it has only been recently effected. Now, however, spirits are charged with the same duties whether they are produced or consumed in England, Scotland, or Ireland, and entire freedom has been given to the home trade in them. We fear, however, that the duty of 8s. a gallon with which they are charged will be found to be too high. It is true that the former facilities for illicit distillation have of late years been materially diminished both in Scotland and Ireland. But, despite this circumstance, the new duty is so very heavy, that it is affirmed by persons well-informed on the subject, that under its protecting influence, illicit practices will, most probably, be revived.

Indirect Taxes.

Account of the Quantities of Home-made Spirits charged with Consumption Duties, and specifying the Rates of Duty in each Division of the Empire since 1800, *with the total Amount of the Duty.*

Years.	England.		Scotland.		Ireland.		United Kingdom.	
	Imperial Galls. charged with Consumption Duty.	Rate of Duty.	Imperial Galls. charged with Consumption Duty.	Rate of Duty.	Imperial Galls. charged with Consumption Duty.	Rate of Duty.	Total Gallons.	Total Amount of Duty.
				Lowlands, per gallon of still content.				
		s. d. *s. d.*		*L. s. d.* *L. s. d.*		*s. d.*		*L. s. d.*
1800	4,352,888	4-10$\frac{11}{21}\frac{8}{0}$ 5-4$\frac{1}{21}\frac{6}{0}$	1,277,596	64 16 4 | 7 16 0$\frac{1}{4}$	1,330,500	2-4$\frac{1}{2}$	6,960,984	1,370,054 16 10
1801	2,555,920	5-4$\frac{1}{21}\frac{6}{0}$	295,931	... | ...	355,106	...	3,206,957	723,992 4 9
				per gall. of spirits. | per gall. of spirits.				
1802	3,981,072	..	1,158,558	3-10$\frac{1}{21}\frac{6}{0}$ | 3-4$\frac{1}{2}\frac{3}{3}$	4,715,098	2-10$\frac{1}{2}$	9,854,728	1,956,313 17 3
1803	5,370,377	5-4$\frac{1}{21}\frac{6}{0}$ 8-0$\frac{1}{21}\frac{1}{0}$	2,022,409	... | ...	4,343,095	2-10$\frac{1}{2}$ 3-6$\frac{3}{4}$	11,735,881	2,508,286 0 5
				Lowlands and Highlands.				
		s. d.		*s. d.*		*s. d.*		*L. s. d.*
1804	3,690,745	8-0$\frac{1}{21}\frac{1}{0}$	1,889,757	5-9$\frac{3}{4}\frac{3}{5}$ | 5-0$\frac{1}{2}\frac{6}{3}$	3,543,599	3-6$\frac{3}{4}$ 4-1	9,124,101	2,678,413 10 11
1805	4,932,645	...	1,625,987	... | ...	3,686,233	4-1	10,244,865	3,122,820 6 4
1806	4,094,985	...	1,812,237	... | ...	3,858,107	...	9,765,329	2,877,052 0 0
1807	4,747,365	...	2,653,478	5-8$\frac{3}{4}\frac{1}{1}\frac{4}{5}\frac{7}{5}$ | 5-0$\frac{1}{2}\frac{6}{3}$ 4-11$\frac{1}{2}\frac{1}{3}\frac{8}{8}$	5,597,204	...	12,998,047	3,863,053 10 2
1808	5,390,884	...	2,683,342	... | 4-11$\frac{1}{2}\frac{1}{3}\frac{8}{8}$	3,575,430	...	11,649,656	3,825,442 7 7
1809	4,035,825	...	1,315,135	... | ...	1,360,386	...	6,711,346	1,873,147 1 8
1810	4,787,555	...	1,748,140	... | ...	4,728,522	4-1 2-6$\frac{1}{2}$	11,264,217	2,543,404 14 4
1811	4,776,330	8-0$\frac{1}{21}\frac{1}{0}$ 10-2$\frac{3}{4}\frac{7}{1}\frac{7}{5}$	1,951,092	5-8$\frac{3}{4}\frac{1}{1}\frac{4}{5}\frac{7}{5}$ 8-0$\frac{1}{4}\frac{1}{3}\frac{1}{5}$ | 4-11$\frac{1}{2}\frac{1}{3}\frac{8}{8}$ 6-7$\frac{1}{2}\frac{3}{8}$	6,378,479	2-6$\frac{1}{2}$	13,105,901	2,969,136 6 5
1812	5,242,470	10-2$\frac{3}{4}\frac{7}{1}\frac{7}{5}$	1,687,905	8-0$\frac{1}{4}\frac{1}{3}\frac{1}{5}$ | 6-7$\frac{1}{2}\frac{3}{8}$	4,009,301	2-6$\frac{1}{2}$ 5-1$\frac{1}{4}$	10,939,676	4,176,977 13 2
1813	4,292,477	...	1,234,291	... | ...	3,158,693	5-1$\frac{1}{4}$ 5-7$\frac{1}{4}$	8,685,461	3,022,546 9 2
1814	4,956,965	...	1,474,187	... | ...	5,393,713	5-7$\frac{1}{4}$	11,824,865	4,527,011 2 2
				Lowlands and Highlands.				
1815	5,468,987	...	1,591,148	9-4$\frac{1}{2}\frac{3}{8}$	4,323,844	5-7$\frac{1}{4}$ 6-1$\frac{1}{2}$	11,383,979	4,897,006 11 3
1816	4,745,484	...	918,859	...	3,557,200	6-1$\frac{1}{2}$ 5-7$\frac{1}{4}$	9,221,543	3,911,981 10 5
1817	4,133,063	...	1,906,950	6-2	3,586,932	5-7$\frac{1}{4}$	9,626,945	3,757,766 9 11
1818	5,259,662	...	2,066,988	...	4,284,347	...	11,610,997	4,496,709 5 11
1819	4,146,505	10-2$\frac{3}{4}\frac{7}{1}\frac{7}{5}$ 11-8$\frac{1}{4}\frac{1}{1}\frac{8}{8}$	2,125,150	...	3,676,516	...	9,948,171	3,913,705 10 3
1820	4,284,798	11-8$\frac{1}{4}\frac{1}{1}\frac{8}{8}$	1,863,987	...	3,299,650	...	9,448,435	4,012,707 8 8
1821	4,125,616	...	2,385,495	...	3,311,462	...	9,822,573	4,085,673 14 11
1822	4,694,055	...	2,225,124	...	2,910,483	...	9,829,662	4,252,010 3 6
1823	3,803,312	...	2,303,286	6-2 2-4$\frac{3}{4}\frac{6}{3}$	3,590,376	5-7$\frac{1}{4}$ 2-4$\frac{3}{4}\frac{6}{3}$	9,696,974	3,407,449 17 2
1824	4,392,611	...	4,350,301	2-4$\frac{3}{4}\frac{6}{3}$	6,690,315	2-4$\frac{3}{4}\frac{6}{3}$	15,433,227	3,895,285 11 1
1825	3,684,049	...	5,981,549	...	9,262,744	...	18,928,342	3,884,830 6 5
1826	7,407,204	7-0	3,988,788	2-10	6,834,867	2-10	18,230,859	4,125,598 14 1
1827	6,671,562	...	4,752,199	...	8,260,664	...	19,684,425	4,178,508 8 2
1828	7,759,687	7-0	5,716,180	2-10	9,937,903	2-10	23,413,770	4,933,552 4 2
1829	7,700,766	...	5,777,280	...	9,212,224	...	22,690,270	4,818,781 0 6
1830	7,732,101	7-0 7-6	6,007,631	2-10 3-0 3-4	9,004,539	2-10 3-0 3-4	22,744,271	5,209,590 8 6
1831	7,434,047	7-6	5,700,689	3-4	8,710,672	3-4	21,845,408	5,189,661 2 6
1832	7,281,900	...	5,407,097	...	8,657,756	...	21,846,753	5,074,854 13 4
1833	7,717,303	...	5,988,556	...	8,168,596	...	21,874,455	5,253,513 19 2
1834	7,644,301	...	6,045,043	...	9,708,416	3-4 2-4	23,397,760	5,243,430 13 6
1835	7,315,053	...	6,013,932	...	11,381,223	2-4	24,710,208	5,073,276 4 6
1836	7,875,702	...	6,620,826	...	12,248,772	...	26,745,300	5,485,882 13 0
1837	7,133,869	...	6,124,035	...	11,235,635	...	24,493,539	5,006,697 9 2
1838	7,930,490	...	6,259,711	...	12,296,342	...	26,486,543	5,451,792 3 0
1839	8,186,552	...	6,188,582	...	10,815,709	...	25,190,843	5,363,220 1 0
1840	8,278,148	7-6 7-10	6,180,138	3-4 3-8	7,401,051	2-4 2-8	21,859,337	5,208,040 13 0
1841	8,166,985	7-10	5,989,905	3-8	6,485,443	2-8	20,642,333	5,161,610 15 6
1842	7,956,054	...	5,595,186	...	5,290,650	2-8 3-8	18,841,890	5,046,813 13 0
1843	7,724,051	...	5,593,798	...	5,546,483	3-8 2-8	18,864,332	4,903,201 10 2
1844	8,234,440	...	5,922,948	...	6,451,137	2-8	20,608,525	5,171,181 1 4
1845	9,076,381	...	6,441,011	...	7,605,196	...	23,122,588	5,749,794 0 10
1846	9,179,530	...	6,975,091	...	7,952,076	...	24,106,697	5,934,359 8 0
1847	8,409,165	...	6,193,249	...	6,037,383	...	20,639,797	5,234,003 0 2
1848	8,581,327	...	6,548,190	...	7,072,933	...	22,202,450	5,504,578 19 6
1849	9,053,676	...	6,935,003	...	6,973,333	...	22,962,012	5,747,218 1 0
1850	9,331,512	...	7,122,987	...	7,408,086	...	23,862,585	5,948,467 19 0
1851	9,596,368	...	6,830,710	...	7,550,518	...	23,976,596	6,017,218 7 4
1852	9,820,608	...	7,172,015	...	8,208,256	...	25,200,879	6,255,708 7 0
1853	10,350,307	...	6,534,648	3-8 4-8	8,136,362	2-8 3-4	25,021,317	6,760,422 6 6
1854	10,889,611	...	6,553,239	4-8 5-8 6-0	8,440,734	3-4 4-0	25,883,584	7,660,778 9 2
1855	10,384,100	7-10 8-0	5,344,319	6-0 7-10 8-0	6,228,856	4-0 6-0 6-2	21,957,275	7,617,582 6 6
1856	9,343,549	8-0	7,175,939	8-0	6,781,068	6-2	23,300,556	8,698,624 10 0
1857	no return	...	no return	...	6,920,046	...	24,150,433	9,025,835 13 0
1858	10,448,572	...	6,836,037	...	6,402,142	6-2 8-0	23,686,751	9,195,154 7 6

Reduction of the duty on brandy, &c.

The duties on brandy and other foreign spirits have been reduced in the course of the present year (1860) to the same level as those on English spirits—that is, they have been reduced from 15s. to 8s. 6d. a gallon—the 6d. being intended to compensate for the inconvenience inflicted on the producers of British spirits by being subjected to the excise. But this reduction appears to have been either wholly or in great measure unnecessary. It involves, what we could not afford, a very considerable loss of revenue; and in whatever degree the consumption of brandy and

Indirect Taxes.

Geneva may be increased, there will be a nearly corresponding diminution in the consumption of British spirits and rum. A reduction of the duty on brandy, &c., to 12s. a gallon might, perhaps, have been expedient; but that is the lowest limit to which it should have been reduced.

Brandy being a more valuable or costly spirit than gin or whisky, it ought, in justice to the producers of the latter, to have been subjected to a higher duty. But their interests, as well as those of others, appear to have been entirely forgotten in our zeal to open new markets for the products of France.

Sect. V.—*Method of Comparing the Amount of Taxation in Different Countries.*

Amount of population not a proper test of the ability of a country to bear taxes.

It has been usual to endeavour to ascertain the comparative weight of the public burdens of different countries by comparing them with their population. But this is obviously a most erroneous criterion. In proof of this we may observe, that if the amount of population in a country were a true test of its capacity to bear taxes, it would follow that Ireland, which had in 1851 a population of 6,552,000, could afford to pay more than twice the amount of the taxes paid by Scotland, which had only a population of 2,889,000. So far, however, from this being the case, the revenue of Scotland is nearly the same as that of Ireland or greater; and yet there is no reason for thinking that the pressure of taxation is felt more severely here than among our neighbours.

Amount of capital not a proper test.

The amount of the capital belonging to different countries has been suggested as a test by which to ascertain the comparative weight of their burdens. But this would also lead to the most erroneous results; for it is plain that a small capital, where profits are high, may be more productive than a large one where profits are low. The market rate of interest, which is always proportional to the customary rate of profit, is usually about twice as great in the United States as in England. *One* million of capital employed in America must therefore be about as productive—that is, it must yield about as large an annual income—as *two* millions employed in this country. And hence it is obvious, that if taxation, as compared with the amount of capital, were the same in both countries, it would, as compared with the profits or revenue derived from that capital, be about *twice as heavy* in England as in America.

Indirect Taxes.

The relative taxation of countries to be learned by comparing their incomes with the number of their inhabitants and their burdens.

It is not therefore by the amount either of the population or capital of a country that its capacity to bear taxes is to be determined. These, as has been already seen, really consist of a portion of the incomes of individuals transferred from them to the state; and hence, to determine whether they are higher or lower in one country than in another, it is necessary to ascertain the respective incomes of the states to be compared together, the number of their inhabitants, and the amount of their burdens. Supposing, for example, that the income of Great Britain, which has 23 millions of inhabitants, is four hundred millions of pounds sterling, which is believed to be pretty near its actual amount, and that its taxes, including poor-rates, tithes, and public burdens of every description, amount to eighty millions, this sum deducted from the former would leave three hundred and twenty millions, which would give a free income of about L.14 a year to every individual in the island. Suppose, now, that the income of France is four hundred and fifty millions, and that the aggregate amount of her taxes and public burdens of every description is seventy-five millions; the three hundred and seventy-five millions of remainder, when divided among a population of thirty-six millions, would only leave a free income of L.10, 8s. to each. There is reason to think that these estimates are not very wide of the mark. We do not, however, give them as being correct, for in such matters it is impossible to attain to any thing like accuracy; but as illustrations of the method to be followed in comparing the burdens laid on different countries, and as showing that, in proportion to her means of paying, a country with a small population, and a large absolute amount of taxes, may be really less heavily taxed than a country with a larger population, and a smaller absolute amount of taxes.

The taxes on tea and sugar are those which fall heaviest on necessaries, and consequently exercise the greatest influence over wages. But we do not believe that they are at all too high, nor do we suppose that the revenue which they yield could be raised with less injury in any other way. We do not, however, make this statement to excuse either these or any other taxes being kept at a higher level than is absolutely necessary. Every practicable effort should at all times be made to lighten the pressure on the national resources, and to add to the comfort and wellbeing of the population. And this will be best effected by avoiding unnecessary expenditure, and resorting to those taxes which we have shown are least productive of public inconvenience.

Tables illustrative of the progress of the public revenue of Great Britain have been given in Postlethwaite's and Sir John Sinclair's *Histories of the Revenue*; in the *Statistical Account of the British Empire*, and the *Treatise on Taxation*, by the author of this article; and in a variety of other publications.

Account of the different items composing the Public Revenue of the United Kingdom in the years ended the 31st March 1858 and 1859.

Income.	1858.		1859.	
Customs and Excise:	L.	L.	L.	L.
Spirits { Foreign	918,071	...	893,371	
Spirits { Rum	1,381,693	...	1,384,948	
Spirits { British	8,963,874	...	8,950,195	
Malt	5,326,023	...	5,612,777	
Hops	521,475	...	396,205	
Wine	1,733,729	...	1,761,738	
Sugar and Molasses	5,587,802	...	5,979,329	
Tea	5,361,165	...	5,271,703	
Coffee	474,994	...	425,828	
Tobacco and Snuff	5,272,471	...	5,465,226	
		35,541,297		35,941,320
Butter	103,004	...	94,795	
Cheese	48,315	...	44,220	
Currants and Raisins	325,342	...	430,061	
Corn	486,026	...	582,864	
Silks	231,490	...	295,073	
Paper	1,130,683	...	1,153,687	
Candles and Tallow	76,722	...	84,933	
Glass	4,336	...	4,414	
Timber	589,571	...	574,239	
Excise Licenses, Post-horse Duties	1,424,663	...	1,436,239	
Hackney Carriages	80,130	...	82,094	
Stage Carriages	118,561	...	124,994	
Railways	348,611	...	339,569	
Miscellaneous of Customs and Excise	686,606	...	711,423	
		5,645,060		5,958,605
Total Customs and Excise	...	41,186,357	...	41,899,925

Income.	1858.		1859.	
Stamps	L.	L.	L.	L.
Deeds and other Instruments	1,331,789	...	1,336,373	
Probates and Legacies	3,032,433	...	3,438,218	
Insurance { Marine	319,508	...	285,324	
Insurance { Fire	1,356,069	...	1,402,535	
Bills of Exchange, Bankers' Notes	594,092	...	525,209	
Newspapers and Advertisements	153,420	...	145,604	
Receipts	281,115	...	418,619	
Other Stamp Duties	402,201	...	442,753	
		7,470,627		7,994,635
Assessed & Land Taxes:				
Land Taxes	1,142,174	...	1,131,768	
Houses	754,044	...	763,900	
Servants	192,760	...	193,302	
Horses	351,006	...	348,307	
Carriages	300,597	...	306,636	
Dogs	197,604	...	191,699	
Additional 10 per cent	14,328	...	15,293	
Other Assessed Taxes	198,257	...	209,851	
		3,150,762		3,160,756
Property and Income Tax		11,396,435	...	6,610,102
Post-Office		3,038,113	...	3,175,561
Crown Lands		417,909	...	420,329
Other Ordinary Revenue and other Resources		1,596,887	...	2,125,944
Total Income		68,257,090	...	65,387,252

(J. R. M.).

Tay || Taylor, Brook.

TAY. See PERTHSHIRE.

TAYLOR, BROOK, was born at Edmonton, on the 28th of August 1685. He was the son of John Taylor, Esq., of Bifrons House in Kent, by Olivia, daughter of Sir Nicholas Tempest, of Durham, Bart. His grandfather, Nathaniel Taylor, was one of those puritans whom "Cromwell thought fit to elect by a letter, dated June 14, 1653, to represent the county of Bedford in Parliament." The character of his father partook in no small degree of the austerity that had been transmitted to him in the line of his ancestors, and by the spirit of the times in which they lived; and to this cause may be ascribed the disaffection which sometimes subsisted between the father and even such a son as is the subject of this article. The old gentlemen's morose temper, however, yielded to the powers of music; and the most eminent professors of the art in that period were hospitably welcomed in his house. His son Brook was induced, by his natural genius, and by the disposition of his father, which he wished by all the means in his power to conciliate, to direct his particular attention to music; and he became in very early life a distinguished proficient in it. To music he added another accomplishment, in which he equally excelled, that of drawing and painting. His classical education was conducted at home under a private tutor; and his proficiency in the ordinary branches of the languages and the mathematics was so great, that he was deemed qualified for the university at the early age of fifteen.

In 1701 he was entered a fellow-commoner of St John's College, Cambridge. At that period mathematics engaged more particularly the attention of the university; and the examples of eminence in the learned world, derived from that branch of science, attracted the notice and roused the emulation of every youth possessed of talents and of application. In 1708 he wrote his treatise on the "Centre of Oscillation," which was not published in the *Philosophical Transactions* till some years afterwards. In 1709 he took the degree of LL.B. In 1712 he was chosen a Fellow of the Royal Society. During the interval between these two periods, he corresponded with Dr Keill on several of the most abstruse subjects of mathematical disquisition. Sir William Young informs us, that he had in his possession a letter, dated in 1712, addressed to Mr Machin, which contains at length a solution of Kepler's problem, and explains the use to be derived from that solution. In this year he presented to the Royal Society three different papers: one on the "Ascent of Water between two Glass Planes;" a second on the "Centre of Oscillation;" and a third on the "Motion of a Stretched String." It appears from his correspondence with Keill, that in 1713 he presented a paper on his favourite subject of "Music;" but this is not preserved in the *Transactions*.

His distinguished proficiency in those branches of science which engaged the particular attention of the Royal Society at this period, and which embroiled them in contests with foreign academies, recommended him to the notice of its most illustrious members; and in 1714 he was elected to the office of secretary. In this year he took the degree of LL.D.; and during the same year he transmitted, in a letter to Sir Hans Sloane, an "Account of some curious Experiments relative to Magnetism;" which, however, was not delivered to the society till many years afterwards when it was printed in the *Transactions*. His application to those studies to which his genius inclined was indefatigable; for we find that in 1715 he published in Latin his *Methodus Incrementorum*; a curious essay preserved in the *Philosophical Transactions*, entitled an "Account of an Experiment for the Discovery of the Laws of Magnetic Attraction;" and a treatise well known to mathematicians, and highly valued by the best judges, his "New Principles of Linear Perspective." In the same year (such were his admirable talents, and so capable were they of being directed to various subjects), he conducted a controversial correspondence with the Count Raymond de Montmort, on the tenets of Malebranche; which occasioned his being particularly noticed in the eulogium pronounced by the French Academy on the decease of that eminent metaphysician. Taylor, Brook.

The new philosophy of Newton, as it was then called, engaged the attention of mathematicians and philosophers both at home and abroad. At Paris it was in high estimation; and the men of science in that city were desirous of obtaining a personal acquaintance with the learned secretary of the Royal Society, whose reputation was so generally acknowledged, and who had particularaly distinguished himself in the Leibnitzian or German controversy, as we may denominate it, of that period. In consequence of many urgent invitations, he determined to visit his friends at Paris in the year 1716. He was received with many tokens of affection and respect. Besides the mathematicians, to whom he had always free access, he was here introduced to Lord Bolingbroke, the Count de Caylus, and Bishop Bossuet.

Early in 1717 he returned to London, and composed three treatises, which were presented to the Royal Society, and published in the thirtieth volume of the *Transactions*. About this time his intense application had to a considerable degree impaired his health; and he was under the necessity of repairing, for relaxation and relief, to Aix-la-Chapelle. Having likewise a desire of directing his attention to subjects of moral and religious speculation, he resigned his office of secretary to the Royal Society in 1718. After his return to England in 1719, he applied to subjects of a very different kind from those that had employed the thoughts and labours of his more early life. Among his papers of this date, Sir William Young found detached parts of a "Treatise on the Jewish Sacrifices," and a dissertation of considerable length on the "Lawfulness of eating Blood."

Towards the end of the year 1720, Dr Taylor accepted the invitation of Lord Bolingbroke to spend some time at La Source, a country seat near Orleans, which he held in right of his wife, the widow of the Marquis de Vilette, nephew of Madame de Maintenon. In the next year he returned to England, and published the last paper which appears with his name in the *Philosophical Transactions*, entitled an "Experiment made to ascertain the Proportion of Expansion of Liquor in the Thermometer," with regard to the degree of heat.

In 1721 he married Miss Bridges of Wallington, in the county of Surrey, a young lady of good family, but of small fortune, and this marriage occasioned a rupture with his father, whose consent he had never obtained. The death of his wife in 1725, and that of an infant son, whom the parents regarded as the presage and pledge of reconciliation with the father, and who actually proved such, deeply affected his sensibility. During the two succeeding years he resided with his father at Bifrons, where "the musical parties, so agreeable to his taste and early proficiency, and the affectionate attentions of a numerous family welcoming an amiable brother, so long estranged by paternal resentment, not only soothed his sorrows, but ultimately engaged him to a scene of country retirement, and domesticated and fixed his habits of life." In 1725, with the full approbation of his father and family, he married Sabetta, daughter of John Sawbridge, Esq., of Olantigh, in Kent. In 1729, on the death of his father, he succeeded to the family estate of Bifrons. In the following year he lost his wife in child-bed. The daughter whose birth occasioned this melancholy event survived, and became the mother of Sir William Young, to whom we owe these notices of his grandfather.

In the interval that elapsed between the years 1721 and

Taylor, Jeremy.

1730, no production of Taylor appears in the *Philosophical Transactions;* nor in the course of that time did he publish any work. His biographer has found no traces of his learned labour, excepting a "Treatise of Logarithms," which was committed to his friend Lord Paisley (afterwards Abercorne), in order to be prepared for the press, but which probably was never printed. His health was now much impaired; relaxation became necessary, and he was diverted by new connections from the habit of severe study, which had distinguished the early period of his life, and which had contributed to contract its duration. He did not long survive the loss of his second wife; and his remaining days were days of increasing imbecility and sorrow. The essay entitled *Contemplatio Philosophica*, published by Sir William Young in 1793, appears to have been written about this time, and probably with a view to abstract his mind from painful recollections and regret. It was the effort of a strong mind, and is a singular example of the close logic of the mathematician applied to metaphysics. But the blow had sunk too deep for study to afford more than temporary relief. Having survived his second wife little more than a year, he died of a decline in the forty-sixth year of his age, December 29, 1731, and was buried in the churchyard of St Ann's, Soho.

Taylor, *Jeremy*, a distinguished theologian, was born at Cambridge, and was baptised on the 15th of August 1613. His father, a descendant of Dr Rowland Taylor, who suffered martyrdom in the reign of Mary, followed the humble calling of a barber. Jeremy was educated at Perse's free-school; and on the 18th of August 1626, being then thirteen years of age, he was entered at Caius College as a sizar, or poor scholar. He took the degree of A.B. in 1630–1, and that of A.M. in 1633. According to the common account, he was elected a fellow of his college, but this account seems to require confirmation. Before he attained the age of twenty-one, he was admitted to holy orders; and having soon afterwards been employed by a friend to supply his place at the lecture in St Paul's, his graceful person and elocution, together with the varied richness of his style and argument, speedily procured him friends and admirers. He was mentioned in such favourable terms to Laud, that he was requested to preach before the archbishop at Lambeth, and was highly commended for his performance. This powerful patron recommended him to a vacant fellowship in All Soul's College, Oxford, and a great majority of the fellows voted for his admission; but as the warden refused his concurrence, no election took place, and the nomination thus devolved to the archbishop as visitor of the college. Taylor was appointed on the 14th of January 1636. It appears from the college records that during the period of his continuing a fellow, he was not a regular resident. He became chaplain to the primate, and afterwards to the king; and, on the presentation of Juxon, bishop of London, he was, in March 1638, instituted to the rectory of Uppingham in Rutlandshire. Here he now fixed his residence; and, on the 27th of March 1639, being then in the twenty-sixth year of his age, he married Phœbe Landisdale, or Langsdale, who bore him several sons and daughters.

The civil commotions speedily ensued; and in August 1642 he was called to Oxford to attend the king in his capacity of chaplain. On the 1st of November he was admitted by *mandamus* to the degree of D.D. He now exerted himself in sustaining the tottering cause of episcopacy, and published various works on the controversies of those unhappy times. Whatever might be the state of the argument between the contending parties, the enemies of episcopacy were stronger than its friends; and for several years Dr Taylor was exposed to many vicissitudes of fortune. He appears to have retired into Wales; and on the 4th of February 1644 he fell into the hands of the parliamentary troops, when they defeated Colonel Gerard before the castle of Cardigan. How long he was detained a prisoner, it is difficult to ascertain. In conjunction with William Nicholson, afterwards bishop of Gloucester, and William Wyatt, afterwards prebendary of Lincoln, he opened a school at Newton Hall in Carmarthenshire. In 1647 was published a little volume, entitled *A New and Easie Institution of Grammar*, which contains a Latin epistle by Wyatt, and an English epistle by Taylor.

Taylor, Jeremy.

Of the principles of toleration, the members of the Church of England had a very faint and inadequate conception, till in their turn they had begun to feel the bitterness of persecution. Some of those who had been deprived of their benefices, began to perceive a glimpse of purer light; and if Dr Taylor had not been reduced to the condition of a wanderer, it is highly probable that he never would have prepared *A Discourse of the Liberty of Prophesying; shewing the Unreasonableness of prescribing to other Men's Faith, and the Iniquity of persecuting different Opinions.*

Dr Taylor's *Liberty of Prophesying*, one of the most remarkable works which he produced, was printed in quarto in the year 1647. In 1650 he published *The Rule and Exercises of Holy Living*, and in the following year *The Rule and Exercises of Holy Dying*. His first wife is supposed to have died before his retirement into Wales; and his second was Joanna Bridges, who possessed a competent estate at Mandinam, in the parish of Llanguedor, and county of Carmarthen. Her mother's family, we are informed, was unknown, but she was generally believed to be a natural daughter of Charles I. She is said to have possessed a very fine person; and, both in countenance and disposition, to have displayed a striking resemblance to her unfortunate father. He must now have relinquished the occupation of a schoolmaster. During his residence in Wales he was much indebted to the kindness of Richard, Earl of Carbery, who resided at Golden Grove in the same county, and who retained him as his chaplain. The next important work which he published was *The Great Exemplar; or the Life and Death of the Holy Jesus*, Lond. 1653, fol. The work speedily obtained an extensive popularity. His learned leisure was soon afterwards exposed to another interruption; and, for some reason which has not been fully discovered, he was imprisoned in Chepstow Castle. He appears to have been in custody in the month of May 1654; but, from some of his own letters, we ascertain that he was released before the close of the ensuing year. According to the statement of Wood, he soon afterwards settled in London, and officiated in a small and private congregation. The accuracy of his statement has been called in question; but it is at least certain that about this period he occasionally officiated in the metropolis.

In 1654 he had published a Treatise against Transubstantiation; and in 1655 appeared *Unum Necessarium; or, the Doctrine and Practice of Repentance.* Here he found occasion to discuss the doctrine of original sin, and in so Arminian a strain, that he incurred much censure, even from the members of his own church. He endeavoured to defend his own opinions in two different tracts. About this period of his life he produced various other works, including a course of *Sermons* for the whole year. Several of his smaller tracts were collected in a volume entitled, *A Collection of Polemical and Moral Discourses*, Lond. 1657, fol. About the beginning of the ensuing year, we find him a prisoner in the Tower, to which he had been committed in consequence of his bookseller having prefixed to his Collection of Offices a print of Christ in the attitude of prayer; for a recent act had declared such representations punishable by fine and imprisonment. His friend Evelyn, to whom he had many obligations, was instrumental in procuring his release, nor

Taylor, Jeremy.

does he seem to have been long detained in custody. On the invitation of the Earl of Conway, he afterwards emigrated to the north of Ireland. He left London in June 1658, and proceeded to the county of Antrim, where he appears to have divided his residence between Lisburne and Portmore, about eight miles distant from that town. At Lisburne he is supposed to have had a small lectureship; and he occupied a house in the immediate neighbourhood of his patron's mansion at Portmore. According to the tradition of his descendants, he frequently preached to a small congregation in the half-ruined church of Kilulta. His tranquillity suffered another interruption in 1659, when he was represented to the Irish council as a person disaffected to the existing government. A warrant was issued for bringing him to Dublin for examination, but it does not appear that he was subjected to any additional annoyance.

In the meantime, he devoted his learned leisure to the completion of a very remarkable work, published immediately after the restoration, under the title of *Ductor Dubitantium; or the Rule of Conscience in all her General Measures*, Lond. 1660, fol. This is the most extensive and learned book on casuistry in the English language. His great merit had now become too conspicuous to be disregarded; and on the 6th of August he was nominated to the bishopric of Down and Connor. He was soon afterwards elected vice-chancellor of the university of Dublin, and this office he retained till his death. On the 30th of April 1661 he was appointed administrator of the bishopric of Dromore, which he continued to hold with his other bishopric. In 1663 he published *A Dissuasive from Popery;* and some answers to it having been produced, he prepared a second part, which was not printed till after his death. He died at Lisburne on the 13th of August 1667, having only completed the fifty-fourth year of his age. His remains were interred in the choir of the cathedral of Dromore. His disease was a fever, which proved fatal in ten days. His funeral sermon was preached by Dr Rust, his successor in that diocese. No son, by either marriage, survived him. His eldest son, a captain of horse, was killed in a duel with a brother officer, named Vane, who also died of his wounds. Three of his daughters, Phœbe, Mary, and Joanna, survived their father. The eldest died single; the second was married to Dr Francis Marsh, who became archbishop of Dublin; and the third to Edward Harrison, member of Parliament for the borough of Lisburne. The bishop's widow survived him many years, but neither the time nor the place of her death has been ascertained.

In Hallam's opinion the sermons of Jeremy Taylor are—

"Far above any that had preceded them in the Church of England. An imagination essentially poetical, and sparing none of the decorations which, by critical rules, are deemed almost peculiar to verse; a warm tone of piety, sweetness, and charity; an accumulation of circumstantial accessories whenever he reasons, or persuades, or describes; an erudition pouring itself forth in quotation till his sermons become in some places almost a garland of flowers from all other writers, and especially from those of classical antiquity, never before so redundantly scattered from the pulpit, distinguish Taylor from his contemporaries by their degree, as they do from most of his successors by their kind. His sermons on the 'Marriage Ring,' on the 'House of Feasting,' on the 'Apples of Sodom,' may be named without disparagement to others, which, perhaps, ought to stand in equal place. But they are not without considerable faults, some of which have just been hinted. The eloquence of Taylor is great, but it is not eloquence of the highest class; it is far too Asiatic, too much in the style of Chrysostom, and other declaimers of the fourth century, by the study of whom he had probably vitiated his taste; his learning is ill-placed, and his arguments often much so; not to mention that he has the common defect of alleging nugatory proofs; his vehemence loses its effect by the circuity of his pleonastic language; his sentences are of endless length, and hence not only altogether unmusical, but not always reducible to grammar. But he is still the greatest ornament of the English pulpit up to the middle of the seventeenth century; and we have no reason to believe, or rather much reason to disbelieve, that he has any competitor in other languages."—*Hallam's Introduction to the Literature of Europe*, vol. iii. c. ii.

Taylor, John.

An edition of Bishop Taylor's whole works, with a copious life of the author, by Bishop Heber, was published at London in the year 1822, in 15 vols. 8vo. Of some of his practical treatises, the recent editions are very numerous; and this complete collection has been often reprinted.

Taylor, *John*, commonly known as the *Water Poet*, was born in Gloucestershire in 1580, and was apprenticed at an early age to a Thames waterman, whose avocation consisted in conveying the citizens of London from Windsor Bridge to Gravesend. Taylor says there were no fewer than 40,000 watermen in those days of peace, before the introduction of hackney coaches, or, as the Water Poet terms them, in true waterman politeness, "hyred hackney hell-carts." During a time of war the watermen were in constant request to man the fleet, so that Taylor himself, during his threescore years and ten, had made no fewer than sixteen voyages in the Queen's ships, and was with Essex at Cadiz and the Azores. He was a shrewd, fluent, passionate individual, who engaged in numerous "wagering adventures," sometimes to the no small danger of his life; such as rowing between London and Queensborough in a paper boat, with two stockfish for oars! This adventure he performed with one Roger Bird, a vintner, who seems to have been reduced to a deplorable plight when night came. As Taylor has it,

> "The water four miles broad, no oars to row,
> Night dark, and where we were we did not know;
> And thus, 'twixt doubt and fear, hope and despair,
> I fell to work, and Roger Bird to prayer.
> And as the surges up and down did heave us,
> He cried, most fervently, 'Good Lord receive us.'"

This four-mile voyage they accomplished in a day and a half: the bottom of their paper boat having given way, there was nothing to trust to for more than half-way but "eight large and well-blown bladders!" Now he embarks in "a very merry wherry-ferry voyage" from London to York; again he undertakes "a discovery by sea from London to Salisbury." Laying aside his oars for a time, he sets out on "The Pennyless Pilgrimage, or the Moneyless Perambulation of John Taylor, *alias* the King's Majesty's Water Poet; [narrating] how he travelled on foot from London to Edinburgh in Scotland, not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging." Taylor complains bitterly of the scurvy manner in which many of those who engaged him in those insane frolics afterwards treated him in his "Scourge for Baseness, a Kicksey-Winsey, or a Lerry-cum Twang." During the state troubles which ensued, Taylor, who was too brave a man to turn with the tide, left London for Oxford. While here he issued his squibs against the Roundheads, and made himself "much esteemed for his facetious company." Returning again to London after the surrender of Oxford, he kept a public-house in Phœnix Alley, near Long Acre, where, after the king's death, he set up a mourning crown for his sign. Compelled to remove this piece of loyal devotion, he elevated his own portrait in its stead. Here he died in 1656, and was buried in the churchyard of St Paul's, Covent Garden. In 1630 he made a collection of *All the Works of John Taylor, the Water Poet*, which are now exceedingly scarce.

Taylor, *John*, a very learned philologer and civilian, was a native of Shrewsbury, and was baptised on the 22d of June 1704. His father followed the trade of a barber, and the son was destined for the same occupation; but his early and unconquerable love of books, and his strong predilection for literature, recommended him to the patronage of a gentleman of fortune, Edward Owen, of Condover, to whom he was chiefly indebted for the advantages of an

Taylor, John.

academical education. He was sent to St John's College, Cambridge; and is supposed to have been assisted by one of the exhibitions founded in that college for the pupils of Shrewsbury school. He took the degree of A.B. in 1724, and that of A.M. in 1728. At the university he speedily distinguished himself by his classical attainments, and especially by his masterly knowledge of the Greek language. He became a fellow and tutor of his college, and was thus placed in a situation of easy competence, extremely favourable to his pursuits. His academical establishment had been rendered more important by an irreconcilable difference with Owen, whose friendship he had forfeited by refusing to drink a Jacobite toast on his bare knees. He was a Tory without being a Jacobite. The Condover family then enjoyed great patronage in the church; and the dissolution of this connection might perhaps occasion a change in Taylor's views. On the 30th of January 1730, he was appointed to deliver the Latin oration then annually pronounced in St Mary's before the university; and at the ensuing commencement, in the month of July, he was selected to recite the music speech. He was a frequent writer of familiar verses; and several of his juvenile poems have been printed by Nichols. In 1731 he undertook to assist Dr Jortin as a contributor to the *Miscellaneous Observations on Authors, Ancient and Modern.* For this publication he wrote several articles, signed "Cantabrigiensis," and one without a signature, entitled *Animadversiones in Luciani Asinum.* In 1732 he was appointed librarian, and afterwards registrar of the university. The office of librarian he only retained for a short time. He first distinguished himself among the scholars of the age by the publication of *Lysiæ Orationes et Fragmenta, Græce et Latine,* Lond. 1739, 4to. To his own illustrations he added the conjectures of his friend Jeremiah Markland, an excellent Grecian. This elegant publication was followed by an octavo edition, printed at Cambridge in 1740, and the editor's notes are there given in an abridged form. Taylor had obtained one of the two law-fellowships in his college; and, according to the academic phraseology, he proceeded in the law-line, and took the degree of LL.D. in the year 1741. On this occasion he wrote an elaborate dissertation, which was soon afterwards published under the title of *Commentarius ad L. Decemviralem de inope Debitore in partis dissecando,* Cantab. 1742, 4to. On the 15th of February 1741–2, Dr Taylor was admitted an advocate at Doctors' Commons. After a short interval, he exhibited a new proof of his profound knowledge of classical antiquity, by the publication of his *Marmor Sandvicense, cum commentario et notis,* Cantab. 1743, 4to. The very ancient marble, on which he supplies so learned a commentary, Lord Sandwich had brought from Athens in the year 1739. About the beginning of the year 1744, Bishop Thomas appointed Dr Taylor chancellor of the diocese of Lincoln. He was now occupied in preparing a most elaborate edition of Demosthenes and other Attic orators. As a specimen, he had already published the oration of Demosthenes against Midias, and that of Lycurgus against Leocrates, Cantab. 1743, 8vo. After much laborious preparation, he at length published, not the first, but the third volume of his projected edition of Demosthenes, Æschines, Dinarchus, and Demades, Cantab. 1748, 4to. The second volume made its appearance in 1757. It contains the controversial orations of Demosthenes and Æschines, together with the epistles ascribed to the latter. The third volume includes ten orations of Demosthenes. His plan extended to five volumes, but he left it in this incomplete state. Dr Taylor having long continued a layman, was at length induced to take orders by the prospect of a speedy vacancy in a valuable college-living. The rectory of Lawford in Essex became vacant in April 1751; and being then in the forty-seventh year of his age, he preferred his claim, which was not admitted without considerable doubt and hesitation. He became archdeacon of Buckingham in 1753, and canon residentiary of St Paul's in July 1757. During the latter year he was elected prolocutor of the lower house of convocation. He was also appointed commissary of Lincoln and of Stowe. Although he was so late in commencing his ecclesiastical career, he is said to have been eminent as a preacher. He printed two sermons; one preached at Bishop-Stortford School-feast, 26th August 1749, and the other before the House of Commons on the fast-day, 11th February 1757. In 1822 they were both reprinted at the suggestion of Dr Parr, who has added notes to the first. He resigned the office of registrar in 1758, and quitted Cambridge to reside in London. Although he ceased to be an advocate, he did not cease to be a lawyer; and the next considerable work which he produced bears the title of *Elements of the Civil Law,* Camb. 1775, 4to.

Taylor, Thomas || Taylor, William.

During the last ten years of his life, he seems to have experienced the usual effects of a large participation in the emoluments of the church. His career was no longer marked by a succession of elaborate publications, but he kept his equipage, and lived like a prosperous gentleman. He was kind and liberal in his disposition; and although he enjoyed a very ample income, he did not accumulate much wealth. Having only attained the sixty-sixth year of his age, he died very generally beloved and lamented, at his residentiary house, on the 4th of April 1766. His remains were deposited in one of the vaults of St Paul's, nearly under the litany-desk. To the school where he had been educated he bequeathed his large and valuable library, together with the residue of his fortune, for the maintenance of an exhibitioner at St John's College. He, however, reserved to his friend Dr Askew all his MSS. and his marginal annotations.

Taylor, *Thomas,* generally known as the *Platonist,* was born in London on the 15th of May 1758. After spending some time at St Paul's school, he was removed to Sheerness, where he spent several years with a relation. A premature marriage and pecuniary difficulties compelled him to relinquish his design of prosecuting his studies for the church. He became a clerk to a banking-house, and subsequently assistant-secretary to the Society for the Encouragement of arts, manufactures, and commerce. He devoted all his spare time to the study of Greek literature, and to the revival and elucidation of the Platonic philosophy. Taylor succeeded in obtaining the patronage of the Duke of Norfolk and a Mr Meredith, a retired tradesman, who published his translations of Plato, Aristotle, and other distinguished Greek writers. His writings number in all thirty-eight distinct works; and some of them, such as the Plato and Aristotle, consist of five and nine volumes respectively. A detailed list of Taylor's writings may be seen in the *English Cyclopædia.* Meredith settled on him a pension of L.100 a year, and he contrived to extend his income to L.200. On this paltry pittance he lived and worked until his end came in 1835. Taylor is said to have been a man of great candour, and a delightful companion.

Taylor, *William,* the son of an eminent merchant at Norwich, was born in 1765. After spending a youth of more than ordinary promise, he went to the continent, where his talent for languages was stimulated, and where he drank as deeply as his nature would permit of at the various fountains, both deep and shallow, of German literature. Returning to Norwich, his admiring parents and friends thought him a prodigy of accomplishments, and chalked out for him a distinguished career in literature. To add to his other virtues he resolved to cultivate the graces of oratory, and enrolled himself member of a democratic club while the French Revolution was at its height. His attention to the refinements of eloquence must have been too exclusive, for while he was gaining fame in the noisy clubs of Norwich,

Tchad || Tcherkask

his father's property, which was wholly under his charge, he found to be rapidly sinking. He published very tolerable translations of Bürger's *Lenore*, and of Lessing's *Nathan the Wise*, and wrote in a rambling, confused sort of style a *Historic Survey of German Poetry*, 3 vols., 1828. Magazines and reviews received the greatest share of his attention, and in many of his appearances in the *Monthly Review* and others of the day, he gave more readable matter to his readers than they could find in the pages of his *German Poetry*. His management of the *Norwich Iris* proved a failure, and one of his last works on *English Synonyms* was essentially meagre. Taylor died in 1836. His *Life* has since been written by Robberds, 2 vols., London, 1843.

TCHAD, or TSAD, LAKE, a large sheet of water in Central Africa, lying between N. Lat. 12. 30. and 14. 30., E. Long. 13. and 15.; bounded by the native states of Bornou, Kanem, Begharmi, and others. Its length from N. to S. is about 120 miles, and its breadth varies from 60 to 80. Reports of such a lake had been current for some time, when Clapperton and Denham in 1823 first ascertained its actual existence, and explored a great part of its coast. Further information was obtained by Overweg and Barth, who arrived in Kuka in 1851. Overweg embarked at Maduari near Kuka, on the lake, in a small boat, which they had brought across the desert for that purpose, and for some distance from the shore he had to make his way through narrow channels among a number of small islands. Leaving these, he crossed a large expanse of open water, and reached another group of small islands, inhabited by a people called Biddumas. On account of a war between these people and some neighbouring tribes, Dr Overweg was unable to reach the eastern shore of the lake, and had to return by the same route as he came. Further explorations were carried on by Dr Vogel in 1854. The water of Lake Tchad is quite fresh, and its depth is in general very small, being only from 8 to 15 feet. At different periods, however, it undergoes great changes, sometimes falling so low that the channels between the islands are left dry, and at other times rising so high as to cover some of the islands and overflow the flat country about the shores. The open part of the lake called *Inkibul*, "white or open water," by the natives, only occupies the south-western part of its centre. The whole of the coasts are skirted by a multitude of small islands, and the north and east portions are occupied by a similar group. The lake has no outlet, and it receives, besides a number of smaller streams, the Shary from the south and the Yeou from the west. The former of these rivers is large and navigable; the latter is partially dry for some months in the year. Fish abound in the lake, and turtles, crocodiles, elephants, and hippopotamuses on its shores. Large wild boars, gazelles, antelopes, and buffaloes are also numerous, but lions and leopards are more rarely seen. The Biddumas, who inhabit the islands, are an independent nation, by no means in a very savage condition. Many of the islands are densely peopled. The people have also boats of considerable size, propelled by long poles instead of oars or sails.

TCHAUSSY, a town of the Russian empire, in the government and 25 miles E.S.E. of Moghilev. It contains Roman Catholic and Greek churches, a synagogue, and a convent. A large annual fair is held here. Pop. 4772.

TCHEBOKSARI, a town of European Russia, in the government and 75 miles W.N.W. of Kasan, on the Volga. It is irregularly built, chiefly of wood; and it has a town-hall, numerous churches, a monastery, large salt magazines, and some manufactures. Pop. 4672.

TCHERKASK, two towns of the Russian empire, in the country of the Don Cossacks. STAROI, or OLD TCHERKASK, stands on the Don, near its mouth, 45 miles E.N.E. of Azoph; and is intersected by canals, on both sides of which are rows of wooden houses supported on posts above the water. It has a Tartar church, with rich treasures of gold, silver, precious stones, &c.; an academy, town-hall, prison, and other buildings. Fish, iron, wine, &c., are exported in large quantities. Pop. 5939. NOVO, or NEW TCHERKASK, stands on the right bank of the Don, 14 miles N.N.E. of the former. It is the capital of the province, and contains a cathedral and many other churches, an arsenal, gymnasium, hospital, and numerous manufactories, especially of beer, brandy, cloth, &c. A considerable trade is carried on. Pop. 17,910.

Tchernigov || Tchugujev

TCHERNIGOV, a government of European Russia, lying between N. Lat. 50. 20. and 53. 10., E. Long. 30. 10. and 34. 40.; bounded on the N. by the governments of Mohilev and Smolensk, E. by those of Orel and Kursk, S. by that of Poltawa, and W. by those of Kiev and Minsk. Length from N. to S., 240 miles; greatest breadth, 180; area, 21,157 square miles. The surface is level, broken only by some hills along the banks of the Dnieper, which forms for some distance the western boundary, and receives most of the rivers of the government. Of these the most important is the Desna, a navigable stream, which enters Tchernigov from Orel, and traverses the centre of the government. Its chief affluents are the Snov, Oster, Seim, and Sudost. The Iput, which joins the Soj, a tributary of the Dnieper, waters the north-west of the government. The soil is generally fertile, consisting of clay covered with loam; but there are tracts of sand in some places. The climate is mild, dry, and healthy. Most of the inhabitants are employed in agricultural or pastoral pursuits. The chief crops are rye, barley, and oats. Hemp, flax, hops, tobacco, and pulse are also cultivated. In 1849, the extent of arable land in the government was 8,274,872 acres; of meadows, 888,793; of wood, 1,840,060; and of waste land, 1,868,406. In the same year, the total quantity of corn produced was upwards of 19,000,000 bushels. Timber, charcoal, tar, and potash are obtained from the forests in large quantities and of good quality. Large herds of horses and cattle are reared. The former are of the Ukraine breed, small but active, and are much used in the light cavalry. The oxen are of a large size and good breed. Tchernigov contained in 1849, 339,495 horses, 271,661 horned cattle, 535,271 sheep, 396,656 swine, and 29,802 goats. The mineral productions of the country comprise iron, chalk, slate, alum, saltpetre, and potter's-clay; but they are only worked to a small extent. Manufacturing industry was long at a very low ebb here; but it has recently been increasing, although it is still in a somewhat backward condition. Besides a large number of distilleries, there are manufactories of cloth, leather, glass, and beet-root-sugar. The trade of the government centres at Neshin, where important fairs are held. Pop. (1856) 1,401,879.

TCHERNIGOV, the capital of the above government, on the Desna, 80 miles N.N.E. of Kiev. It is surrounded by earthen ramparts, which have been formed into public promenades. It has an old castle, a cathedral and several other churches, 4 convents, a gymnasium, an imperial mechanics' school, and orphan hospital. Some manufactures are carried on, and four annual markets are held in the town. Tchernigov was built in 1024, and is considered the oldest town in European Russia. Pop. 12,000.

TCHORUM, or CHURUM, a town of Asiatic Turkey, in the pashalic of Sivas, 28 miles S.W. of Osmanjik. It has a castle, numerous mosques, khans, and baths, manufactures of leather and pottery, a considerable trade in wheat, and a population of 7600, chiefly Mohammedans.

TCHUGUJEV, a town of European Russia, in the government and 45 miles E.S.E. of Charkov, at the confluence of the Tchugevka and the Donetz. It is defended by earthen ramparts, and contains numerous churches, and manufactories of leather and other articles. Pop. 8130.

TEA AND TEA-TRADE.

I.—BOTANY, GEOGRAPHY, AND CHEMISTRY OF THE TEA-PLANT.

Botany, Geography, and Chemistry.

The tea-plant (*Thea Sinensis*) is a polyandrous evergreen shrub (belonging to *Monadelphia Polyandria* of the Linnæan system and to *Ternströmiacea*, or the Theads, of Mirbel, De Candolle, and Lindley), and is of the same family as the camellias, to one species of which (*Camellia Sasanqua*, introduced from China in 1811) it bears a very close resemblance. It usually grows to a height of from three to five feet. The stem is bushy, with numerous and very leafy branches. The leaves are alternate, large, elliptical, obtusely serrated, veined, and placed on short channelled foot-stalks. The calyx is small, smooth, and divided into five obtuse segments or sepals. The flowers are white, axillary, and slightly fragrant; often two or three together on separate pedicels. The corolla has from five to nine petals, cohering at the base. The filaments are short, numerous, and inserted at the base of the corolla; the anthers are large and yellow; the style trifid; and the capsules three-celled and three-seeded.

(1.) Botanical characteristics.



Fig. 1.
Thea Sinensis.

(2.) Geographical distribution.

Tea is more or less cultivated, for local consumption, in almost every province of China, but very little black tea is exported of other growth than that either of Fokien or of the Canton district, and very little green tea of other growth than that of Kiang-nan, or of the adjacent province of Che-kiang. In Japan, Tonquin, and Cochin-China, the plant is largely cultivated. The attempts which have been repeatedly made to cultivate it in Ceylon (both by Dutch and English colonists), Brazil, and South Carolina, have had but little success. In Brazil, indeed, it grows luxuriantly, especially in the vicinity of New Friburg, St Paul, and Santos; gaining, says Dr Liautaud (who went thither with a commission from the French government to inquire into this culture), "the proportions of a third-class tree, and with a rich foliage." But, he adds, the Brazilian teas are too astringent and bitter, and lack the aroma so much prized in those of China. The cost of manufacture, too, is much higher than in China. Hence he infers that, in the long run, the Brazilian teas will not be able to compete with the Chinese, even for home consumption.[1] Sir Emerson Tennent considers that the experiments of Messrs Worms in Ceylon establish the adaptation of soil and climate, and show that the practical failure of the attempt is to be ascribed simply to the want of skilled artisans.[2]

Botany, Geography, and Chemistry.

In South Carolina the experiment was begun in 1850, by Dr Smith of Greenville, and it appears to have been prosecuted, under sanguine expectations of success, for a considerable period. Its ultimate abandonment is said to have been caused by the high price of labour, rather than by any unfavourable circumstances of soil or climate; but the evidence before us does not warrant any confident conclusions on this head.[3]

In Assam, tea was discovered by Major Bruce as early as 1823. The instructive history of this discovery has been told in a former article [ASSAM]. Its most recent commercial results we shall have to indicate hereafter. In 1834, Lord W. Bentinck appointed a committee to report as to the best methods of cultivating tea in India. This committee recommended that the attempt should first be made on the lower hills and valleys of the Himalayan range. Next to them, it was added, "those of our Eastern frontiers offer the best prospects, and, after them, the Neilgherry and other lofty mountains, in Southern and Central India."

Assam.

Tea plantations of the Himalayas.

An abundance of seed-plants of *T. Bohea* was obtained from China, with which plants were raised at Calcutta, and then distributed to the Neilgherries, to Coorg, and to Mysore. But these first experiments almost entirely failed. Tea nurseries were then established in Kumaon and Gurhwal, and these have prospered. The plantations in the valley of Deyra (Lat. 30. 18. N., Long. 78. E.) were visited by Mr Fortune in 1851. Here, in a plain bounded on the S. by the Sewalick range, and on the N. by the Himalayas, open on the W. to the river Jumna, and on the E. to the Ganges, he found three hundred acres planted, and about ninety more prepared for some thousands of seedling-plants which had just been raised. "The soil of the valley," says Mr Fortune, "is composed of clay, sand, and vegetable matter, resting upon a gravelly subsoil, consisting of limestone, sandstone, clay-slate, and quartz-rock." But, in his opinion, this valley is too flat, too much exposed to hot drying winds, and too much irrigated.[4] The Guddowli plantation, near Paorie in Eastern Gurhwal (30. 8. N. and 78. 45. E.), pleased him much better. It occupies a large tract of terraced land, extending from the bottom of a ravine 4300 feet above the level of the sea, up the slopes of the mountain to a height of nearly 5300 feet. About a hundred acres were then under tea-culture, and they contained some 500,000 plants, growing admirably, and evidently liking their situation.[5] All this country is mountainous. Nothing meets the eye but hills, ravines, and glens. Some of the hills rise to a height of 7000 feet. But cultivated spots are plentifully dotted along the lower slopes, and the cottages and gardens wear a cheerful aspect.

At a smaller tea-farm, on the banks of the river Kosilla, and not far from Almorah, the chief town of Kumaon, he found under culture thirty-four acres of land, of a sandy loam, well mixed with vegetable matter, and much resembling, in its general appearance, the best tea-lands of China. The plants were in robust health. This was not the case with the plantations of the Bheem Tal (29. 20. N. and 79. 30. E.), situated amidst the sublime scenery of the snowy range. The tal or lake is 4000 feet above the sea-level, and the loftiest of the surrounding mountains rise to more than twice that height. Some of these plantations are on low, flat land, better suited to the growth of rice than to that of tea. Others are terraced on the slopes, but suffer from the prevalent fault of excessive irrigation. There is great similarity between the climate of the Himalayan districts and that of the best tea-lands of China. The rainy season comes earlier in China than in India, and hence the highest temperature of the former country occurs in July and August; that of the Himalayas in June. The extremes of temperature are somewhat less here than in China.

In a letter addressed to the Government of Agra in March 1857, Dr Jameson, superintendent of the botanical gardens of the East India Company, states that the tea-plant is now thriving well from Hazarah, in the Scinde Saugur Doab of the Punjaub to the Kalee river, the eastern boundary of Kumaon; or over five degrees of latitude and eight degrees of longitude.[6]

The geographical extent of the principal tea-growing districts (excluding Java) may be roughly indicated thus:

---

[1] Liautaud, Article contributed to the Rio Janeiro *Journal of Commerce*, translated by the author in Hunt's *Merchant's Magazine* (New York), xxxiii. 442–445.

[2] Emerson Tennent, *Ceylon* (1859), i. 89; ii. 252.

[3] *Merchant's Magazine*, xxiii. 579.

[4] *Journey to the Tea Countries*, 368–370.

[5] Ib. 373.

[6] *Minutes of Evidence before Select Committee on Colonization (India)*, Session 1859, 3464.

Botany, Geography, and Chemistry.

Botany, Geography, and Chemistry.

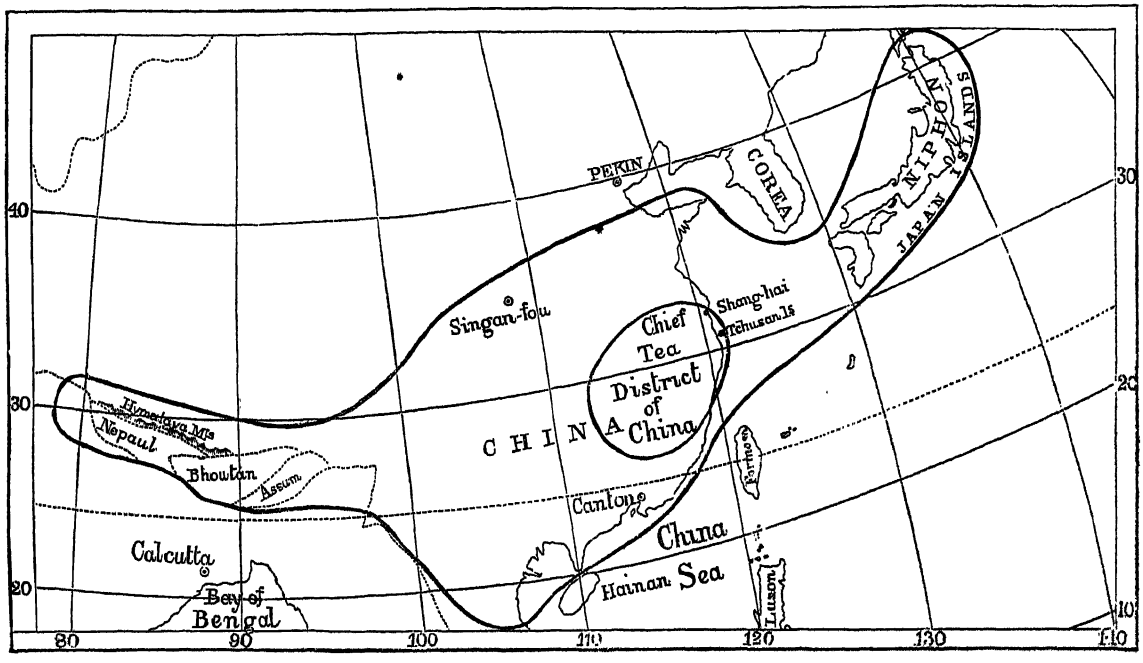


Fig. 2.

(3.) Chemistry of tea.

The most conspicuous chemical constituents of tea are—(1.) tannin or tannic acid, to which it owes its astringency; (2.) volatile oil, to which it owes its peculiar aroma; (3.) theine, the crystalline principle, which is characteristic alike of tea and coffee, and which is to those beverages what quinine is to bark. The other substances extracted from tea by chemical analysis are those which, in various proportions, enter into the composition of all plants. The volatile oil in good teas is about ½ per cent. The tannic acid varies in different sorts and according to different analyses, from 13 up to 26 per cent.; the theine is represented to vary still more considerably. Mulder obtained less than ½ per cent. of their weight from Chinese teas, and about a fifth more than that proportion from Java teas.[1] Stenhouse obtained a little more than 1 per cent.; Péligot obtained about 6 per cent. The experiments of the eminent chemist last-named are of great interest, and merit a somewhat detailed description :—

Péligot's analysis.

M. Péligot began by determining (by Dumas's process) the total amount of nitrogen contained in the tea-leaf, dried at 110°. In Pekoe tea he found 6·58 of nitrogen in 100 parts; in souchong and in gunpowder tea, 6·15; in Assam tea, 5·10; a proportion nearly six times more considerable than had been shown in any previous analysis. Thence, testing every soluble or separable substance for nitrogenous matter, he proceeded, by successive eliminations, to ascertain the quantity of theine in twenty-seven different sorts of teas. He thus found that green teas contain, on an average, 10 per cent., and black teas 8 per cent. of water; that dried black teas contain on the average 43·2 of matter soluble in boiling water, and green tea 47·1 per cent.; that the ordinary black teas of commerce contain 38·4, and the ordinary green teas 43·4 soluble parts; and, further, that in this soluble matter yielded by gunpowder tea, there was 4·35 per cent. of nitrogen, and in that yielded by souchong 4·70 per cent. It remained to determine whether this large quantity of nitrogen was wholly due to the theine, or due in part to any other principle. Having first ascertained that the precipitate obtained by the sub-acetate of lead contained no appreciable quantity of nitrogen, he then treated the theine by a modification of Mulder's process, obtaining from hyson, on the average, 2·48 per cent.; from a mixture of equal parts of gunpowder, hyson, imperial, caper, and pekoe, 2·70 per cent.; and from gunpowder, on the average, 3·52 per cent. Greatly as these quantities exceeded those obtained by Mulder and by Stenhouse, they were still insufficient to account for the whole amount of nitrogen found in the infusion. By another and simple process, that of adding to the hot infusion, first sub-acetate of lead, and then ammonia,

[1] Mulder's analysis was made from the hyson and congou respectively, both of China and of Java. Its entire results were as follows: —

	Chinese Teas.		Java Teas.	
	Hyson.	Congou.	Hyson.	Congou.
Volatile oil	0·79	0·60	0·98	0·65
Chlorophyl	2·22	1·84	3·24	1·28
Wax	0·28	0·00	0·32	0·00
Resin	2·22	3·64	1·64	2·44
Gum	8·56	7·28	12·20	11·08
Tannic acid	17·80	12·88	17·56	14·80
Theine	0 43	0·46	0·60	0·65
Extractive matter	22·80	19·88	21·68	18·64
Apothem	Traces.	1·48	Traces.	1·64
Colouring matter, separable by muriatic acid	23·60	19·12	20·36	18·24
Albumen	3·00	2·80	3·64	1·28
Woody fibre	17·08	28·32	18·20	27·00
	98·78	98·30	100·42	97·70
Salts or ash contained in these constituents	5·56	5·24	4·76	5·36

—Mulder, in *Pharmaceutisches Central-Blatt* (1838), 403.

Botany, Geography, and Chemistry.

separating the liquid by filtration, and passing through it a current of sulphuretted hydrogen, to precipitate the lead, and then evaporating the liquid at a gentle heat, he obtained an abundant supply of crystals of theine; the liquid, or "mother lye," being re-evaporated, this supply was increased, till it amounted, in the whole, to 3·84 per cent. There still remained a syrup containing more theine, only to be precipitated by tannic acid. The result, added to the theine already crystallized, gave a total of 5·84 per cent. from gunpowder tea in its ordinary state, and 6·21 per cent. from the same tea when dried. The experiments were continued by boiling the exhausted leaves with potash, which showed the presence of casein to the extent of 28 per cent.; the proportion in tea, in its ordinary state, being from 14 to 15 per cent.[1]

According to the chemical classification of food, the "flesh-formers" in tea of average quality may be said to be about 18 per cent., and the "heat-givers" 72 per cent.; water and mineral matter dividing between them the residue. The several constituents, as they are shown in the excellent "Food Collection" at the South Kensington Museum, stand thus:—

Constituents.		Quantities contained in one pound of good tea.		Centesimal proportions.
		oz.	grains.	
Water		0	350	5·00
Flesh-formers	Theine	0	210	3·00
	Casein	2	175	15·00
Heat-givers	Volatile oil	0	52	0·75
	Gum	2	385	18·00
	Sugar	0	211	3·00
	Fat	0	280	4·00
	Tannic acid	4	87	26·25
	Woody fibre	3	87	20·00
Mineral matter, or ash		0	350	5·00
		15	267	100·00

Sanitary properties of tea.

On the sanitary effects of tea, there was for a long period much controversy. The champion of "our wholesome English product, sage," as being far superior to "the boasted Indian shrub," was but one of a host who attacked it as an innovation pregnant with danger both to health and good morals. Some of them, however, although resolute for its banishment from the caddy, were willing to give it a place in the medicine chest. "Among many other novelties," says a medical writer in 1722, "there is one which seems to be particularly the cause of the hypochondriac disorders, and is generally known by the name of thea, or tea. It is a drug which of late years has very much insinuated itself, as well into our diet as regales and entertainments, though its occupation is not less destructive to the animal economy, than opium, or some other drugs which we have at present learned to avoid."[2] Dr Lettsom was the first medical writer who gave the public a reasonable and scientific account of the plant; but even his fears of its abuse ran away with his judgment. The poet who commends "the cups which cheer but not inebriate" must have been startled, if Dr Lettsom's tract ever fell into his hands, at the assertion, that "the first rise of this pernicious custom," of drinking spirits to excess, "is often owing to the weakness and debility of the system, brought on by the daily habit of drinking tea; the trembling hand seeks a temporary relief in some cordial, in order to refresh and excite again the enfeebled system, whereby such persons almost necessarily fall into a habit of intemperance."[3] Here, assuredly, the exceptions must have been taken for the rule. That tea may be so abused as to create a craving for alcoholic stimulant is unquestionable. That, at any period, the abuse of tea has been so general as to become a main cause of drunkenness may safely be denied.

Botany, Geography, and Chemistry.

Tea and the poets.

With the brain-workers, tea has always been a favourite beverage. The subdued irritability, the refreshed spirits, the renewed energies, which the student so often owes to it, have been the theme of many an accomplished pen. To say nothing of our own familiar poets and essayists, its praises have been sung by Herrichen and by Francius, in Greek verses; by Pechlin, in Latin epigraphs; by Pierre Petit, in a Latin poem of five hundred lines; and by a German versifier, who celebrates, in a fashion of his own, its "burial and happy resurrection."[4] Huet, bishop of Avranches, has also paid his graceful tribute[5] to a stimulant, to which, probably, no scholar was ever more indebted, and which he continued to enjoy at the age of ninety. Johnson, indeed, wrote no verses in its honour; but he has drawn his own portrait as "a hardened and shameless tea-drinker, who, for twenty years, diluted his meals with only the infusion of this fascinating plant; whose kettle had scarcely time to cool; who with tea amused the evening, with tea solaced the midnight, and with tea welcomed the morning."[6]

The assailants are not so distinguished, but, as we have partially seen already, they have been quite as emphatic. Jonas Hanway, a man "whose failings," as Johnson said, "may well be pardoned for his virtues," is perhaps the most conspicuous of them. He looked abroad on the world (of which he had seen a great deal), and perceiving that many things went wrong in it, and that other things no longer presented the same attractive appearances he remembered them to have worn in his youth; remembering, too, that when he was young tea was very little drank, whereas it had by that time come into almost universal use, he laid to its charge the evils and the disenchantments that oppressed his spirits. "Men," he says, "seem to have lost their stature and comeliness, and women their beauty.... What Shakspeare ascribes to the concealment of love, is, in this age, more frequently occasioned by the use of tea."[7] To these complaints, echoes were not wanting; but, after a while, the tea-drinkers had it all their own way.

Briefly, it may be said, that to persons in health, besides the more obvious effects with which almost everybody is familiar, tea saves food by lessening the waste of the body; thus it soothes the vascular system, whilst it excites the brain to increased activity. Nor are its directly medicinal uses quite without importance. In the early stages of fever, it is a useful diluent; in the later ones, a tincture, made by macerating tea in proof-spirit, is sometimes administered with advantage. A very strong infusion of tea has proved an antidote in cases of poisoning by arsenic, and by tartarized antimony, as well as by opium. Under the infirmities of advancing age, when the digestive powers become enfeebled, and the size and weight of the body begin very perceptibly to diminish, the value of tea in checking the too rapid waste of the tissues is especially observable.

That the characteristic element, theine, should be present, not only in the tea-shrub of China and India, but in coffee, in *Guarana officinalis*, and in the maté-plant (*Ilex Paraguayensis*) of Paraguay,—of which last-named plant it is estimated that 40,000,000 lbs. are consumed annually in South America,—is a striking and beautiful fact. From plants so unlike in appearance, and so remote in birth-place,

[1] Péligot, "Recherches sur la composition chimique du thé," in *Comptes Rendus . . . de l'Académie des Sciences*, xvii., 107–112 (1843).

[2] *An Essay on the Nature, Use, and Abuse of Tea*, 14, 15.

[3] Lettsom, *Natural History of the Tea-Tree*, 78.

[4] *Der Thee Begräbnüss und Glückliche wieder Aufferstehung* [1680 ?]

[5] In the verses beginning—

"I, puer, i, Theam confestim in pocula misce;
Urget non solitus lumina nostra sopor;
Mens stupet; obtusæ languent in corpore vires;
Languorem solvet vivida Thea novum."

(Huetii, *Commentarius de rebus ad eum pertinentibus*, 304).

[6] *Literary Magazine*, vol. ii., No. 13 (1757).

[7] Hanway, *Essay on Tea* (1756).

Cultivation and Manufacture.

myriads of people in all parts of the earth derive a refreshing and exhilarating beverage, alike enjoyable by persons of all degrees of civilisation and culture. Under such a fact, there may well lie more significance than science has yet elicited.

II.—THE CULTIVATION AND MANUFACTURE OF TEA.

Soil of the tea-lands.

The soil of the tea-lands of China varies very considerably, even in districts which are alike famous for the growth of the plant. That of the Bohea tea-hills, or Woo-e-Shan district, is described by Mr Fortune as being commonly a brownish-yellow adhesive clay, containing a considerable portion of vegetable matter, mixed with fragments of clay-slate, of a sandstone conglomerate, "formed principally of angular masses of quartz, held together by a calcareous basis of granite and of a fine calcareous granular sandstone. It has always," he adds, "a very considerable portion of vegetable matter in those lands which are most productive, and in which the plant thrives best. In the gardens, on the plains, the soil is of a darker and often of a reddish colour, and contains a still greater portion of vegetable matter.[1] It is uniformly well drained, owing to the natural declivities of the hills, or, if on the plains, by being a considerable height above the water-courses."[2] Mr Ball (long a resident in China as inspector of teas for the East India Company), to whom we owe the most satisfactory account of the culture of the tea-plant which has yet been given to the public, sums up an elaborate examination of this part of the subject, by stating that, whilst it delights in hilly sites of moderate elevation, the plant may be successfully cultivated along the banks of rivers, in a light stony soil, subject to occasional inundations; or in a soil, rich and somewhat compact, retentive of moisture, though of easy filtration; sufficiently porous to be permeable to the delicate fibres of the roots .... and sufficiently tenacious to supply a healthy moisture, without being liable to be dried up and baked during the alternations of sun and rain."[3]

Analyses of soil from China;

Seven specimens of earth from Chinese tea plantations, analysed by Mr Faraday, gave the following results:—

Constituents.	Whence taken.						
	From Lapa, near Macao.	From N.E. part of prov. of Fokien.		From a Pot Plant, Bohea.	From the Bohea Tea-hills, Woo-e-Shan.		
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5. First quality.	No. 6. Second quality.	No. 7. Third quality.
Sand	46·1	17·70	10	51·54	33·08	44·61	36·15
Ferruginous clay, &c.	53·9	56·53	90	48·46	66·92	55·39	63·85
Stony fragments	...	25·77	a few fragments	...	...	no stones but much mica.	a few silicious stones and some mica.
	100·0	100·0	100	100·00	100·00	100·00	100·00

from Japan;

In the analysis of the earth of a Japanese tea plantation, by Nees von Esenbeck and Marquart, 100 grains were found to contain 53 of silicious earth, 22 of clay, 9 of oxide of iron, ½ a grain of oxide of manganese and magnesia, ½ a grain of gypsum, 1 of humus, traces of phosphoric acid, and 14 grains of water. In appearance this earth is described as resembling slate atmospherically dissolved.[4] The gypsum and the traces of phosphoric acid are owing to manure. An analysis of the soil of the tea plantations in Assam, by Mr Piddington, is reported thus: —"Silex, 85·40; carbonate of iron, 7·40; alumina, 3·50; water, 2·45; vegetable matter, 1·0."[5] The accompanying assertion that the tea soils of China and of Assam are "exactly alike" is insufficiently supported by the evidence adduced.

Cultivation and Manufacture.

and from Assam.

The tea-plant is propagated in China from seeds gathered in October, and kept, mixed up with sand and earth, during the winter. The seeds are sown sometimes in the rows where they are to grow; sometimes in a corner of the tea farm, whence, when they are about a year old, they are transplanted. The preliminary hoeing of the ground is shown in the accompanying illustration, copied, like those that follow, from a series of Chinese drawings now in the South Kensington Museum.

Propagation of the plant in China.

Hoeing the ground.

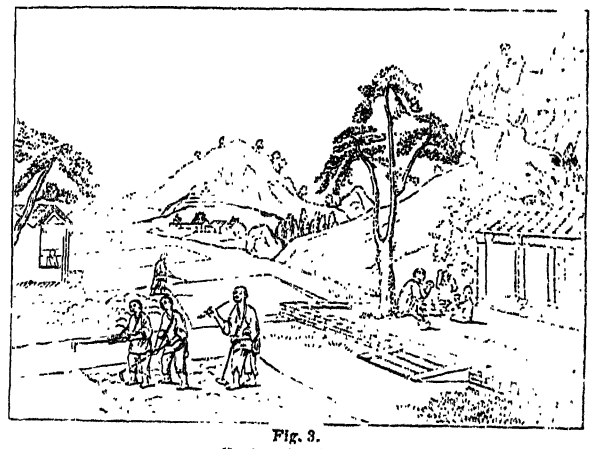


Fig. 3.
Hoeing the Ground.

Planting.

"In sowing the seed," says the *Kiun Fang Pu*, quoted by Mr Ball, "use paddy husk and parched earth. Put from six to ten seeds into each hole, placing them about an inch below the surface of the ground." The rows are usually about four feet apart. This operation is shown thus:—

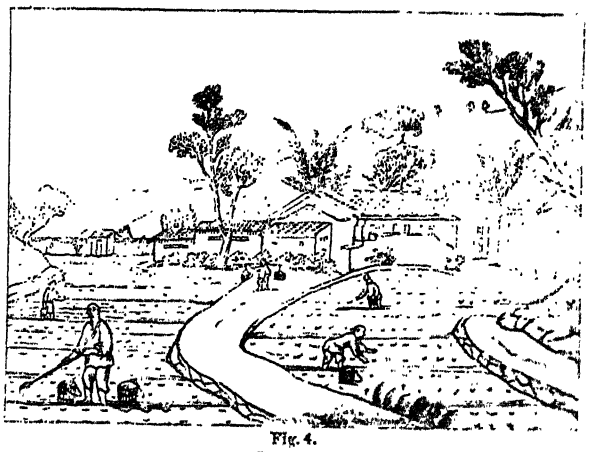


Fig. 4.
Planting.

Watering.

"When the plants begin to germinate," continues the *Kiun Fang Pu*, "the weeds ought not to be raked up. If the season be dry, water them with water in which rice has been washed, and manure them often with manure in a liquid state, or with the dung of silk-worms. Water lodging about the roots of the plants will inevitably destroy them." The manuring process seems to be more

[1] Fortune, *Two Visits to the Tea Countries*, ii. 195, 217. [2] Ib. 218. [3] Ball, *An Account*, &c., *ut supra*, 46-73.
[4] Von Siebold, *Anbau und Bereitung des Thees auf Japan* (*Nippon*, § vi.) 18.
[5] As quoted by Mr P. Saunders in his Evidence before the Committee on Colonization of India (*Minutes of Evidence*, 1859, 3409).

Cultivation and Manufacture.

used in the green tea districts than in the black tea districts. "That tea," says another Chinese authority, "is the most fragrant which is not manured."



Fig. 5.
Watering.

Gathering the early leaves.

The young plants are generally allowed to grow until they are pretty well established, and are producing strong and vigorous shoots before the first gathering of their leaves. Sometimes this first gathering takes place in the second, sometimes in the third year. It begins in the Woo-e-Shan district about the 5th of April, and consists of the young leaf-buds just beginning to unfold. These constitute "Pekoe," the highest quality of black tea. The practice is often very injurious to the health of the plants; but copious showers fall at this season, and fresh leaves soon show themselves.

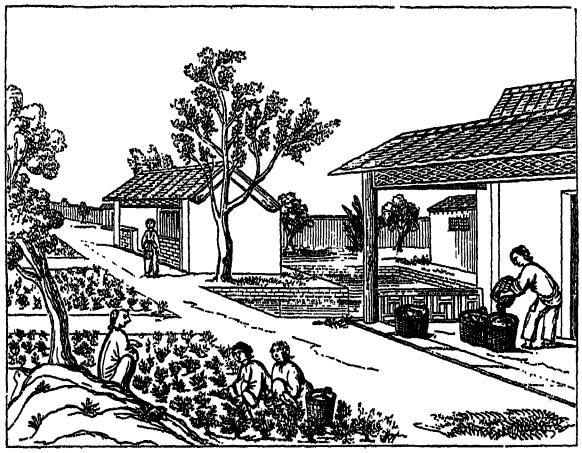


Fig. 6.
Gathering.

The first gathering of the expanded leaf begins towards the end of April or commencement of May. A second gathering follows about a month later, and a third at the beginning of July. The autumnal gathering takes place in August or September. It consists of large and old leaves, and is of small value. In some districts there are but three gatherings in all. "The first," says the *Vu-yé Shan-chy*, "is fragrant in smell and full-flavoured; the second has no smell at all, and is weak in flavour; the third has a little scent, but is also weak."

Sorting.

When a sufficient quantity of leaves has been gathered, they are carried to the cottage, barn, or public factory in which the operation of drying is performed. But the first process is to class the leaves, which is done with more or less care, according to the kind of tea under treatment. As thus:—

Cultivation and Manufacture.

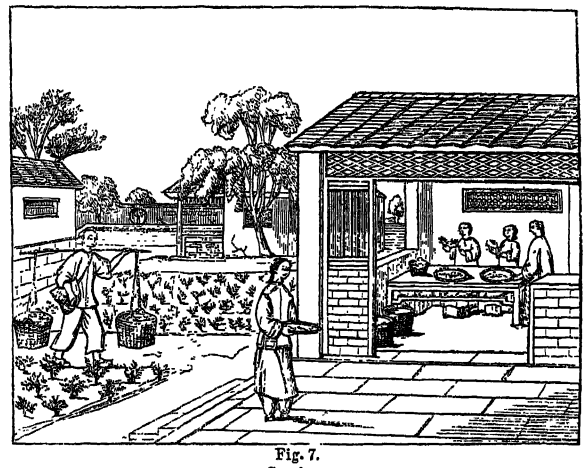


Fig. 7.
Sorting.

Drying.

Then comes the first drying process. The leaves are put into round and very shallow pans or trays of thin iron, which are placed in shady situations in the open air; often under verandahs, as shown in fig. 8.

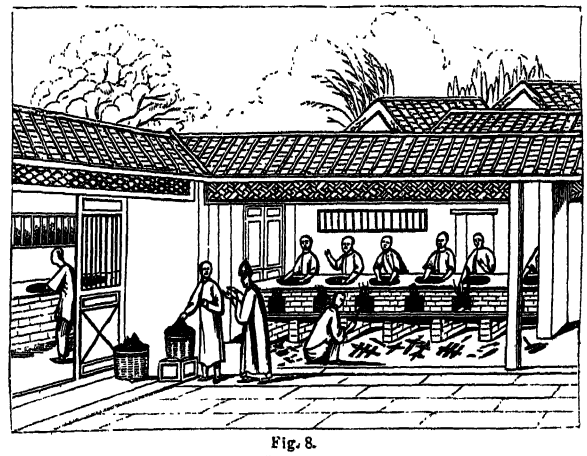


Fig. 8.
Drying.

Other drying processes follow, which greatly vary, according to the character of the teas manipulated. For these operations the Chinese have a long series of technical terms, the explanations of which, as vouchsafed to the "outside barbarians," are often perhaps intended rather to mystify than to elucidate. In the preparation of some kinds, a man collects together as many leaves as he can hold, turns them over and over, and then tosses them to a considerable height, repeating the process many times. Some of the finer sorts are neither handled nor tossed, but are simply whirled round in sieves, as in fig. 9.

Sifting.

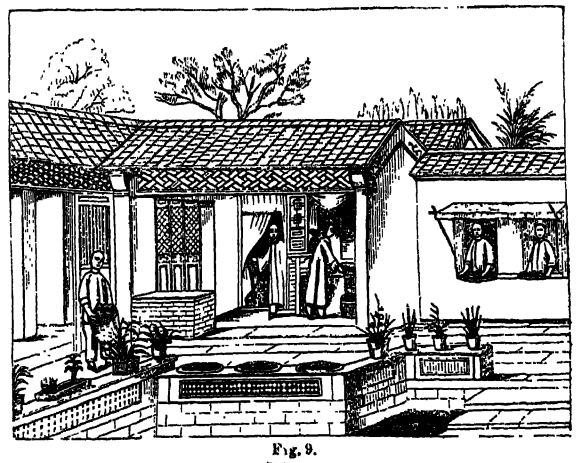


Fig. 9.
Sifting.

Cultivation and Manufacture.

Roasting.

The roasting of the leaves is performed in shallow iron pans (called *kuos*), a series of which is built into brickwork, low in front, and rising very gradually at the sides and back; having a flue beneath them, and a fire-place at one end. In the first roasting of black tea, a fire is made of dry wood, and kept very brisk. The roaster throws a small quantity of leaves into the kuo, draws them, with a slight pressure of his hands, from side to side, and turns them over and over; repeating the process for several minutes, and keeping them constantly in motion. The leaves immediately begin to crack, and soon become moist, soft, and pliable. When the heat becomes too great, they are lifted above the kuo, and allowed to fall gradually, so as to cool them. If any leaves begin to burn, they are instantly removed.

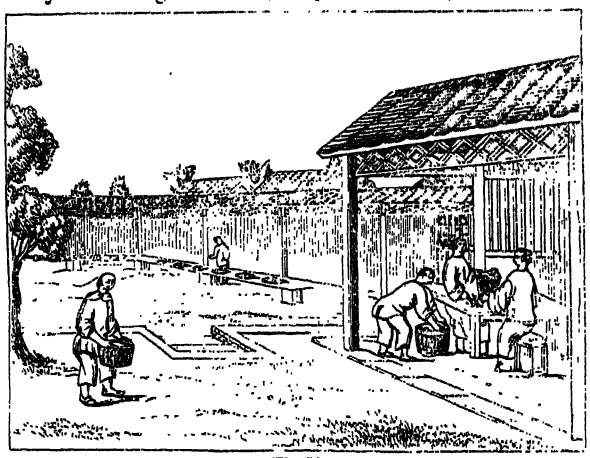


Fig. 10.
Roasting.

Twisting.

When taken out of the pans, the leaves are thrown upon a table surrounded by several workmen, each of whom takes as many leaves as he can hold in his hands, and rolls them from left to right, with a circular motion which keeps them together. This rolling process is performed either on a bamboo table, or on trays of bamboo-work, so as to admit of the passing away of the expressed moisture. The leaves are thus both twisted and dried.



Fig. 11.
Twisting.

As soon as the operations of rolling and twisting are completed, the leaves are once more exposed to the action of the air; after which they are again roasted at a diminished heat, and with charcoal instead of wood. They are frequently shaken and strewed around the less heated sides of the pans, so as to quicken evaporation. Then follows another rolling, and in the preparation of some kinds of tea—as for instance those called "Yen" or "Padre souchong"—a third roasting and rolling. For some of the finer sorts, the last stage consists of a drying process, performed in flat bamboo baskets or sieves, over a slow charcoal fire. A drying-basket or tube is placed over the charcoal stove, and is furnished with cross-wires, on which the sieve containing the leaves is placed. After about half an hour's exposure to the fire, another sieve is placed over that which contains the leaves, and both are reversed, so as to turn the leaves without mixing them. They are then rubbed between the hands, and sifted until they become black, dry, crisp, and well twisted.

Cultivation and Manufacture.

Manipulation of green teas.

The manipulation of such green teas as are not artificially coloured (a process to be described hereafter) differs from that of black teas chiefly (1), in the roasting of the leaves almost as soon as they are gathered; and (2), in the rapid drying of the leaves after they have undergone the operation of rolling; whereas the black teas, as has been shown, are exposed to the air between all the stages of manufacture, and are finally dried by a slow and elaborate process. An accomplished chemist, Mr Warington, of Apothecaries' Hall, has shown by analogy, in a very interesting manner, how these differences of manipulation affect the characteristic properties which distinguish good green teas from good black teas. "The medicinal plants, for the most part nitrogenous, brought to us," he writes, "by dealers or collectors from the country, when they arrive fresh and cool, dry of a bright green colour; but if delayed in their transit, or kept in a confined state for too long a period, they become heated from a species of spontaneous fermentation, and, when loosed and spread open, emit vapours, and are sensibly warm to the hand. When such plants are dried, the whole of the green colour is found to have been destroyed, and a reddish brown, and sometimes a blackish brown, result is obtained. I had also noticed that a clear infusion of such leaves, evaporated carefully to dryness, was not all dissolved by water, but left a quantity of brown, oxidized, extractive matter, to which the denomination *apothene* has been applied by some chemists; a similar result is obtained by the evaporation of an infusion of black tea. The same action takes place by the exposure of the infusions of many vegetable substances to the oxidizing influences of the atmosphere: they become darkened on the surface, and this gradually spreads through the solution; and on evaporation, the same oxidized extractive matter will remain, insoluble in water. Again, I had found that the green teas, when wetted and redried, with exposure to the air, were nearly as dark in colour as the ordinary black teas."[1] The inference is obvious, that the peculiar characteristics which distinguish black tea from green are to be attributed to a sort of fermentation, accompanied with oxidization by exposure to the air.

Mr Warington's experiments.

Classing of the teas for market.

The picking and classing of teas for the market are performed very diversely in different localities. Hand-picking to remove the coarse leaves and stalks is seldom practised with the ordinary black teas, but is essential in the preparation of twankay and hyson. The black tea markets are usually held every tenth day during the season, and the teas of a farm are carried thither for sale in quantities of from 100 to 200 chests at a time. Thence they are removed to certain villages where the teas of a district are collected, and at which the Canton Hong merchants and tea-factors have large packing establishments. The congous are packed in parcels or "chops" of about 600 chests, each chest containing about 80 lb. of tea. Each parcel is divided into two packings, consisting generally of 300 chests each. The teas which are to constitute one uniform quality of 600 or even 1000 chests consist, according to Mr Ball, of certain proportions of the three gatherings, collected from various farms. These teas having been previously classed according to their quality, a sufficient quantity to make a

[1] Warington, "Observations on the Teas of Commerce," in the *Quarterly Journal of the Chemical Society of London*, iv. 159, 160.

Artificial Colouring and Adulteration.

"packing" of 300 chests is started into a heap, and so placed in different layers that, when raked down with a wooden rake, their various qualities may mix and blend together, so as to form one uniform quality suited to a fixed price.[1] The teas are then packed and trodden into chests, as in fig. 12.



Fig. 12.
Packing.

Final preparation and classing of hyson teas.

The final preparation and classification of the hyson teas Mr Ball describes as follows:—The rough or unpicked teas, when purchased by the factors, is brought home, and roasted for two hours and a half. In about a month they are sifted. In this operation, as Mr Ball saw it, four sieves were employed. The first received the rough tea, and passed "young hyson" and the smallest "gunpowder" and dust, which he calls No. 1. The second sifted the returns of the first sieve, and passed the small hyson leaves and the large round gunpowder, No. 2. The third sieve passed the middling-sized hyson leaves, No. 3. The fourth passed large hyson leaves, No. 4, retaining still larger leaves, No. 5, which were then roasted in a kuo considerably deeper than those already described, at a heat of 90° Fahr. They were winnowed, whilst hot, with large circular bamboo trays, so as to drive off a *chaffy kind of skin or dust*. The leaves were then strewed upon a table. The large open leaves and large knobby leaves were picked out by hand, and formed the finest sort of "hyson skin" (known commercially as *pretty good bloom, brightish hyson kind mixed, knobby leaf*); the remaining leaves were hyson. Next, the large leaves, No. 4, were roasted and winnowed in like manner. The knobby and other fine skin leaves were picked out (*middling to good middling, bloom brightish, mixed knobby leaf*); the residue were hyson (*middling bloom, brightish twisted leaf*). The middle-sized hyson leaves, No. 3, were then roasted at a diminished fire and for a shorter time. When winnowed, a middling quality of skin was fanned off (*but middling to middling bloom, small twisted wiry leaf*); leaving hyson, as before. And in like manner with Nos. 1 and 2.[2]

III.—THE ARTIFICIAL COLOURING AND ADULTERATION OF TEA.

For consummate skill in the "tricks of trade," the Chinese have long been proverbial. "They are a self-ended people," says an old writer, "having the same repute in Asia that the Jews have in Europe." A century afterwards, we find Duhalde warning his readers that "the Chinese call a great many herbs by the name of tea which have no claim to that distinction," and which nobody so designates without special reasons for the compliment.[3] But, as we shall see presently, although the Chinese have by no means forgotten their cunning, they have been far outshone, as respects the crafty manipulation of tea, by "self-ended people" of quite another race.

Artificial Colouring and Adulteration.

In the course of those inquiries into the adulteration of food by which Dr Hassall and the proprietors of *The Lancet* have conferred so eminent a benefit on the British public, 29 samples of black tea as imported from China, and 30 samples of green tea, also as imported, were analysed. Of the black teas none contained leaves other than those of the tea-plant. But 12 samples—being varieties of "scented pekoe," "scented caper," and "black gunpowder"—were largely adulterated, either with an imitation of tea formed of tea-dust and fragments of rice or paddy husks, or with glazing substances, such as black-lead, indigo, turmeric, and an iridescent powder resembling mica. The congous and souchongs were free from adulteration. Of the 30 samples of green teas, every sample without exception was found to be adulterated. The substances detected were Prussian blue, China clay, turmeric, and a white powder variously composed, but usually consisting of kaolin, soapstone, or sulphate of lime. Five of these samples, called by the vendors gunpowder, consisted entirely of what the Chinese themselves designate as "Lie-tea." They have had the candour, in this particular, to call things by their right names. This "Lie-tea" is composed of tea-dust and sand, made up with rice-water. Another sample was largely composed of paddy-husk and other fraudulent substances. Another contained a large admixture of foreign leaves. Every sample of the thirty was artificially coloured or glazed; not a single leaf of natural green was found. All, when deprived of their cosmetics, were either yellow, olive, brown, or black.[4]

Chinese adulteration of tea

Four samples of black teas from Assam and two from Java analysed at the same time were found to be pure. Two samples of green teas from Assam and one from Kumaon were also found to be pure and uncoloured. One from Java was slightly faced with a white powder.

The colouring of green teas is an operation performed exclusively for the advantage of Europeans, and the Chinese make little difficulty in exhibiting the process. Tea, they sometimes say on such occasions, is, "in our opinion," better without Prussian blue and gypsum; but as "foreigners seem to prefer an admixture of those ingredients with their tea, to make it look uniform and pretty, and as the ingredients admired are cheap, we have no objection to supply them, especially as coloured teas always fetch a higher price."[5] Another inquirer into this branch of tea manufacture, Mr Berthold Seeman, was so much pleased with the gentlemanly frankness with which the operation was shown and explained to him, that he protests against the application to it of so coarse a term as adulteration,[6] although the very manipulations which he witnessed produced to the courteous Chinaman who displayed them the agreeable result of converting a black tea worth about 5d. a lb. into a green tea valued at 15d. a lb. Mr Ball, too, dismisses these dyeing processes with the gentle remark, that "when the leaf is deficient in the requisite colour, the Chinese do not hesitate to employ colouring matter to improve it."[7]

The colouring of green teas.

The colouring, as seen by Mr Fortune in the Hwuy-Chow district, was performed by the foreman of the factory. Having procured a portion of Prussian blue, he threw it into a porcelain bowl, and crushed it to a fine powder. A quantity of gypsum was then burned, pulverised, and mixed with the Prussian blue, in the proportion of four parts to three. Then, about five minutes before the removal of the tea from the pans, the foreman scattered this mixture over the leaves in each pan. The workmen then turned them rapidly round with both hands, that the colouring matter might be equally diffused. In the course of this procedure their hands became quite blue.[8]

The British methods of adulterating tea are very multifarious. Leaves of the beech, elm, horse-chesnut, plane, willow, poplar, haw-thorn, and sloe, have been repeatedly detected. The usual method is to dry the leaves, break them up into small pieces, mix them up with a paste of gum and catechu or *terra Japonica*, reduce them to powder, colour them with rose pink, and then mix them with tea-dust or with genuine black teas of inferior quality. The microscope is of great service in detecting fabrications of this kind, even when the leaves have been completely pulverised. Exhausted tea leaves mixed with a solution of gum or of *terra Japonica*, re-dried and faced or glazed with a mixture of rose-pink and black-lead, are used to an enormous extent. Here the fraud can best be detected by chemical analysis. Logwood is used to give a high colour to the infusion of inferior black teas. If such an infusion be tested by

British adulteration of tea.

[1] Ball, *An Account*, &c., *ut supra*, 137–139.
[2] Ibid., 229–233.
[3] Duhalde, *Description de la Chine*, edit. of 1736, i. 26.
[4] Hassall, *Food and its Adulterations* (1855), 273–291, 301–309.
[5] Fortune, *Journey to the Tea Countries*, 94.
[6] Hooker's *Journal of Botany*, iv. 24 (1852).
[7] Ball, *ut supra*, 234.
[8] Fortune, *ut supra*, 92–3.

History of the Use and Commerce.

the addition of a few drops of sulphuric acid, a reddish tinge will indicate the presence of this substance. Powdered talc or soap-stone is used for the purpose of imparting a deceptive bloom. It is not easy to pulverise these substances so completely that fragments of them may not sometimes be detected by the naked eye.[1]

Twenty-four samples of black teas, and twenty of green teas, purchased from various retailers in London, were analysed by Dr Hassall and his colleagues. Of the black teas, eighteen samples were found to be genuine; of the green, not one. Almost every fraudulent substance which has been mentioned was found in one sample or other, together in several instances, with a liberal mixture of the homely leaves of our English hedges. The colouring and glazing matters, it may be added, which are commonly used by the adulterators at home are of a more injurious and poisonous kind than those used in China. These facts afford a sad commentary on the hopeful prophecy of a writer of 1750. "Here," said he, "we are secured against sophistication, and know what 'tis we drink."[2]

IV.—HISTORY OF THE USE AND COMMERCE OF TEA.

Conjectural identification of tea with the *malabathrum* of Arrian.

One of the writers of the able *Historical Account of China*, published in 1836, as a portion of the *Edinburgh Cabinet Library*, has ventured to identify with tea the *malabathrum* mentioned in that very curious passage of the *Periplus of the Erythrean Sea*, in which, after describing "a city called Thina," the author (usually supposed to be Arrian) proceeds to narrate a yearly mercantile journeying to its neighbourhood of "a certain people called Sesatæ, of short stature, broad face, and flat nose." The articles they bring for traffic are wrapped, he says, in mats which outwardly resemble vine leaves, and which they leave behind them on their departure. From these mats, it is added, the Thinæ "pick out the haulm called Petros, and drawing out the fibres, spread the leaves double, and make them up into balls, passing the fibres through them. . . . In this form the balls take the name of *malabathrum* (Μαλάβαθρον), and under this name they are brought into India by those who prepare them."[3] Under any interpretation, this is an obscure and confused story. Vincent unhesitatingly asserts that *malabathrum* is the betel leaf, so widely used in the East, with the areka-nut, as a masticatory; whilst admitting the difficulty of understanding why it should be carried from Arracan to China, and then carried back to India by the Chinese. Horace mentions *malabathron*, but only as an ointment.[4] Pliny mentions it both in that sense, as a medicine, and as a masticatory.[5] Dioscorides has it in the latter sense.[6] The writer of the *Historical Account of China* prefers to consider the passage in the *Periplus* as a clumsy account of a process not understood by the describer, but agreeing far better with the manipulation of tea than with that of the betel leaf;[7] and his conjecture, unsupported as it is, merits citation, if only for its originality.

Tea indigenous in China.

Chinese writers agree in the assertion that the tea-plant is indigenous in China, and that it was first discovered amongst the hills of those central provinces where it still grows so abundantly. Some of them place the date of the discovery in the eighth, some in the ninth century. There is independent evidence, in the narratives by two Arabian travellers, of their wanderings during the latter half of the ninth century—supposing those narratives to be trustworthy—of the use of tea as a beverage by the Chinese at that date.[8]

Japanese accounts of tea.

Von Siebold, relying on certain Japanese writers who state that the Chinese received the tea-plant from Corea, assigns its introduction to the year 828. But this story seems improbable. Von Siebold himself observes that, in the southern provinces of Japan, the plant is abundant in the plains, but as the traveller advances towards the mountains it disappears; and hence he infers that it is an exotic. The converse of this holds good of China, so that a like inference would tend to confirm the assertions of the Chinese, that with them it is indigenous. In the *Kaung-Moo*, a historical epitome quoted by Mr Ball, it is stated that an impost was levied on tea by an edict of the 14th year of Te-Tsong (A.D. 783). The Japanese writers say that tea was brought to them from China in the ninth century, and that in 1206 a temple was built on the first Japanese plantation in honour of the bonze who brought it.[9]

History of the Use and Commerce.

The intercourse of the Portuguese with China dates from 1517. A little poem of Waller's has often been quoted to show that tea came to England with Catherine of Braganza. He knew better than to say so, but what he really asserts is unquestionably true—

> "Venus her myrtle, Phœbus has his bays;
> Tea both excels, which she vouchsafes to praise;—
> The best of queens, and best of herbs, *we owe*
> *To that bold nation* which the way did show
> To the fair region where the Sun doth rise,
> Whose rich productions we so justly prize!"

No accounts at present accessible to us establish the date of the first importation of tea by the Portuguese, but the article is mentioned in one of the earliest privileges or licences accorded to them for trade. It is not until the expiration of more than half a century from the beginning of that trade that we find a distinct account from an European pen of tea as a beverage. "The inhabitants of China, like those of Japan," writes Giovanni Pietro Maffei in his *Historiæ Indicæ*, "extract from an herb called *chia*, a beverage which they drink warm, and which is extremely wholesome, being a remedy against phlegm, langour, and bleariedness, and a promoter of longevity."[10] Elsewhere he tells us that the Japanese are very careful to have their tea well-made, and that the most distinguished persons prepare it for their friends with their own hands, and even have rooms in their houses especially devoted to that service.[11] Giovanni Botero, in his treatise *Delle Cause della grandezza . . della Città*, also published in 1589, says of the Chinese, that they have a herb whence they extract a delicate juice, which they use instead of wine, and find to be a preservative against those diseases which are produced by the immoderate use of wine amongst us.[12]

Maffei's account of tea (published 1589).

Botero's account (1589).

The earliest mention of tea by an Englishman is probably that contained in a letter from Mr Wickham, an agent of the East India Company, written from Firando in Japan, on the 27th June 1615, to Mr Eaton, another officer of the Company, resident at Meaco, and asking for "a pot of the best sort of *chaw*." How the commission was executed does not appear, but in Mr Eaton's subsequent accounts of expenditure occurs this item:—"Three silver porringers to drink chaw in."[13]

First mention of tea by Englishmen.

Father Alexander de Rhodes, who entered China in 1623, remained there more than twenty years, and afterwards travelled through other parts of Asia, asserts that, although the use of tea was then common throughout the East, and "*begins, I perceive, to be known in Europe*, it is, in all the world, only to be found in two provinces of China, those of Nanquin and of Chin-Chean, where the gathering of it occupies the people as the vintage occupies us. . . All China, Japan, Tonquin, and other kingdoms use it, and the abundance is so great that it is sold at a very cheap rate." They drink it, he adds, at all hours. He found it, in his own experience, an instantaneous remedy for headache, and when compelled to sit up all night to hear confessions, its use saved him both from drowsiness and from subsequent fatigue. On one occasion, he tells us, he so sat up for six consecutive nights, but he honestly adds that at the end of them he was very tired, notwithstanding the virtues of tea.[14]

F. Alex. Rhodes' account.

Adam Olearius, describing the travels of the embassy sent by the Duke of Holstein to Muscovy and Persia in 1633, writes of the Persians that they are "great frequenters of the taverns called *Tzai Chattai Chane*, where they have *thé* or *cha*, which the Usbeque Tartars bring thither from Chattai. . . . . The Persians boil it till the water hath got a bitterish taste, and a blackish colour, and add thereto fennel, aniseed, cloves, and sugar. But the Indians only put it into seething water. . . . The Persians, Indians, Chinese, and Japanese assign thereto such extravagant qualities, that, imagining it alone able to keep a man in constant health, they are sure to treat such as come to visit them with this drink at all hours. *But this herb is now so well known in most parts of Europe, where many*

Use of tea in Persia;

---

[1] Hassall, *ut supra*, 289–291.

[2] *Treatise on the Inherent Qualities of the Tea-Herb* (1750), 11.

[3] *The Voyage of Nearchus, and the Periplûs*, &c., Gr. and Engl., by Vincent (Oxford, 1809), 116, 117. Comp. Vincent, *The Commerce . . . of the Ancients in the Indian Ocean*, ii. 462, 526–528, 735–739.

[4] . . . . coronatus nitentes,
Malobathro Syrio capillos." (*Carm.*, lib. ii. od. 7.)

[5] "Dat et malobathron Syria, arborem folio convoluto, arido colore: ex quo exprimitur oleum ad unguenta; . . . sapor ejus nardo similis esse debet sub lingua." (*Hist. Nat.* xii. 59.) "Malobathri quoque naturam et genera exposuimus. Urinam ciet," &c. (Ib. xxiii. 48.)

[6] Περὶ Ὕλης Ἰατρικῆς, i. 11.

[7] *Historical Account of China*, i. 152–154.

[8] *Anciennes Relations des Indes et de la Chine*, published by Renaudot, 222–226. These narratives appear to have been extracted from the curious repertory of Masoudy, entitled, *Moroudj-eddheheb*, or "The Golden Meadows," &c.

[9] Von Siebold, *Anbau und Bereitung des Thees auf Japan*, *ut supra*, 3.

[10] Maffei, *Historiarum Indicarum* lib. vi. 108 (Col. Agr. 1589).

[11] Ibid. 242.

[12] Botero, *Della Ragion di Stato . . . Con tre libri delle Cause*, &c., 350, (Ven., 1589).

[13] MS. records of East India Company, as quoted by Crawfurd, "Account of British Intercourse with China," (Murray's *China*, ii. 337).

[14] *Sommaire des divers Voyages*, . . . du R. P. Alexandre de Rhodes, 27, 28, (Paris, 1653).

History of the Use and Commerce.

persons of quality use it with good success, that it must needs be known what are both its good and bad qualities."[1]

and in Europe (1637).

This author's visit to Persia, as secretary to the embassy whose proceedings he narrates, was made in 1637. His narrative appears to have been prepared for the press in 1639 or 1640, although its publication, at Sleswick, did not occur till 1647. Its English translation did not appear until 1662. But the strong expressions as to the familiar use of tea in Europe, applying, as they do, to a period certainly not later than 1640, are sufficient to show that the ordinary accounts place the adoption of that beverage, at least as respects the Continent, too late.

Use of tea in Japan.

Mandelslo, who, after accompanying the Danish embassy, visited Japan in 1638, wrote either in that or in the following year:—"As for *tsia*, it is a kind of thé or tea, but the plant is much more delicate, and more highly esteemed. The Japanese prepare it quite otherwise than is done in Europe. For, instead of infusing it [in the leaf] into warm water, they break it as small as powder . . . and put it into a dish of porcelain . . full of seething water."[2] Tavernier confirms Mandelslo's assertion as to the superiority of the Japanese tea, and he states that it was exported to Tonquin.[3] "The tea most prized," he adds, "is that which makes the water green; that which makes it yellow is middling; that which reddens it is worst of all. . . . In Japan the king and the grandees take only an infusion of the flower of tea, which is more wholesome than the leaf and of finer favour, . . but so dear that the quantity which would fill one of our ordinary glasses costs about a crown of our money."

Early history of the tea-trade in England.

There is distinct evidence that for some years prior to the year 1657, tea was occasionally sold in England at prices ranging from L.6 to L.10 the pound weight. "In respect of its scarceness and dearness, it hath been only used as a regalia in high treatments and entertainments," writes the first English tea-dealer, Thomas Garway, "and presents made thereof to princes and grandees." In that year the founder of the London Coffee-house, still so well-known as "Garraway's," purchased a quantity of the rare and much-prized commodity, and for the first time offered it to the public, in the leaf, at fixed prices varying from 15s. to 50s. the lb., according to quality; and also in the infusion, "made according to the directions of the most knowing merchants and travellers into those eastern countries."[4] The curious broadside which records this fact is without a date of publication, but from internal evidence must have been printed in 1659 or 1660; in which last-named year an act of the first Parliament of the Restoration imposed a tax on "every gallon of chocolate, sherbet, and *tea*, made and sold, to be paid by the maker thereof, eightpence." (12 Car. II., c. 23.)[5]

Pepys' often quoted mention of the fact that on the 25th September 1660, "I did send for a cup of tee, a China drink, of which I never had drunk before,"[6] has been too hastily regarded as proving the extreme novelty of the introduction of tea into England at that date. But he was then not so prosperous a man as in after years, so that its price may have deterred him from any earlier experiment, as it must have deterred many other people. A later entry (28th June 1667) seems also to imply that it was never very much to his own taste. In 1664, we find that the East India Company presented the king with 2 lb. and 2 oz. of "thea," which cost 40s. a lb., and two years afterwards with another parcel containing 22¾ lb., for which the directors paid 50s. a lb. Both parcels appear to have been purchased on the Continent. Not until 1677 is the Company recorded to have taken any steps for the direct importation of tea from China. The order then given to their agents was for "teas of the best kind to the amount of 100 dollars." But their instructions were considerably exceeded, for the quantity imported in 1678 was 4713 lb., a quantity which seems to have glutted the market for several years.[7]

History of the Use and Commerce.

As yet no alarm had been excited that the use of tea was putting in peril the stalworthhood of the British race. But some manly fellows already looked with discontented eye at the growth of a practice which might make liberality with the tea-caddy an excuse for restrictions on the buttery-hatch.

Discontent of the "jolly fellows" at the growing taste for tea.

In the very year of this large importation, we find Mr Henry Saville, writing to his uncle, Mr Secretary Coventry, in sharp reproof of certain friends of his "who call for tea, instead of pipes and bottles after dinner; a base, unworthy Indian practice, which I must ever admire your most Christian family for not admitting." And he adds, with an audible sigh: "*The truth is, all nations are growing so wicked as to have some of these filthy customs!*"[8] Whether from some sympathy in the public at large with these indignant reprehensions, or from other causes, the whole recorded import of tea during the six years 1679–84, amounts to only 410 lb. But, in December 1680, Thomas Eagle, "at the King's Head in St James' Market," inserted in the *London Gazette* the following advertisement, which shows that tea still continued to be imported independently of the Company, but only (as its terms seem to imply) at rare intervals:—"These are to give notice to persons of quality, that a small parcel of most excellent tea is, by accident, fallen into the hands of a private person, to be sold; but, that none may be disappointed, the lowest price is 30s. a lb., and not any to be sold under a lb. weight." The "persons of quality" are also desired to "bring a convenient box with them."[9]

The surreptitious trade.

The annals of the Company record that, in February 1634, the directors wrote thus to Madras:—"In regard thea is grown to be a commodity here, and we have occasion to make presents therein to our great friends at court, we would have you to send us yearly five or six canisters of the very best and freshest thea." And they add, almost in the words of Tavernier, "That which will colour the water . . . most of a greenish complexion is generally best accepted."[10]

Tea duties.

Until the Revolution, no duty was laid on tea other than that levied on the infusion as sold in the coffee-houses. By 1 William and Mary, c. 6, a duty of 5s. a lb. and 5 per cent. on the value was imposed. For several years the quantities imported were very small, and consisted exclusively of the finer sorts. The first direct purchase in China was made at Amoy; the teas previously obtained by the Company's factors having been purchased in Madras and Surat.[11] During the closing years of the century, the amount brought over seems to have been, on the average, about 20,000 lb. a year. The instructions of 1700 directed the supercargoes to send home 300 tubs of the finer green teas, and 80 tubs of bohea."[12] In 1703, orders were given for "75,000 lb. Singlo (green), 10,000 lb. imperial, and 20,000 lb. bohea."[13] The average price of tea at this period was 16s. a lb.

Chinese imitations of English precedents.

At this date an ingenious attempt was made in China to match the exclusive privilege of importing tea accorded by the British Government to the East India Company, with a like exclusive privilege to one Chinaman, called "the Emperor's Merchant," of selling it for exportation. But the Company did not consider the charms of the precedent to afford any reason for satisfaction with its Chinese parody. They stigmatized the arrangement as "a new monster in trade;" but had to compound with the "emperor's merchant" for the waiver of his privilege, by a gift of L.1600 for each ship; and soon afterwards the emperor imposed on

---

[1] *Voyages and Travels of the Ambassadors*, &c., translated by Davies, 323, 324, Lond., 1662.
[2] Ibid., part ii., 195.
[3] Tavernier, *Relation nouvelle du royaume de Tonquin*, 49, 50, Paris, 1679.
[4] Garway, *An exact Description of the Growth, Quality, and Virtues of the Leaf Tea* [1659–60 ?]
[5] *Statutes of the Realm* (Record Com.), v. 255.
[6] Pepys' *Diary*, i. 137, (3d edit.); comp. iv. 100.
[7] Macpherson, *History of the European Commerce with India*, 131.
[8] Harleian MS., 7001, 180. [This letter has been printed by Sir H. Ellis in the 4th volume of his 2d series, p. 62.]
[9] *London Gazette*, No. 1574, 16th Dec. 1680.
[10] MS. records, *ut supra*.
[11] Macpherson, *ut supra*, 152.
[12] Bruce's *Annals*, iii. 304.
[13] MS. records, *ut supra*.

History of the Use and Commerce.

them a permanent tax of 4 per cent. on the value of their cargoes.[1] In 1728 an additional tax of 10 per cent. was levied in like manner, which continued until 1736.

In 1721 the annual import had reached 1,000,000 lb.; and in 1728, 1,100,000 lb. The nett produce of the duty in Great Britain was, in the latter year (1727–8), L.104,300. In 1728–9 it reached L.133,821.[2] During the hundred years from 1710 to 1810 the aggregate sale of tea by the East India Company amounted to 750,219,016 lb., worth L.129,804,595 sterling. Of this aggregate quantity 116,470,675 lb. were re-exported, and 633,748,341 lb. retained for home consumption.[3] The duties during those hundred years ranged from 4s. a lb. excise, with a customs duty of 14 per cent., which was the maximum (1722–1744), down to a total duty of 12½ per cent., which was the minimum (1784–1795), but which lasted only eleven years. Macpherson estimates the former duty as amounting to a tax of 200 per cent. on the value of common teas.[4] The extreme reduction, therefore, amounted to 187½ per cent., and its effects are instructive.

Summary of Company's trade, 1710–1810.

Effects of the enormous duties.

The first result of so enormous a tax had been to create a smuggling trade not less enormous. The second had been to offer irresistible lures to the adulteration of the teas imported or smuggled, and to the fabrication of counterfeit teas. The extent of the smuggling trade may be estimated from the fact, that whilst there is satisfactory evidence that, prior to the great reduction of duty in 1784, the annual consumption of real tea in Britain amounted to at least 13,000,000 of lb., the annual importation in British ships averaged but 5,639,939 lb., and the average export from China to Europe in foreign ships averaged 13,198,201 lb.,[5] so that British *consumption* was, in fact, in inverse ratio to British, as compared with foreign, *importation*. The extent of the fabrication trade can only be estimated conjecturally, but none, we think, who may look carefully into the abundant evidence, will incline to regard Macpherson's estimate,[6] that it amounted to at least 5,000,000 lb. annually as an excessive one.

First reduction of duties (1745).

The *first* reduction of duties, in 1745, amounted, practically, to 50 per cent. The sales for home consumption of the five years preceding that reduction show an annual average of 768,520 lb., and an annual revenue, under the high duty, of L.175,222. The sales for home consumption of the five years succeeding it show an annual average of 2,360,000 lb., and an annual revenue, under the reduced duty, of L.318,080.[6] The lesson seems uneludible, but it was not learnt. Between 1759 and 1784, the duties were again, by successive steps, carried up to about 119 per cent. on the value. The smuggling and the fraud again increased, and much more rapidly.

Second reduction of duties (1784).

The *second* reduction of duties, in 1784, amounted to 106⅔ per cent. The sales for home consumption of the three years preceding that reduction show an annual average of 5,721,655 lb., and an annual revenue, under the high duty, of about L.700,000.[7] The sales for home consumption of the three years succeeding it—excluding the year 1784, in which the reduction was made—show an annual average of 16,044,603 lb.; and an annual revenue, under a duty reduced from 119 per cent., on the value, to 12½ per cent., of L.315,426.[7] In other words, little more than one-tenth of the former duty produced nearly one-half of the former revenue.

Return to high duties.

But the old course was soon reverted to. Notwithstanding the success of the Commutation Act of 1784 (so called because it commuted the old tea duty for a window-tax), the duty was doubled in 1795, and by several successive augmentations was, in 1819, carried up to 100 per cent. on the value, of all tea sold by the Company at 2s. the lb. and upwards, and to 96 per cent. on all teas of lower price. Under these enhanced duties the quantity retained for home consumption in Great Britain, which in 1795 had reached 18,394,232 lb., remained for many years almost stationary, despite the vast increase of population. In 1800 it was 20,358,702 lb.; in 1805, 21,025,380 lb.; in 1810, 19,093,244 lb.; in 1815, 22,378,345 lb.; in 1820, 22,452,050 lb. The net amount of duty in 1800, at a maximum rate of 40 per cent., was L.1,152,262; in 1805, at a maximum of 95 per cent., it was L.2,925,298; in 1810, at a uniform rate of 96 per cent., it was L.3,212,430; in 1820, at a maximum of 100 per cent., it was L.3,128,449.

History of the Use and Commerce.

The effects of this system—greatly aggravated as it was in its operation upon prices by the monopoly of the East India Company—are seen conspicuously if the relative consumption, per head of the population, be stated in decennial periods. Thus, in 1801, it was 1 lb. 3¾ oz.; in 1811, 1 lb. 1 1/10 oz.; in 1821, 1 lb. ½ oz.; in 1831, 1 lb. 4 oz.[8] Coffee, which had been very differently dealt with, had increased in consumption from somewhat less than 1 1/10 oz. per head in 1801, to 1 lb. 5½ oz. per head in 1831.[8]

Cessation of East India Company's monopoly of the tea-trade.

To show, even in briefest form, in what manner the Company's monopoly impeded the trade in tea, and aggravated the restrictive effects of high duties, would demand space which is not here available. This part of the question has been elaborately investigated by Mr M'Culloch in his *Dictionary of Commerce*,[9] and to that valuable work we refer the reader who may desire to pursue the subject. Here it must suffice to note, that the monopoly was abolished, and it was made lawful for any person to import tea, by an act of 1833, 3 and 4 Will. IV., c. 85. The trade was opened on the 22d April 1834.

Duties under free-trade.

By an act of the same session, 3 and 4 Will. IV., c. 101, the *ad valorem* duties were abolished; and all bohea tea imported for home consumption was charged with a customs duty of 1s. 6d. per lb.; congou, twankay, hyson skin, orange pekoe, and campoi, were charged 2s. 2d. a lb.; souchong, flowery pekoe, hyson, young hyson, and all unenumerated teas, 3s. a lb. In 1836 these duties were altered to a uniform duty of 2s. 1d. a lb., which rate, with the addition of 5 per cent, imposed in 1840, continued to obtain until 1851, when the penny was removed. In 1853, the duty was regulated with a view to its permanent reduction to 1s. per lb. in 1856. The plan then adopted fixed the duty at 1s. 10d. until 5th April 1854; at 1s. 6d. from 1854 to 1855; at 1s. 3d. from 1855 to 1856; and at 1s. from and after the 5th April 1856. But amongst the many sacrifices which were imposed on the British public by the righteous and necessary war with Russia, a sacrifice of the great advantages accruing from this modification of the tea duties was included; and, like the others, it was borne ungrudgingly by the great majority. The duty, which had fallen to 1s. 6d., had to be raised to 1s. 9d.; but, in 1857, it was reduced to 1s. 5d., at which it still remains.

Effect of the Crimean war on the tea duties.

Imports, exports, and amount of duty under free-trade.

During the first entire year of free-trade in tea (1835), the aggregate importations amounted to 44,360,550 lb.; those of the last entire year of the restricted trade (1833) having been 32,057,852 lb. The quantity re-exported was, in 1833, 254,460 lb.; in 1835, 2,158,029 lb. The amount of duty received in the former year was L.3,444,102; that received in the latter, L.3,832,427. The highest importation which has been attained is that of the year 1856, which amounted to 86,200,414 lb.; that of 1857 was 64,493,989 lb.; of 1858, 75,432,578 lb.; and of 1859,

---

[1] Auber, *China*, 150. [2] Additional MSS. in Brit. Mus., 5936. p. 86. [3] Martin, *Report on the Tea-Trade*, 483.
[4] Macpherson, *Commerce with India*, *ut supra*, 208. [5] Ibid. 209. [6] M'Culloch, *Taxation*, p. 332.
[7] Macpherson, *ut supra*, 416. [8] *Report from the Select Committee on Commercial Relations with China* (12th July 1847), vi.
[9] *Dictionary of Commerce*, &c., (1859), 1296–1298.

History of the Use and Commerce.

70,500,000 lb. (of which 62,057,000 were black, and 8,443,000 green teas). The total *deliveries* of 1859 were 83,500,000 lb., against 81,000,000 lb. in 1858. The total *exports* of 1859, 7,200,000 lb., against 8,000,000 lb. in 1858. The amount of duty received in 1858 was L.5,186,171.

Fluctuation in prices of tea.

The *average* price of tea per lb., including duty, was in 1833, 4s. 4d.; in 1838, 3s. 8½d.; in 1840, 4s. 9d.; in 1845, 3s. 4d.; in 1850, 3s. 5½d.; in 1855, 2s. 11d.; in 1859, 3s. 1d. Taking sound common congou as an index, we find its average quotation, in bond, in 1849, 9d. a lb.; in 1850, 11½d.; in 1852, 8½d.; in 1853, 11½d.; in 1855, 9d.; in 1857, 1s. 1½d.; in 1858, 11½d.; and, in 1859, 1s. 1d.

Recent effects on the tea market of the disturbed relations with China.

The disturbed relations with China have not recently been attended with such violent fluctuations in the tea market as at former periods. There has been less speculation than has often followed political events of much smaller moment. Even the news, in September 1859, of the repulse on the Peiho (although it led to large sales at an advance extending to 2d. per lb. in a market which had been steadily rising during the greater part of the year, to an aggregate advance of nearly 25 per cent.—common congou reaching, at the highest point, 1s. 5½d.—and was followed by the usual reaction) induced no permanent belief that trade would be seriously interrupted. But as the stock remaining at the close of 1859 was less by 13,000,000 lbs. than that held at the corresponding period of 1858, and less by 25,000,000 than the average of the three previous years,[1] the prospect of continued dependence on China, for our main supply, would be an unsatisfactory one, despite the enormous breadth of land which is under tea culture; the relative insignificance of our demand compared with that of the Chinese themselves; and the great interest they have in fostering that demand, whatever may be the policy pursued at Pekin. The potency of the last-named consideration is shown by the latest intelligence received from China whilst these pages are at press. Advices from Hong-Kong, of 28th February 1860, state that the shipments of the present season amount to 61,096,600 lb., against 41,607,400 lb. during the same period of last season, being an increase of 19,489,200 lb. On the other hand, the plantations of Assam, of Kumaon, and of other parts of British India are making rapid progress, and their capabilities of further development are vast. Assam teas, from their strength and purity, have commanded high and increasing prices, but the cost of production is relatively low. Of these teas, the sales in 1847 were but 144,161 lb.; and, in 1850, 253,427 lb. In 1858 they had increased to 531,120 lb., and in 1859, to 710,220 lb. Of "sorts and Assam teas," classed together in the trade reports, the aggregate importation in 1849 was 356,000 lb.; in 1852, 552,000 lb.; in 1855, 871,000 lb.; in 1858, 946,000 lb.; in 1859 it reached 1,457,000 lb.[2]

Summary of Statistics.

The imports of tea into the United States amounted in 1844 to 14,257,364 lb.; in 1848 to 19,339,083 lb.; in 1851 to 28,056,712 lb.; in 1852–3 to 40,960,737 lb.; in 1853-4 to 27,867,000 lb.; and, in 1855–6, to 40,246,000 lb.[3]

Of the States of continental Europe, Holland and Russia rank highest in regard to the consumption of tea. Holland takes about 3,000,000 lb., chiefly from Java, in a year, the duty on which varies from 1½d. to 4½d. per lb. Russia takes upwards of 10,000,000 lb. yearly. France imported, in 1848, 1,244,193 lb.; in 1853, 280,779 lb.; in 1855, 577,073 lb.; and, in 1857, 647,496 lb.[4] In Paris the consumption is steadily on the increase, but was estimated, in 1856, not to exceed 90,000 lb. a year, the average price of which was 6s. 6d. the kilogramme, or about 2s. 11d. a lb.[5]

The consumption of tea, relatively to population, in the principal tea-consuming countries, may be estimated as follows:—In the Channel Islands (where there is no duty), 56 oz. per head; in the United Kingdom, 36 oz.; in the U. States of America, 16 oz.; in Russia, 4 oz.; in France, 1 oz.; and in the German Zollverein, ½ oz. per head. Taking the component parts of the United Kingdom, the estimated proportion is—for England, 40 oz.; for Scotland, 35 oz.; and for Ireland, 23 oz. per head.

V.—SUMMARY OF THE STATISTICS OF THE TEA TRADE.

The first of the following tables shows the quantity and value of the tea imported from Canton by the East India Company and by private traders during the last 14 years of the old system, together with like particulars of the American imports during the same period. The second table exhibits the quantities of tea retained in the United Kingdom for home consumption, and its average price at various periods, and under various rates of duty, from the year 1728 to the year 1859, inclusive. The third table exhibits the imports and deliveries of tea in the United Kingdom for each year, from 1849 to 1859 inclusive:—

I.—*Imports of Tea*, 1820–1834, *by Great Britain and by the United States.*

(1) Imports into United Kingdom and into United States of America, 1820–34.

Year.	East India Company.		Private Traders.		Total for Britain.		American Trade.	
	Quantity.	Value.	Quantity.	Value:	Quantity.	Value.	Quantity.	Value.
	lb.	L.	lb.	L.	lb.	L.	lb.	L.
1820–21	28,807,733	1,677,682	2,592,266	196,204	31,399,999	1,873,886	7,890,267	447,649
1821–22	26,010,800	1,555,182	2,776,800	220,443	28,787,600	1,775,625	9,312,267	555,164
1822–23	27,580,400	1,644,446	2,121,773	159,064	29,702,173	1,803,510	11,303,733	652,591
1823–24	29,850,440	1,777,038	2,246,933	151,572	25,097,373	1,925,610	10,152,267	683,749
1824–25	28,836,133	1,690,702	2,331,866	201,520	31,167,999	1,892,222	13,741,467	974,235
1825–26	27,970,533	1,541,022	2,563,866	185,716	30,534,399	1,556,738	12,750,000	953,229
1826–27	40,105,066	2,109,499	3,535,466	228,204	43,640,532	2,337,703	8,577,467	452,274
1827–28	33,455,466	1,858,343	2,142,666	147,212	35,598,132	2,005,555	10,416,934	687,569
1828–29	29,631,200	1,686,708	3,329,066	185,059	32,960,266	1,871,767	9,851,067	590,182
1829–30	30,691,200	1,647,389	2,986,400	150,044	33,677,600	1,797,433	8,827,200	530,545
1830–31	30,476,533	1,692,453	2,748,533	143,199	33,225,066	1,835,652	7,251,467	428,061
1831–32	31,668,800	1,699,468	3,196,133	160,995	34,864,933	1,860,463	11,183,334	779,350
1832–33	31,328,400	1,747,421	2,915,066	169,014	34,243,466	1,916,435	16,327,600	1,259,177
1833–34	30,775,333	1,681,229	3,870,800	221,974	34,646,133	1,903,203	...	...

[1] We take these facts from the valuable Tea Reports of Messrs W. J. and H. Thompson, for the communication of which we are indebted to their courtesy.

[2] Tea Circular and Annual Reports of Messrs Thompson, *ut supra.*

[3] Hunt's *Merchant's Magazine*, xxix. 105; xxx. 743; Tooke, *History of Prices*, vi. 727.

[4] *Tableau General du Commerce de la France*, pendant les années 1848, 1853, 1855, 1857, (Paris, 1849–58), pp. 97, 130.

[5] Husson, *Les Consommations de Paris* (1856), 356–361.

Summary of Statistics.

(2) Consumption of tea in United Kingdom at various periods, from 1728 to 1859.

II.—*Duty, Price, and Consumption of Tea in United Kingdom*, 1728–1859.[1]

Summary of Statistics.

Year.	Average Price of good qualities, per lb.; in the Company's Warehouse (*until* 1833), or in bond.	Rates of Duty	Retained for Home Consumption—lbs.	Estimated Population. [England and Wales only, *until* 1801.]
1728	[32s. 6d. (duty included)]	4s. per lb., and L.13, 18s. 7½d. per cent.	1,493,626	6,252,750
1760		1s. per lb., and L.43, 18s. 7½d. per cent.	3,860,976	6,682,000
1782	5s. congou : 9s. 10d. hyson	1s. 1¼d. per lb., and L.55, 15s. 10d. per cent.	6,202,257	7,641,000
1783	... ...	... ...	4,741,522	...
1784	4s. 10d. congou; 8s. 3d. hyson...	L.12, 10s. 0d. per cent.	10,150,700	...
1785	4s. 3d. congou; 6s. 9d. hyson...	... ...	14,800,932	7,913,000
1786	4s. 6d. congou; 7s. 1d. hyson...	... ...	15,851,747	...
1795	3s. 9d. congou; 6s. 4d. hyson...	L.20 per cent.	21,342,845	
1801	3s. 5d. congou; 5s. 6d. hyson...	L.50 per cent., at or above 2s. 6d., and L.20 under...	23,730,150	15,828,000
1821	3s. congou; 5s. 4d. hyson	L.100 and L.96	26,754,537	20,935,000
1833	2s. 6½d. congou; 4s. 2d. hyson...	... ...	31,829,620	24,561,000
1835	2s. 2½d. congou; 3s. 9½d. hyson	1s. 6d. to 3s. per lb.	36,574,004	25,104,000
1845	1s. 8d. congou; 3s. 7d. hyson...	2s. 2¼d. per lb. for all kinds	44,193,433	27,875,000
1855	1s. 7d. congou; 2s. 7d. hyson...	1s. 9d. per lb.	63,429,286	27,899,000
1858	1s. 8d. congou; 2s. 11d. hyson...	1s. 5d. per lb.	73,000,000	28,654,000
1859	1s. 9d. congou; 2s. 9d. hyson...	1s. 5d. per lb.	76,300,000	28,900,000

(3) Imports, deliveries, and exports, 1849–59.

III.—*Imports, Deliveries, and Exports of Tea, in and from the United Kingdom*, 1849–1859.[2]

Year.	Import.			Delivery.			Of which exported.
	Green.	Black.	Total.	Green.	Black.	Total.	
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1849	9,166,000	43,234,000	52,400,000	9,936,000	45,364,000	55,300 000	5,200.000
1850	8,427,000	40,873,000	48,300,000	10,161,000	46,239,000	56,400 000	5,400,000
1851	9,286,000	62.214,000	71,500,000	9,095.000	49,405,000	58,500,000	4.700,000
1852	9,314.000	55.386,000	64,700,000	9,288,000	52,512,000	61,800,000	6,700,000
1853	11,249,000	58,451,000	69,700,000	9,038,000	54,362,000	63,400,000	4,900,000
1854	8,601,000	70,099,000	78,700,000	9,731,000	60,469,000	70,200,000	9,000,000
1855	13,030,000	70,270,000	83,300,000	10,775,000	67,225,000	78,000,000	15,000.000
1856	10,594,000	77,147,000	87,741,000	9,528,000	59,713,000	69.241,000	6,241.000
1857	12,713,000	51,780,000	64,493,000	12.229,000	66,531,000	78,760,000	9,600.000
1858	8,334,000	65,666,000	74,000,000	11,868,000	69,132,000	81,000,000	8,000,000
1859	8,043,000	62,457,000	70,500,000	10,975,000	72,525,000	83,500,000	7,200,000

Of the many and pregnant lessons which are taught by the history of trade, none lies nearer the surface than that which warns us of the rashness of prophesying results, whilst we are under the excitement of a strife to carry or to defeat projects of legislative change, and certainly none is more frequently disregarded. Fifteen years ago, Parliament was strenuously assured, on high official authority, that it was "more than probable that tea has now reached the limit of consumption in England, and that any reduction of taxation would not augment the use of this *innutritious leaf*;" and it was confidently predicted, that "a reduction of the duties from 2s. to 1s., as proposed, would diminish the revenue one-half, without any perceptible corresponding advantage to the consumer."[3] As we have shown already, the whole reduction then wisely projected has not yet been realized. The self-denial which is imposed on nations as well as on individuals, for purposes of a higher order than buying and selling, has had to step in between plan and execution. But the duty, which was then 2s. 2¼d. per lb., has already been reduced to 1s. 5d. The revenue received in the year 1844, at the former rate, was L.4,524,193; that received in the year 1858, at the latter rate, was L.5,186,171. The results (thus far) to the consumer have been sufficiently indicated in the tables given above. (E. E.)

[1] Martin, *Report on Tea-Trade, ut supra*; Parliamentary Reports, Accounts, and Papers, of various years; Tooke, *History of Prices*, i. 416; iv. 433; Tea Circulars, *ut supra*.

[2] Tea Reports and Circulars, *ut supra*.

[3] *Appendix to Report from Select Committee on Commercial Relations with China*, 500.

TEANO (anc. *Teanum*), a town of Naples, province of Terra di Lavoro, 13 miles N.W. of Capua, on the S.E. side of an extinct volcano called Rocca Monfina. It has narrow streets, a cathedral, several other churches and convents, a diocesan seminary, almshouses, the remains of a Roman theatre and amphitheatre, and of a very large mediæval castle. Some trade in corn and oil is carried on. The ancient Teanum was the capital of the Sidicini, and with the other possessions of that people it fell into the hands of the Romans about 300 B.C. In the vicinity there are mineral-springs. Pop. 7800.

TEFLIS, or TIFLIS, a town of Russia, capital of Georgia and of all the Transcaucasian provinces, on the Kur, 280 miles E. by N. of Trebizond. The river here flows through a narrow valley with lofty mountains on each side, and the appearance of the town is somewhat gloomy, as it is overhung by dark and barren cliffs broken by deep clefts and caverns. The city proper stands on the right or west side of the river, and consists of an old town, whose limits are marked by the remains of the ancient walls, and a new town extending to the north and west of the former. The suburb of Avlabar stands on the other side of the Kur, and

Tefza ‖ Tegea.

is connected with the town by an old bridge of a single arch. In the new town stands the governor's residence, and several other handsome buildings in the European style; but in the older portions everything is of an Asiatic character. The streets are narrow, and covered with deep mud or dust according as the weather is wet or dry; the houses are low, flat roofed, and built of brick mingled with stones and mud; their doors and windows are very small, and the latter are frequently filled with paper instead of glass. The citadel is circular in form, and stands at the point where the valley is most contracted, the mountains approaching very near to the river. There are in Teflis several fine churches of various sects, that of the Roman Catholics being the finest. The Armenian cathedral is also a large and imposing edifice, and there are two Protestant churches and two mosques in the town. The caravansaries, which rise in a double tier of piazzas, are but ill supplied with goods; but the bazaar, though narrow and generally crowded, is well stocked with fruits and various kinds of merchandise. Near it stand the baths, built over sulphurous springs from 75° to 115° in temperature. In the neighbourhood there are a botanic garden, and a large public garden laid out with fine shady walks. Among the articles manufactured here the most important are shawls, carpets, and silk goods. The situation of the town is very favourable to trade, and it is the centre of an extensive commerce between Europe and Asia. But the restrictive duties imposed by the Russian government prevent the full development of its commerce, and many European articles which were formerly conveyed to Tabriz and other Persian towns by way of Redout-Kaleh and Teflis, are now carried direct from Trebizond through the Turkish territory. The trade with Persia and Turkey is, however, still very important, and is almost entirely in the hands of Armenians, who form about half of the population of Teflis. While some branches of trade have suffered under the Russian government, the commerce of the town has much increased since it came into their possession in 1801. It was founded about the middle of the fifth century, by a powerful monarch called Waktang; and afterwards rose to great importance. In 1723 it was taken by the Turks, in 1734 by Kouli Khan, and it was destroyed by Aga Mohammed in 1795. Pop. (1820) 15,000, (1857) 47,304.

TEFZA, or TEDLA, a town of Morocco, capital of the province of Tedla, in a valley near the foot of Mount Atlas, 135 miles N.E. of Morocco. It is celebrated for the manufacture of black and white woollen mantles, which are exported in considerable quantities. Pop., along with the neighbouring town of Efza, 11,000.

TEGEA, an ancient city of Greece, forming one of the most powerful states in Arcadia. At an early period, protracted wars were carried on between Tegea and Sparta. A king of the latter nation, named Charilaus, deceived by an ambiguous oracle, invaded the land of the Tegeans, but was totally defeated and made prisoner along with all the survivors of the battle. Another invasion, about 200 years later, under Leon and Agesicles proved equally unsuccessful; but in 560 B.C. the Spartans gained a victory, and compelled the Tegeans to recognise their supremacy. The city remained independent, though bound to assist the Spartans with a military force, which they supplied at Thermopylæ and Platæa. After the Persian war we find Tegea again at war with Sparta, but for what reason we know not. But in the Peloponnesian war, Tegea adhered to Sparta, and fought on several occasions on her side. After the battle of Leuctra in 371, it joined the Arcadian confederacy against Sparta; and at a later period it joined the Ætolian league. Subsequently, during the wars between Sparta and the Achæan league, it was subject alternately to the one and the other; until, with the rest of Greece, it fell under the Roman power. Tegea continued to be an important place, till it was totally destroyed by Alaric in the end of the fourth century A.D.

Tegner ‖ Teignmouth.

TEGNER, ESAIAS. See SCANDINAVIAN LITERATURE.

TEGUCIGALPA, or TEJUCIGALPA, a town of Central America, capital of a department in the state of Honduras, at the foot of the Cordilleras, 40 miles S.W. of Comayaqua. It has large churches and convents, and is one of the most flourishing manufacturing towns in the state, having in its vicinity gold, silver, and copper mines. Pop. 8000.

TEHERAN, or TEHRAN, the modern capital of Persia, in a wide, stony, and barren plain, bounded on the E. and W. by bare hills, and on the N. by the mountains of Elburz, 211 miles N. of Ispahan. Before the present century, it was hardly a town of sufficient importance for the capital of a province, and had been destroyed by the Afghans at the beginning of the 18th century. But about 1790 it was selected by Aga Mohammed Khan as his residence, improved by him, and still further enlarged and embellished by his successor. As a central point of general surveillance for the safety of the empire, between the provinces to the N.W., which border on Georgia, and those to the E., which are subject to invasions from the Turkomans and their restless allies of Afghanistan, it is well chosen; but it is far from being a pleasant residence, and it is very damp and unhealthy during the summer. It is about 4 miles in circumference, and surrounded by a high mud wall, with towers, and a dry ditch. Several gates give access to the town, which consists of narrow, crooked, and dirty streets, with very mean houses built of sun-dried bricks. The only good buildings are the British residency, the house of the Russian ministry, and the sultan's palace, which stands in the citadel, and consists of a number of buildings, courts and gardens, covering a wide area, and enclosed by a high wall. Many parts of the town are covered with extensive ruins of former buildings. The bazaars are large but very dirty, and generally crowded. Teheran contains an iron-foundry, and is a place of considerable trade. On a hill to the N.E. stands an imperial palace, with extensive grounds; and to the S. of the town are the ruins of the ancient Rhages, once the capital of Persia. Pop. permanently from 10,000 to 12,000; during the residence of the court in winter, upwards of 60,000.

TEHUANTEPEC, a town of Mexico, in the department and 150 miles E.S.E. of Oaxaca, 10 miles above the mouth of the small river Tehuantepec, in the bay of the same name. It has salt-works and cotton factories, and many of the inhabitants are employed in the fishery of pearls, and of a shell-fish that yields a purple dye. A considerable coasting trade is carried on. Pop. 14,000.

TEIGNMOUTH, a market-town and seaport of England, Devonshire, at the mouth of the Teign, 12 miles S. of Exeter. It consists of two parts, one on each side of a small rivulet called the Tame, which falls into the Teign from the N. West Teignmouth is the older portion of the two, and contains the port and the chief business quarters of the town. The other part is more modern; and has near the mouth of the Teign a broad sandbank, called the Den, forming an esplanade, with a small lighthouse at its extremity. The Teign is crossed by a bridge of thirty-four arches, said to be the longest in England, and which has a swing in the centre for allowing vessels to pass. The chief buildings of the town are an octagonal church of modern date, places of worship for several Dissenting sects, a library, a theatre, baths, and assembly-rooms. The town has a dockyard and a quay, but the mouth of the river is obstructed by a shifting bar. A considerable trade is carried on, granite and pipe-clay being exported, and coal imported. The number of vessels registered at the port December 31, 1857, was 60, tonnage 7005. In that year there entered 563 sailing vessels, tonnage 47,872; and 3 steamers, tonnage 129; and cleared 194 sailing vessels, tonnage 12,384; and 4 steamers, tonnage 72. Pop. 5149.

TELEGRAPH, ELECTRIC.

Material Signs of Ideas.

TELEGRAPH, from τηλε and γραφω, an instrument to *write at a distance*. But the term has been from the beginning, and is constantly still applied to apparatus for communicating intelligence to a distance in *unwritten signs*, interpretable by an intelligent being from their effects perceived through his senses of sight or of sound, and has, in fact, only recently had application to those wonderful combinations of inanimate matter which literally *write at a distance* the intelligence committed to them. We may, therefore, define telegraphic communication simply as the interchange of ideas between two intelligent beings by means of inanimate matter occupying space between them. Whether men first interchanged ideas by speech or by visible signs, whether spoken language was given complete by the Creator to the first two human beings, or was gradually invented by them and their successors, are questions upon which revelation and history shed but partial light; and the origin of the telegraphic art is shrouded in obscurity. The chief object of the present article being to explain the principles and practice of the Electric Telegraph, our space does not allow us to enter on the history of language or of other systems of signalling by sound, of dumb signs, of lamp-signals as proposed by the Greek general, Eneas, and improved by Polybius,[1] of flag-signals as universally practised at sea for communicating between ship and ship, of the semaphore as used by various governments until the realisation of the electric telegraph; or even to more than cursorily allude to the successive suggestions and inventions through which the electric telegraph itself has risen to its present important position among the various material means which the ingenuity of man has made subservient to his moral and intellectual wants. We shall only further allude to those other telegraphic systems which have been mentioned, for the sake of illustrating the general principles of signalling, which will form the subject of our first section.

I.—MATERIAL SIGNS OF IDEAS.

A signal is a change in the condition of external matter produced by one intelligent being with the intention that it should be perceived by another. A word is the direct and explicit expression of an idea, according to a prearranged plan of signalling, and may be communicated by voice, by trumpet calls, by gun fire, by gesture or dumb signs, by lamp-signals, by flags, by semaphore, or by electric telegraph. The simplest system of word-signalling hitherto practised, is that of the nautical flag telegraph, in which each hoist represents a word by a combination of four flags in four distinct positions. If n denote the number of different varieties of flag out of which the four to be sent up may be selected, the number of different ideas which can be expressed by a single hoist is n^4, since there are n varieties out of which the flag for each of the four positions may be independently chosen. To commit to memory each of so great a number of combinations, which will amount to 456,976 if $n=26$, would be a vain effort, and hence the operators on each side must have constant recourse to a dictionary, or code as it is called, arranged in two parts, one showing the combinations of flags to express each word included in the list, and the other the word expressed by each combination of flags. For the sake of convenient reference, each flag is called by the name of a letter of the alphabet, and all that must be borne in mind by the operator is the letter by which each flag is thus designated. Sometimes the words to be expressed are spelled out by means of these letters as in ordinary language; but as in most words there are more than four letters, as scarcely any two consecutive words are spelled with four or less than four letters, and as more than four flags at a time cannot be conveniently used, the system of alphabetic signalling frequently requires the use of two hoists for a word, and scarcely ever has the advantage of expressing two words by one hoist. It is, therefore, much more tedious than code signalling in the nautical telegraph.

Electrical Definitions and Explanations.

In point of simplicity, spoken words may be considered as almost on a par with the nautical telegraph, since each word is in reality spoken and heard almost as a single utterance. Next to these in order comes the system of spelling out words letter by letter in succession, in which—instead of, as in the nautical telegraph, merely 456,976 single symbols to express the same number of ideas—26 distinct symbols are used to express by their combinations any number whatever of distinct ideas. Next again to this may be considered the system by which *several distinct successive signals are used to express a letter*; and letters thus communicated by compound signals are combined according to the ordinary method of language to spell out words. It is to this last class that nearly all systems of electro-telegraphic signalling hitherto carried out in actual practice belong. But some of the earliest and latest proposals for electric telegraphs are founded on the idea of making a single signal to represent a single letter of the alphabet: as for instance, Ampère's suggestion of 1821, put in practice before the Society of Arts in Edinburgh, by Mr Alexander in 1837, in which a distinct conducting wire was used for each letter of the alphabet; also, a method of signalling by currents of different strengths for the different letters of the alphabet, tried and found successful through the Atlantic cable in harbour at Devonport in 1858, by the writer of this article; and the newest American printing telegraph, Mr Hughes's very successful instrument, which shows each letter by the measurement of a simple duration of time.

We shall now proceed to examine the nature of simple electric signals, and the modes of representing letters by means of them, taken either singly or in combinations, which have been adopted in the various practical systems hitherto adopted; and we commence with a slight preliminary notice of elementary laws of electric action and electrical properties of matter, with which we have to deal as the material means employed in the communication of ideas by the electric telegraph.

II.—ELECTRICAL DEFINITIONS AND EXPLANATIONS.

(1.) *Electro-motive Force, Conduction, and Insulation.*—Electricity tends always to place itself so as to exercise no force in the interior of any matter upon which it may be situated, or to do away with all electric force, should there be independent distributions of electricity in the neighbourhood of the body considered. This tendency gives rise to what is called electro-motive force, and is always more or less resisted in every kind of matter. In one large class of bodies, however, including metals, the resistance to electro-motive force is so extremely slight, that it is altogether undiscoverable without tests of a very special kind, or with-

[1] See Rollin's *Ancient History*, book xviii. sec. 6.

Electrical Definitions and Explanations.

out the use of excessively copious sources of electricity; and the class of bodies thus characterised are accordingly called *conductors*. On the other hand, many bodies oppose to the natural electric tendency so great a resistance that electricity may be placed in any manner upon or in them, and will be found to remain in the positions assigned to it, without any sensible change for finite perceptible intervals of time, for seconds, for minutes, for days, weeks, or years. Such bodies are called *non-conductors* or *insulators* of electricity. But while no kind of matter, as has been stated, is found to be perfectly devoid of electrical resistance, neither does any kind of matter perfectly and absolutely prevent all motion of electricity through it. It appears, therefore, that the distinction between conductors and non-conductors or insulators, is not an absolute distinction, but a distinction of degree. Bodies which possess the resisting quality to a very high degree, such as glass, vulcanite, india-rubber, gutta-percha, dry silk, and nearly all vegetable and animal substances, when deprived of their natural moisture by heat not sufficient to cause decomposition, are commonly called *insulators* or *non-conductors*. Bodies which exercise but very little resistance to electric locomotion, such as metals, charcoal, acid and saline solutions, and watery liquids generally, or moist porous solids, are commonly called *conductors*. There are, in fact, very large differences in degree of resistance presented by different bodies of either one class or of the other. Thus, the writer has found, that a Leyden phial charged and hermetically sealed, and after that kept cool, will not allow as much electricity to flow through it in three years[1] as will flow in a few minutes through a piece of gutta-percha, similarly dealt with. Hence, the resistance of cold glass may be as many times the resistance of gutta-percha as there are of minutes in a year. As wide differences exist between the resisting qualities of different bodies, called conductors. Thus, a piece of damp wood or thread may be used to discharge a Leyden phial gradually in the course of a few minutes; a metallic wire of equal dimensions and similar form may effect a discharge in the millionth of a second or less.

The testings of the first Atlantic cable made during the spring of 1857, when it was in process of manufacture, afforded data "not sufficient for any very accurate determination, yet definite enough to show the resistance of the gutta-percha of that cable at temperatures between 60° and 90° Fahr. to be from one hundred million million million to twenty million million million times that of copper, when equal and similar volumes of the two substances are compared."[2] Mr F. Jenkin has since, by experiments of a very precise character,[3] on the Red Sea and various Indian cables, at the works of Messrs Newall and Company, Birkenhead, found the resistance of the insulating medium of the Red Sea cable at temperature 60°, after electrification for one minute, to be one hundred and four million million million times that of an equal and similar volume of copper of the best quality measured by Weber. Thus the numbers 1, 100×10^{18}, and 50×10^{24} may be taken as expressing relatively the resisting powers of copper, gutta-percha, and glass, at a common atmospheric temperature, or rather of particular specimens or qualities of those substances, since large differences are found in the resistances of different specimens,[4] probably attributable to differences, which may be excessively slight, in their chemical composition.

Description of Electric Telegraphs for Land and Sea.

A conductor supported by a non-conductor is said to be insulated.

III.—GENERAL DESCRIPTION OF ELECTRIC TELEGRAPHS FOR LAND AND SEA.

The first requisite for electro-telegraphic communication between two localities, is an insulated conductor extending from one to the other. This, with proper apparatus for originating electric currents at one end, and for discovering the effects produced by them at the other end, constitutes an electric telegraph. Faraday's term "electrode," literally a way for electricity to travel along, might be well applied to designate the insulated conductor, along which the electric messenger is despatched to bear tidings to the distant intelligence. It is, however, more commonly and familiarly called "the wire," or "the line."

The apparatus for generating the electric action at one end is commonly called the *transmitting apparatus*, the *transmitting instrument*, or the *sending apparatus* or *instrument*, or sometimes simply the *sender*. The apparatus used at the other end of the line to render the effects of this action perceptible to any of the senses—eye, ear, or taste (all have been used in actual telegraphic signalling)—is called the *receiving apparatus* or *instrument*. In land telegraphs, the main electrode consists generally of a "galvanized"[5] iron wire stretched through the air from pole to pole, at a sufficient height above the ground for security. The supports or insulators, as they are called, by means of which it is attached to the poles, are of very different form and arrangement in different telegraphs, but involve essentially a stem of glass, porcelain, coarse earthenware, or other non-conducting substance, protected by an overhanging screen or roof from falling rain. One end of this stem is firmly attached to the pole, and the other bears the wire. The best idea of a single telegraphic insulator will be formed, by considering a common umbrella, with its stem of insulating substance, attached upright to the top of a pole, and bearing the wire supported in a notch on the top outside. The umbrella may be either of one substance with the stem—all glass, or all glazed earthenware for instance—or may be of a stronger material, such as iron, with an insulating stem fitted to it to support it below. The best insulators undoubtedly are those of continuous glass; but well glazed earthenware, which is cheaper, and insulates well as long as the glazing is sufficient to prevent the porous substance within from absorbing moisture, may be used with economical advantage in some cases.

The following figure represents a form of glass insulator applied to nearly all the wires of the British and Irish Magnetic Telegraph Company, by their engineer, Sir Charles Bright, which has proved very satisfactory.

---

[1] In the month of February or March 1857, a number of glass balls, with tubes sealed to apertures in them, so as to constitute long-necked phials, were each partially filled with water, which moistened the whole inner surface of the globe and neck, making as it were the inner coating of the Leyden phial. The outside of the globes were coated with tinfoil, and each was charged as a Leyden phial, and hermetically sealed. After about two years, one was opened, and was found still strongly charged. In February of the present year two more were opened, of which one showed no electric indications, but the other was found strongly charged, showing an electrometric indication (difference of potentials between inside and outside castings) equal to that of about 420 elements of Daniell's battery.

[2] Lecture "On the Atlantic Telegraph" before the British Association, Dublin, 1857, by Prof. W. Thomson.

[3] For a more comprehensive statement of his results, see below, sect. iv.

[4] The writer has found that Leyden jars made of thin glass shades will, if of flint glass, keep their charges for weeks in as large proportion as they will for hours if of crown glass. The latter quality is nearly, if not quite, as clear as the former, being only distinguishable by a slight tinge of green when seen in mass; and being now made very thin, and so quite satisfactory in point of transparency, is the more commonly used for protecting ornamental objects. It is produced at about half price, weight for weight.

[5] That is to say, coated with zinc to prevent corrosion.

Qualities of a Line of Telegraph.

In all submarine telegraphs hitherto made, the conductor is of copper, either a solid wire, as in the earlier lines, or a little rope or "strand" laid together spirally, as first proposed by the writer of this article at a meeting of the Philosophical Society of Glasgow, Nov. 29, 1854, and since universally adopted, for the purpose of allowing a sufficiently massive conductor to be used to diminish inductive embarrassment, and ensure a rapid rate of signalling through submarine lines of great length. This conductor is insulated by a continuous coating of gutta-percha enclosing it. A layer of tarred yarn, forming round the gutta-percha a soft, tough bed, and strong iron wires, laid firmly, and close to one another, round it in spirals but slightly inclined to the longitudinal direction, are added for protecting the gutta-percha from external injury, and complete what is called an electric cable. This iron sheath ought to be extremely strong in cables to lie in shallow water or rocky bottoms, in situations exposed to the disturbing influence of waves or currents, or to accidental rough usage from ships' anchors or otherwise. On the other hand, for cables to lie on a soft bottom, under very deep water, the iron sheath need not be stronger than to afford the necessary protection to the copper and gutta-percha during the process of submergence, the extremely tranquil condition of the great ocean depths in most localities affording complete immunity, both from continued wear and tear and from accidental damages, to an electric cable once submerged in good condition.

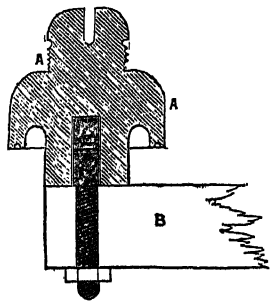


Fig. 1.

In some submarine cables, several separately insulated conductors are enclosed in a common iron sheath, for the sake of economy; but as each is separately insulated in its own gutta-percha, and as each gutta-percha coating is separately sheathed in tarred yarn, which under sea-water becomes thoroughly moist, and keeps the outer cylindrical surface of the gutta-percha round each wire at the earth's electric potential, we may regard such an arrangement as equivalent, in electrical circumstances, to so many independent electric cables laid side by side. It will be a question whether any kind of mutual influence can sensibly affect the electric action through a number of conductors so placed. It cannot be overlooked that in reality there is an effect produced by electro-magnetic induction (one of Faraday's first electrical discoveries), according to which the rising or falling of a current through one of the conductors must give rise to currents, respectively in the similar ones, and in contrary directions in the others; but it has been theoretically demonstrated by the writer, that this influence is so small in an extended cable as to be insensible, in ordinary telegraphic work, through any considerable length of wire.

IV.—QUALITIES OF A LINE OF TELEGRAPH.

The efficiency of the telegraph depends on three qualities of the main electrode—

(1) Its Conducting Power.
(2) Its Insulation.
(3) Its Electrostatic Capacity.

We shall proceed to explain in order the general character of each of these qualities.

(1) *Conducting Power.*—The conducting power of a wire, or other elongated portion of matter, is measured by the quantity of electricity which it allows to flow through it, when a stated "electromotive force," or "difference of electric potentials," is maintained between its two ends.

Qualities of a Line of Telegraph.

The word "power" here may be regarded as used in a somewhat figurative sense, since in reality we cannot regard the conductor as exercising itself a power in the transmission of electricity through it, and must rather conceive it as admitting electricity to pass with more or less of resistance when urged by an external source of power. Hence the quality with which we are concerned may be more naturally, and is in point of fact more generally, expressed in terms of the *resistance to transmission*, regarded as a quality inverse to that of conducting power, and expressed numerically by the reciprocal of the measure of the conducting power. An independent explanation and definition of the electrical resistance of a conductor may be given as follows:—The electrical resistance of a conductor is measured by the amount of electromotive force, or of the difference of potentials which must be maintained between its ends, to produce a stated strength of electric current through it. To render these statements completely definite, we must now consider what standards are to be adopted for the measurement of electromotive forces, and of quantities of electricity. In this branch of electrical science, we are necessarily as yet somewhat embarrassed by the variety of electrical effects, among which we have to choose that which is most suitable for measuring the amount of the agency which we regard as their cause. Thus, to measure the strength of a current, we may use a galvanometer, in which the directing power which a wire conveying electricity exerts on a magnetic needle in its neighbourhood, according to Oersted's great discovery, is the object of measurement. Many different forms of this instrument have been invented and extensively used, each having the property of giving at every instant a measure of the rate at which electricity is flowing through the conductor to be tested. Again, the amount of chemical decomposition effected by an electric current may, according to Faraday's law of definite electro-chemical action, be used to measure the integral amount of current which has passed in any finite interval of time. The difficulty of obtaining definite absolute measurements, by means of the galvanometer, has led many experimenters to adopt this electrolytic method of gauging an electric current. Although subject to many drawbacks, which would render it intolerably inconvenient for ordinary use, it is susceptible of considerable accuracy when carried out with sufficient care, and may be advantageously had recourse to for reducing the indications of an ordinary galvanometer to absolute measure, when an absolute galvanometer is not available. On the other hand, the most elementary method of reckoning electrical quantity—that in which the mutual forces of attraction and repulsion manifested among electrified bodies are the immediate subjects of measurement—has been hitherto but very little used in practice, the total want, until within the present year, of any instrument available as an absolute electrometer, and the unsatisfactory character of almost all ordinary electrometers or electroscopes as to availability, for even relative measurements of an accurate kind, having hitherto proved a barrier.

The elements of these different principles of measurement, separately worked out by the experimenters and mathematicians, to whom our knowledge in the different parts of the subject is due, have been brought together by Professor Weber of Göttingen; and owing to his admirable investigations, we have now a thoroughly complete triple foundation for an electrometric system, in which the numerical relations between the three different classes of natural effects we have mentioned are established, and measurements of electrical quantity, electromotive force, and electrical resistance made by means of any one of them, is immediately reducible to absolute measure in terms of any other. It is scarcely possible to over-estimate the value of this step in science, whether in regard to actual and pro-

Qualities of a Line of Telegraph.

spective advancement in the knowledge of nature, or to the improvement of the electric arts. We regret that the limits within which this article must be confined prevent us from more than alluding to so important a topic. For information regarding it the reader is referred to Weber, *Messungen galvanischen Leitungswiderstände nach einem absoluten Maasse*, Poggendorff's *Annalen*, March 1851; Thomson, "Mechanical Theory of Electrolysis," "Application of the Principle of Mechanical Effect to the Measurement of Electromotive Force, and of Galvanic Resistances in Absolute Units," and "Transient Electric Currents,"—*Philosophical Magazine*, 1851 and 1852; Weber, *Electrodynamische Maasbestimmungen insbesondere Zurückführung der Stromintensitäts-messungen auf Mechanischen Maas*, Leipzig, 1856; Thomson, "On the Electric Conductivity of Commercial Copper," and "Synthetical and Analytical Attempts" on the same subject; "Measurement of the Electrostatic Force between the Poles of a Daniell's Battery, and Measurement of the Electrostatic Force required to produce a Spark in Air,"—*Proceedings of Royal Society*, 1857 and 1860.

(2) *Insulation of a Line of Telegraph.*—The true measure of the insulation of a body is the *resistance to conduction* of its supports. The reciprocal of this, or the *conducting power of the supports*, measures the defectiveness of the insulation. From the explanations given in Section II., and in the preceding part of the present section, it will be readily understood that perfect insulation is impossible, but that if the supports on which a telegraph wire rests present on each part and on the whole so great a resistance to electric conduction as to allow only a small proportion of the electricity, sent in, in the actual working, at one end to escape by lateral conduction, instead of passing through the line and producing effect at the other end, the insulation is as good as need be for the mode of working adopted. With so good insulation as is attained in a submarine line round every part of which the gutta-percha is free from flaws, no telegraphic operation completed within a second of time can be sensibly influenced by lateral conduction: for a charge communicable to such a wire thus insulated in gutta-percha under water at an ordinary temperature, is so well held that, after 30 seconds, not so much as half of it is found to have escaped, from which, according to the familiar "compound interest" problem, it appears that the loss must be at a rate less than 5 per cent. per two seconds; and hence, the insulation is practically "as good as perfect," unless retention of a charge for several seconds of time is in some way required for the signalling. This cannot be the case except in very long submarine lines, when, owing to the great "electrostatic capacity" of the conductor (which we have next to consider), a very slow rate of signalling is all that can be attained. In all submarine lines of lengths not exceeding 1000 miles, there is no sensible loss of working effect by imperfect insulation, *except through decided flaws in the gutta-percha;* and even in the 2000 nautical miles of submarine telegraph connecting Ireland with Newfoundland, the loss would be no obstacle to good working, and would be, in fact, *inappreciable* on the telegraphic signals of the degree of rapidity which would be sent through it, if the gutta-percha were throughout in such condition as any hundred miles of submarine cable found passable by the ordinary tests.

The test for insulation we have indicated, in which a charge is communicated and its rate of dissipation is observed when both ends of the cable are left insulated, is available for every length of submarine cable from a few yards to as many thousand miles, and is extremely easy in practice with the aid of one or other of two forms of *electrometer*, patented by the writer for this application. It will show faults on short lengths which, when separately tried by the ordinary galvanometric method, might be overlooked, but which, when the different lengths are put together, into one long cable, would tell most seriously on the insulation of the whole; and it is therefore of especial value for testing, in every department of the manufactory, although hitherto it has not been taken advantage of. It has another even more important application:—to discriminate between a slight fault of insulation close at hand and a worse fault at a greater distance in a very long submarine cable. Even if the test is to be made on board ship during the submergence of the cable, it can be put in practice with great ease by means of a *portable electrometer* recently constructed by the writer for the use of travellers in observing atmospheric electricity; or failing a suitable electrometer, a somewhat less direct method of applying the same test, either at sea or on shore, is afforded by the particular mode of using his *marine galvanometer*[1] in measuring "discharges," introduced by the writer in the submergence of the Atlantic cable.

Qualities of a Line of Telegraph.

The ordinary test for insulation consists in applying a galvanic battery, with one pole to earth and the other through a galvanometer coil, to the line of telegraph of which the remote end is kept insulated. If the insulation of the whole line were perfect, the galvanometer needle would stand at zero; but when looked for with a battery of suitable power and a galvanometer of suitable sensibility, indications of a current are always found, unless it is a very short length of very perfectly insulated line that is tested. The absolute measure of the strength of this current divided by the absolute measure of the electromotive force of the battery gives an absolute measure for the insulation of the cable. No telegraphic testing ought in future to be accepted in any department of telegraphic business which has not this definite character, although it is only within the last year that convenient instruments for working in absolute measure have been introduced at all, and the whole system of absolute measurement is still almost unknown to practical electricians.

It has been put in practice systematically for the first time, in August and September 1859, at the works of Messrs R. S. Newall and Co., Birkenhead, in the experiments by Mr F. Jenkin alluded to above. A complete description of this important investigation has been communicated to the Royal Society of London, and will, it is hoped, soon be published in the *Transactions*. In the meantime, the chief results will be sufficiently understood from the following brief account, for which the writer is indebted to Mr Jenkin:—

The resistance of gutta-percha at various temperatures was determined by measuring the rate of loss from three separate knots[2] of insulated wire immersed in water, and kept electrified by a galvanic battery. One knot was covered with pure gutta-percha; the two others with different proportions of Chatterton's compound and gutta-percha. The loss, or current flowing from the metal conductor to earth through the gutta-percha coating, was measured on a very delicate galvanometer; corrections due to varying electromotive force of battery and loss from the connections were made on the result of each experiment. A regular and remarkable decrease in the rate of loss was observed for some minutes after the first application of the battery to the cable. The rate of loss was therefore measured from minute to minute for five minutes with each pole of the battery.

The results of the experiments entered as abscissæ and ordinates furnished regular and complete curves between the temperatures of 50° and 80° Fahr. for pure gutta-percha, and between 60° and 75° for the mixed covering. The curves showing the loss through pure gutta-percha were very regular, and were not affected at ordinary temperatures by a change in the sign of the current: the loss increased very rapidly at the higher temperatures. The

[1] For a description and drawing of this instrument see section viii. art. 4, below.

[2] The length of a knot, or nautical mile, is taken as 6087 feet.

Qualities of a Line of Telegraph.

curves representing the loss through the compound were less regular; some difference was observed in the tests with opposite currents; the extra resistance due to continued electrification was also greater. This extra resistance was most marked in the coil covered with the thickest coat of gutta-percha. Chatterton's compound was found to be the better insulator at high temperatures, but below 65° pure gutta-percha had the advantage.

The absolute resistance, G, of the gutta-percha covering was next obtained from long cables in the same units as those employed to measure the resistance of metal conductors, by comparing the deflection caused by the current traversing a known resistance on one galvanometer, with the deflection caused on a second galvanometer by the current from the same battery flowing through the gutta-percha to earth.

G having been obtained in the proper units from a mean of many experiments at one temperature, the specific resistance, S, was calculated by the following equation given by Professor W. Thomson:—

Let $\frac{a}{b}$ be the ratio of the external to the internal diameter of the covering, and L be the length of the cable in feet, then

$$S = \frac{\pi LG}{\log \frac{a}{b}}.$$

The values of S were inferred for various intermediate temperatures by means of the curves previously obtained. The two following tables contain some of the principal results:—

TABLE I.—*Specific resistance in British absolute Units of the Red Sea covering (Chatterton) at various Temperatures.*

Temperature.	Zinc to Cable.		Copper to Cable.	
	After Electrification for one Minute.	After Electrification for five Minutes.	After Electrification for one Minute.	After Electrification for five Minutes.
60°	2162×10^{17}	3330×10^{17}	2239×10^{17}	3405×10^{17}
65	$1810 \times$ „	$2947 \times$ „	$1720 \times$ „	$2770 \times$ „
70	$1460 \times$ „	$2378 \times$ „	$1318 \times$ „	$2239 \times$ „
75	$1160 \times$ „	$1753 \times$ „	$1000 \times$ „	$1739 \times$ „

TABLE II.—*Specific resistance, in British absolute Units, of pure Gutta-Percha at various Temperatures.*

Temperature.	Zinc to Cable.		Copper to Cable.	
	After Electrification for one Minute.	After Electrification for five Minutes.	After Electrification for one Minute.	After Electrification for five Minutes.
50°	4113×10^{17}	5663×10^{17}	4113×10^{17}	5663×10^{17}
55	$2917 \times$ „	$3636 \times$ „	$2917 \times$ „	$3636 \times$ „
60	$2163 \times$ „	$2549 \times$ „	$2163 \times$ „	$2549 \times$ „
65	$1634 \times$ „	$1858 \times$ „	$1634 \times$ „	$1858 \times$ „
70	$1162 \times$ „	$1291 \times$ „	$1193 \times$ „	$1291 \times$ „
75	$805 \times$ „	$877 \times$ „	$796 \times$ „	$866 \times$ „
80	$566 \times$ „	$613 \times$ „	$548 \times$ „	$591 \times$ „

The importance of having results thus stated in absolute measure is illustrated by the circumstance that the writer has been able at once to compare them, in the manner stated in Section II. above, with his own previous deductions from the testings of the Atlantic cable during its manufacture in 1857, and with Weber's measurements of the specific resistance of copper.

From Mr Jenkin's investigation it appears that the insulating power of the coating of a submarine cable is as nearly as possible equal under positive and negative electrifications, and equally altered by the continuance of one and the other charge. No such symmetry as to positive and negative is found in the case of a faulty cable, either submerged, as is well known among practical electricians, or coiled on land, as has been ascertained by the writer, and we have thus an indication for discriminating between loss by conduction through sound gutta-percha, and loss through flaws, which will probably prove a most valuable test in the manufacture of future cables.

Qualities of a Line of Telegraph.

It is to be remarked, that the method of testing insulation by continuous galvanometric measurement of the loss under influence of a constant battery, is the only one applicable to land wires, since, in consequence of the smallness of the electrostatic capacity of a wire stretched in the air from pole to pole, any charge communicated to it would be lost in a few seconds, even if the insulation were as good absolutely as it is in a submarine cable, and is, in fact, lost almost instantly, since, except in weather in which the atmosphere is unusually dry, the loss over even glass umbrella-shaped insulators (of which the surfaces absorb moisture from the air), and moist spider lines between the wire and the poles, is much greater than that experienced through the gutta-percha of a submarine cable, on equal lengths of line, under the influence of equal constant batteries.

(3.) *Electro-static Capacities of Telegraphic Conductors.*—In 1849, Werner Siemens proved, that "when a current is sent through a submerged cable, a quantity of electricity is retained in charge along the whole surface, being distributed in proportion to the tension of each point" (that is to say, the difference of potentials between the conductor at any point and the earth beside it). In 1854, Faraday showed the effect of this "electrostatic charge" on signals sent through great lengths of submerged wire, bringing to light many admirable phenomena, and pointing out the "inductive" embarrassment to be expected in working through long submarine telegraphs. In letters to Professor Stokes in November and December of the same year, published in the *Proceedings of the Royal Society* for 1855, Professor W. Thomson gave the mathematical theory of these phenomena, with formulæ and diagrams of curves, containing the elements of synthetical investigation for every possible case of practical operations. Our limits prevent us from entering on this subject at all; but the following statement of preliminaries will convey some idea towards its bearing on the working of land and submarine telegraphs.

The conductor of a submarine cable has a very large electrostatic capacity in comparison with that of a land telegraph wire stretched in the air from pole to pole, in consequence of the induction, as of a Leyden phial, which takes place across its gutta-percha coat, between it and its moist outer surface, which may be regarded as perfectly connected with the earth, that is to say, at the same potential as the earth. The mathematical expressions for the absolute electrostatic capacity, c, per unit of length, in the two cases are as follows:—

Submarine Line. D = diameter of inner conductor, supposed circular, or of a circle inappreciably less than one circumscribed about the strand, constituting a modern submarine conductor.

D′ = outer diameter of insulating coat.

I = specific inductive capacity of the gutta-percha, or other substance constituting the insulating coat.

$$C = \frac{I}{2 \log \frac{D'}{D}},$$ log denoting a Naperian logarithm.[1]

Air Line.—Single wire of circular section, diameter D, undisturbed by the presence of others, and supported at a

[1] The same formula, except the constant factor, bringing it to absolute electrostatic measure, has been more recently investigated by Mr Werner Siemens and Mr Cromwell F. Varley separately, the latter, by a very remarkable method, involving no other mathematical forms than such as are commonly used in the theory of "compound interest," being in reality the principle more concisely expressed in the language of the integral calculus by the formula $\int \frac{dx}{x} = \log \frac{A}{x}$.

Qualities of a Line of Telegraph.

constant height, h, above the earth by poles so far asunder as not to influence its capacity sensibly.

$$C = \frac{1}{2 \log \frac{4h}{D}}.$$

Example 1.—Atlantic Telegraph.

$D' = \cdot 4$ of an inch; $D = \cdot 089$; $\text{Log} \frac{D'}{D} = 1 \cdot 5$; $C = \frac{I}{3}$.

From Faraday's experiments on the specific inductive capacity of glass, shell-lac, and sulphur, it is probable that the value of I for the gutta-percha of a submarine cable does not differ much from 2, and this estimate is in accordance with all the data from telegraphic operations and experiments which have yet been collated. Hence the most probable estimate we can now make of the capacity of the Atlantic cable is $\frac{1}{3}$ of a unit per foot; which may be explained, that the capacity of the conductor, in a specimen of the cable 1 foot long, with its sheath connected with the earth, is the same as that of a globe of $\frac{1}{3}$ of a foot radius, insulated out of reach of disturbing influence.

Example 2.—Land line $\frac{1}{4}$ inch diameter, circular conductor, at a height 20 feet above the ground.

$$\log \frac{4h}{D} = 8 \cdot 25; \quad C = \frac{1}{16 \cdot 5}.$$

The capacity, therefore, in this case, is $\frac{1}{11}$th of that of the Atlantic cable, for the same length.

The bulk of this wire would be rather more than 8 times that of the Atlantic conductor, for equal lengths. If made of iron, its "resistance" might be somewhat less, or possibly as much, or even more; the conductive quality of iron telegraph wires having never yet been thoroughly investigated. We may estimate the "resistance" of the iron wire in question as not improbably being from $\frac{1}{7}$ths to $\frac{1}{3}$ds of that of equal lengths of the Atlantic conductor. The mathematical theory of submarine signalling enables us to conclude, that in attempting to work through 2000 nautical miles of such a land line as we have supposed, at 27 or 33 words a minute, inductive embarrassment would be experienced equal in absolute amount to that which was actually overcome when the Atlantic cable was worked through between Valencia and Newfoundland at the rate of 2 words a minute. It would obviously be much more difficult to deal with the inductive difficulty at the high speed than at the low; and it is probable that about 20 words would be the highest speed attainable through 2000 nautical miles of land line of iron wire, $\frac{1}{4}$th of an inch diameter, insulated at an ordinary distance from the earth. The same degree of true inductive embarrassment would be met with in working

At	80 words	per minute	through	1000	nautical miles.
„	320	„	„	500	„ „
„	1280	„	„	250	„ „

As no higher speed than 30 to 50 words a minute has yet been attained through 250 nautical miles of land telegraph, and as 1000 miles are not often worked through direct, and never at any such speed as 80 words a minute, we may infer that the induction of electrostatic charge has never yet been sensible as an obstacle to rapid working through land lines of telegraph.

V.—GENERAL PLAN AND CONNECTIONS OF TELEGRAPHIC INSTRUMENTS.

Plan and Connec-

The sending instrument involves an electromotor—that is to say, some kind of electrical machine. The common frictional electric machine is not copious enough for any useful practical signalling by electricity, and the electric telegraph only became practicable on the discovery of "galvanism," and the invention of the Voltaic pile. Faraday's more recent discovery of electro-magnetic induction supplied another class of electromotors, which have been largely used in practice, which have a decided advantage in certain limited cases, and which have been used in the greatest telegraphic operation yet accomplished—that of signalling at the rate of 2½ words a minute through the Atlantic cable from Newfoundland to Ireland. The galvanic battery, or the Voltaic battery, or pile, as it may with equal, or perhaps greater historical justice be called, is, however, as has been uniformly maintained by the writer of this article, by far the most advantageous electromotor for all great telegraphic work, and it was only in consequence of fallacious interpretations of experiments on the relative capabilities of "battery" and "induction coils," that the latter were ever introduced into the service of the Atlantic telegraph.[1]

When battery power is used, an apparatus for making contacts, or, when "coils" are used, an apparatus for generating the inductive electromotive forces, at the right times and in the right directions, to produce the signal currents, is required. This apparatus is called the "key" in each case when it is worked by hand. It may be either the simplest possible—a simple "Morse key"—of which the simplest, the cheapest, and *by far the best* construction, is a metal spring, which is pressed down by hand against a metal stud, connected with one pole of a battery of which the other is connected with the earth; but only one kind of simple signal is then available. Or it may be a key of greater or less complexity, to produce more or less varied battery applications. In fig. 3 and in fig. 8 of Section VII., Art. 3, below, the simplest possible key to produce either a positive or a negative battery application at will, by pressing down one or other of two springs, is shown.

The receiving apparatus, except in Bain's chemical system without "relay," consists essentially of a galvanometer, of which the form may be indefinitely varied (1*st*), according as it is required for indicating the distinctions merely between strong signal currents and no current, or weak earth currents, or between positive and negative currents, or between different degrees of positive and of negative currents, or between natural earth currents, and the same increased or diminished by a very small proportional amount of signal current (as in the work done through the failing Atlantic cable); and (2*nd*), according as it is, or is not required to record its indications. If simply required to indicate the distinction between no current and currents, either positive or negative, exceeding a certain strength, the receiving galvanometer sometimes takes the rude form of an electro-magnet, with a soft iron armature pulled off by a spring when not overcome by the electro-magnetic force excited by the signal currents.

There is, besides, at each station an *earth connection*,

[1] The induction coils were superseded by Daniell's battery at Valencia, after a few days' trial through the rapidly failing line had seemed to prove them incapable of giving intelligible signals to the Newfoundland station; but, owing to the immediate introduction and continued use of an entirely new kind of receiving instrument—the mirror galvanometer introduced for long submarine telegraphs by the writer—at Valencia, the signals from the Newfoundland coils were found sufficient during the three weeks of successful working of the cable. It is quite certain that, with a properly adjusted mirror galvanometer as receiving instrument at each end, twenty cells of Daniell's battery would have done all the work that was done, and at even a higher speed if worked by a key devised for diminishing inductive embarrassment, according to the indications of the mathematical theory; and the writer, with the knowledge derived from disastrous experience, has now little doubt but that, if such had been the arrangement from the beginning, if no induction coils and no battery power, either positive or exceeding 20 cells of Daniell's negative, had ever been applied to the cable since the landing of its ends, imperfect as it then was, it would be now in full work day and night, with no prospect or probability of failure.

Classification of Practical Telegraphic Systems.

for which, except in towns, the best plan is generally a large copper-plate, buried in moist ground or below water. The gas-pipes and water-pipes of towns are often used for "earths," as the conductors leading to the earth are familiarly called.

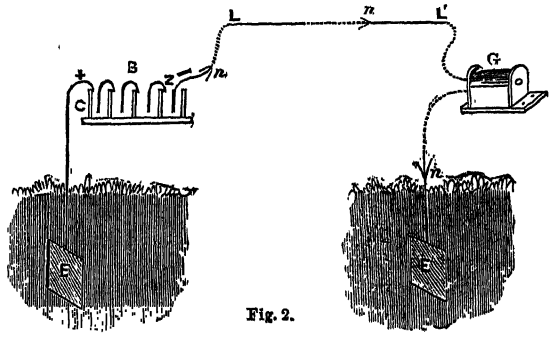


Fig. 2.

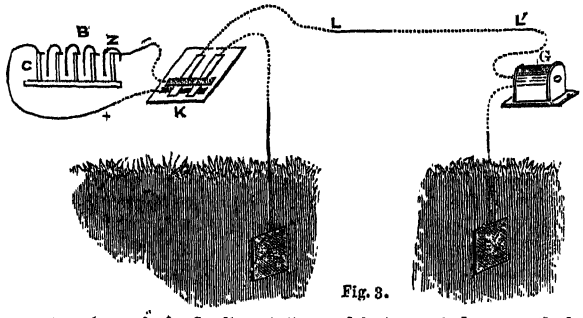


Fig. 3.

Explanation of fig. 3.—Sending station and instrument shown on the left. Receiving station and instrument shown on the right. E, earth-plate of sending station. B, the battery. +, −, its positive and negative electrodes. K, the sending key. LL' the line of telegraph, or "main electrode." G, the receiving galvanometer. E', the earth-plate of receiving station.

In fig. 2, the connections made to produce a so-called "negative" current, are shown—E, E', earth-plates; B, battery; +, its positive pole; −, its negative pole; LL, the insulated line of wire; G, receiving galvanometer. The symbol indicates the direction of the so called negative current.[1]

In fig. 3, the arrangement of battery and key, constituting a sending instrument of what is, in the writer's opinion, the best kind for land and short submarine telegraphs, when the sending is to be done by hand.

VI.—CLASSIFICATION OF PRACTICAL TELEGRAPHIC SYSTEMS.

A *current* through the line of telegraph where it enters the receiving station, is the effect received from the transmitting station; and variations of this effect indicating themselves by means of the receiving instruments, constitute signals. It is possible to work with currents which enter the receiving station only to electrify an insulated conductor there, and indicate by electrostatic force; and if the insulation of the line were perfect, this might be the most economical plan for all land telegraphic work. But in reality, it has never been used with advantage, and we may practically regard the continuous flow of electricity, through proper apparatus to indicate its effect in the receiving station, to a conductor leading away to the earth, as the effect which, when remaining unchanged, gives an unchanging indication on the instruments. Referring to the general definition of a "simple signal" given above (Section I.), a change in the condition of external matter produced by one intelligent being, with the intention that it should be perceived by another, we may now, for the particular case of the electric telegraph, define a simple signal, as a *change in the strength of current through the receiving station, resulting from an operation performed in the transmitting station.*

Classification of Practical Telegraphic Systems.

The number of different kinds of simple signal that can be made depends on the number of different degrees of current that can be produced by the regular operation of the transmitting instrument. An extremely simple system of telegraphing consists of using different degrees of current singly, for the different letters of the alphabet; this, in any case in which it is applicable, will probably give a greater speed of signalling than is attainable through the same line by any other method. There are, indeed, many serious practical difficulties in the way of its application, although none which would be insuperable, if the insulation of the line were either practically "perfect" (see above, Section II.), or nearly constant. This condition as to insulation, is generally violated in air-lines of any considerable length as at present constructed; but it is probably fulfilled in all submarine lines sufficiently free from flaws in their insulating coats to be permanently successful. All things considered, it is far from improbable that the method of signalling by a distinct degree, positive or negative, of received current, for each letter of the alphabet, of which successful trials through lengths from 1500 to 3000 British statute miles of the Atlantic cable, when coiled on board the Agamemnon and Niagara, were made by the writer of this article, both in harbour at Devonport, and at sea on the experimental cruise in the Bay of Biscay, in 1858, may be the most advantageous in all submarine lines exceeding 1500 or 2000 miles of extent. In the methods actually practised through the Atlantic cable during the process of laying, and in the three weeks of its successful working between Valencia and Newfoundland, as well as in all other actual telegraphs as hitherto worked, either three different degrees,[2] or two different degrees,[3] of received current have been utilised for the indication of signals. We have thus the following exhaustive division of practical electro-telegraphic systems.

Class I.—Systems in which three different degrees of received current are distinguished.

Class II.—Systems in which two different degrees of received current are distinguished.

To Class I. belong—1. Cooke and Wheatstone's needle system of 1837, with five wires, and their double-needle instrument working through two-line wires, still to some extent used by the original Electric Telegraph Company; and their single needle instrument, similarly worked, with only one-line wire.

2. Steinheil's telegraph of 1837, indicating electric signals either by visible motions, by sounds, or by marks on a ribband of paper.

3. Highton's system, introduced by the British Telegraph Company, and still much used in their English and Scotch lines, by the British and Irish Magnetic Telegraph Company, with which the first-mentioned company became amalgamated some years ago.

4. Improved double-needle instrument, to work through one line, with simplified key described below, as planned by the writer.

5. In the bell instrument applied by Sir C. Bright for receiving Highton's signals by sound; in the system adopted by the Continental Telegraph Union; and in Mr Wheatstone's new self-recording telegraphic instruments.

6. In the signalling of a few words by the writer of this article on board the Agamemnon, approaching the Irish

[1] It seems to the writer most probable that an "electric current" is a real flow of some fluid. But so little do we know of the ultimate nature of electricity, that we cannot tell whether the vitreous or so-called positive, or the resinous or so-called negative excitement is caused by an accumulation of the true fluid. Even the infinitely improbable hypothesis of two fluids flowing in opposite directions to constitute an "electric current," has been accepted by some.

[2] Positive, zero, and negative, being reckoned as three degrees.

[3] As for instance, one current, and zero, or positive and negative, with no signal zero.

Description of Telegraphs distinguishing Three Degrees of Current.

coast, which were read correctly on his marine galvanometer on board the Niagara, approaching Newfoundland.

To Class II. belong—1. Morse's system of electro-magnetically self-recording signals.

2. Bain's system of electro-chemically self-recording signals.

3. Henley's magneto-electric signals.

4. Every other method, whether by batteries, by volta-induction coils, or by magneto-induction machines, for signalling by the Morse alphabet; now much used over the continent of Europe, and in the telegraphs of the East; also in the Atlantic Telegraph during the three weeks of its successful working between Valencia and Newfoundland; also now almost exclusively by the English "Electric and International Telegraph Company."

5. Wheatstone's step by step telegraph, read by eye, which, with modifications introduced by various makers, was used almost exclusively on the continent of Europe until a few years ago.

6. Wheatstone's printing telegraph, and House's American patent mechanism for carrying it into practice.

7. Hughes' American printing telegraph.

VII.—DESCRIPTION OF TELEGRAPHS, DISTINGUISHING THREE DEGREES OF CURRENT.

We shall now proceed to describe very briefly the chief characteristics of these different systems, referring to them by numbers, according to the preceding classification.

Class I.—Variety 1. The transmitting apparatus consists of a galvanic battery, with a hand-key and connections arranged to act as follows:—

(1.) The handle of the key, when left to itself, is urged by springs into a vertically downward position, and keeps the line in connection with the earth.

(2.) When turned to one side, it produces at once contact between the negative pole of the battery and the earth, and a contact between the positive pole of the battery and the line.

(3.) When turned to the other side, it produces at once a contact between the positive pole of the battery and the earth, and a contact between the negative pole and the line.

The receiving apparatus consists of a magnetised steel needle, balanced on a horizontal axle or shaft, so as to hang in a vertical position in the interior of a coil of fine wire, and prevented by stops from being deflected to more than a small fixed angle to either side of the vertical. The axle of the needle, prolonged through a division in the coil to the outside, carries a light indicating bar or needle in a conspicuous position in front of a vertical dial-plate, behind which the coil is fixed. This indicating-needle ought to be no more massive than is necessary for rigidity and easy enough visibility. It may with advantage be made of ivory; and the original idea of making it of steel, because it was supposed to be advantageous to have it magnetised in the opposite direction to the inner or efficient needle, is now recognised as a mistake.

The key of the transmitting apparatus, and the whole receiving apparatus, are arranged in a single case, the handle of the former being a short distance below the needle, and in front of a continuation of the dial-plate. This *combination*, constituting what is called *the instrument*, is placed in a convenient position to be used by the operator either standing or sitting before the dial-plate. The two ends of the coil are connected permanently, one with the line, and the other with the line connection of the key. Thus, ordinarily, the key, when operated with, sends its currents through the coil into the line; and when left in its middle position, allows any currents which may come from the other end to pass to earth through the coil. Sometimes a short metallic connection is applied by means of a "short circuiting" key, screw-stop, or other arrangement, between the two ends of the coil, when the instrument is being used for transmission,—as, for instance, if the line is badly insulated, and it is desired to spend no power against unnecessary resistance; but most frequently the currents of transmission are all sent through the coil, and thus the operator sees by the resulting motions of the needle on the dial before him, (which should exactly follow the motions of his hand,) that he is performing his manipulations correctly, and with perfect effect.

Description of Telegraphs distinguishing Three Degrees of Current.

The "single needle instrument" is adapted to work through one telegraphic wire, in the manner just described.

The "double needle instrument" consists of two single needle instruments, connected separately with two telegraph wires, and put together in one case, so as to show two needles side by side on one large dial-plate, and to present two handles below them, to be worked by the right and left hands of the operator respectively.

The appearance of these instruments, especially of the double needle instrument, is no doubt familiar to many of our readers, being to be seen at almost all the chief railway stations of England and Scotland. The annexed figures will sufficiently explain the interior, construction, and connections of the whole apparatus.

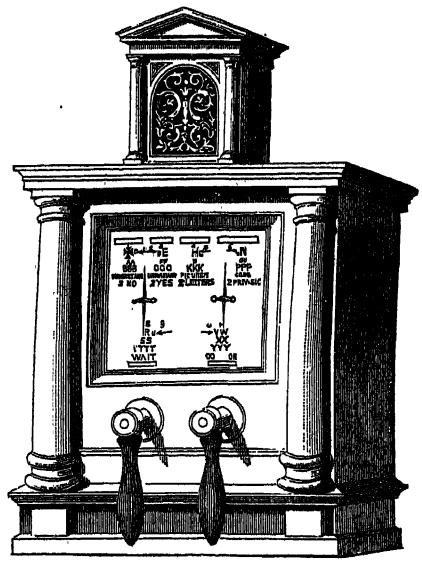


Fig. 4.

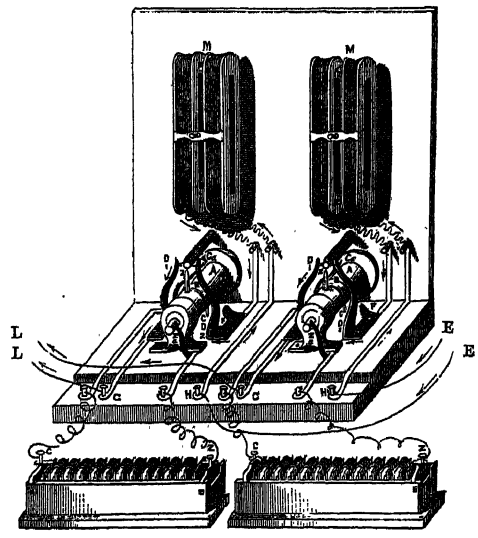


Fig. 5.

The system first introduced under Cooke and Wheat-

Description of Telegraphs distinguishing Three Degrees of Current.

stone's patent of 1837 involved the use of five line-wires, and five indicating needles, each with a right and left deflection from its middle position; but the double wire telegraph quickly superseded it, and was for many years employed in all the works of the original "Electric Telegraph Company" of England, now called the "Electric and International Telegraph Company." The double-needle instrument, being always used when two-line wires were available, was worked as a single-needle instrument with one of its needles and keys alone in action, in case of a temporary failure of one of the wires. For many years after their first introduction, these instruments were made with needles so heavy that they could only be worked at a very slow speed, not more than three or four words a minute being attainable on the single-needle instrument, nor than five or six on the double. Although a much higher speed is now attained in consequence of the introduction of lighter needles, the rapidity of action is still limited by their inertia, which (especially by giving rise to vibrations, when the key is put into its middle position so as to allow the current to cease and release the needle from pressing against its stop on either side) necessitates a rate of working to ensure distinctness of signals, which is much lower than the highest that could be easily and accurately performed by a skilful manipulator. The hand-keys are also objectionable, on account of the great space through which they must be moved, and the force required to move them, to produce the signals; and if the needles were as quick as they might readily be made, a good operator would begin to find his speed limited by the muscular effort required to work as fast as his mind could guide him, and as the receiving operator at the other end could read his signals by eye.

2. Steinheil's telegraph of 1837, carried out in actual practice between Munich and Bogenhausen, separated by a distance of 12 English miles, consisted of a transmitting apparatus, a single "main electrode," a receiving instrument, and earth connections precisely as shown above in the general plan, figs. 2 and 3; and its system of signalling was founded on the use of the positive and negative current as distinct elements, with pauses of time to distinguish the consecutive successions of signals representing the individual letters. It was, in fact, the first practical one-wire telegraph on the system used afterwards in England, casually in the old "single needle" of the "Electric Telegraph Company," and regularly in Highton's single-needle instrument as adopted by the "British" company. It is now likely to supersede all other systems of inland telegraph in Europe.

Steinheil's transmitting instrument was an electro-magnetic machine, used to give a positive electromotive impulse to the line by one motion, and a negative impulse by the reverse motion, of a coil of wire in the neighbourhood of a steel magnet; but the other parts of his telegraph were equally adapted for the use of a battery as electromotor, with any manipulating key constructed to give the positive, the zero, and the negative connections at pleasure. The double-spring key indicated above in the general plan (fig. 3), and described more minutely below (Art. 4), would be the best possible for this purpose.

Various forms of receiving instrument were invented by Steinheil, each of which has now come into extensive practical use. The simplest was a single needle, indicating to the eye the two varieties of signal by its right and left motions. The addition of two bells on the two sides allowed the indications to be perceived by ear, and their successions interpreted into letters, words, and sentences without the aid of any other sense. The telegraph was thus literally endowed with the power of speech. In a third instrument two needles were used, one to move under the influence of the positive, and the other of the negative current, each carrying a light tube of ink, by which, when deflected, it marked its signal on a slip of paper, drawn along by clock-work so as to receive the marks of the two needles in two rows of dots; and thus the telegraph was made to write down its tale in enduring symbols, having precisely the same expressive character and power as printed, or as the most distinct of written, letters. In Steinheil's alphabet, letters are essentially represented by—(1), Two single deflections to right and left; (2), Four combinations of two consecutive deflections, right or left; (3), Nine combinations of three consecutive right or left deflections; and (4), Eleven of the sixteen combinations of four consecutive right or left deflections. With no less convenience than justice, we may call by the general designation of *Steinheil alphabets, or systems*, all in which the same two elementary electric signals are used, according to the same principle of combination. All practical single-wire telegraphs of Class I., as we shall see, are founded on the Steinheil system thus defined.

3. Highton's instrument is adapted to signal on the Steinheil system, through one telegraph wire. It is simply a "single needle," with some modifications of form and dimension, which render it capable of working at a higher speed. Instead of the straight needle of the original instrument, it has a small, light horse-shoe magnet, turning round a horizontal axis in a line through the centre of its bend, and midway between its poles, on a shaft which bears a thin rhombus of ivory for index, attached to it by an acute angle, and hanging down in front of a black dial. The sending apparatus consists of a galvanic battery, and a key presenting two flat levers of ebony or ivory, working up and down on spring-joints when pressed and released by the operator, who generally applies one hand to one of them, and the other to the other. When one of these levers is pressed down, the positive pole of the battery is thrown to the line, and the negative to the earth; and when the other is pressed, the same connections are made with the poles reversed. When neither is touched, the line is kept to earth simply, and both poles of the battery are left insulated. It is found practicable to operate at a considerably higher speed with this instrument than with the original single-needle instrument; so that by means of it, with the alphabet arranged for it by Highton, nearly as much work can be done through one wire as through two by the common double-needle system. It is to be observed, however, that much of this gain in speed is due to the excellence of Highton's alphabet, which appears to be the first electro-telegraphic alphabet constructed on the true principle of representing the letters of most frequent occurrence by the most rapidly executed signals, whether simple or complex, and which is probably somewhat better than the original Steinheil, and undoubtedly a very great improvement on the first English single-needle alphabet.[1]

[1] The original Steinheil alphabet was arranged to imitate, in a necessarily incomplete manner, the forms of printed letters, by the groups of dots in which his telegraph writes them. In the single-needle casual system of the Electric Telegraph Company, the letters are represented by numbers of right and left deflections, corresponding in some arbitrary way with their order in the alphabet. Experience has, however, shown, that the memory neither requires aid, nor is effectively aided, by any such relations, however natural it may have been felt to lean upon them in first attempts to practise so novel an art as that of communicating intelligence by words spelled in letters composed from only two distinct elementary signals. After a very short time of learning, it is quite as easy to distinguish with perfect readiness the Highton-Steinheil or the Morse letters, when recorded in Steinheil's dots, or in the Morse dot and dash (to be explained below), or to recollect the manipulation required to execute them, as it is to read Greek, Roman, or German printed characters, or to write the letters of any of these alphabets.

Description of Telegraphs distinguishing Three Degrees of Current.

The form of instruments to which we have now alluded was patented by the Rev. H. Highton, M.A., and Mr E. Highton, C.E., in 1848, along with various other improvements and inventions in electro-telegraphic apparatus. One part of this patent is so remarkable for the ingenuity and the simplicity of the idea involved, that we quote the following statement regarding it from Mr E. Highton's treatise, which, with the accompanying drawing, will make it sufficiently clear:—"The maximum work capable of being produced by any number of lines was taken advantage of, and thus three wires were made to produce twenty-six *primary signals*, and so to show instantly any desired letter of the alphabet." Suitable keys were devised for sending currents of electricity over three wires in the twenty-six orders of variation. "Direct-action printing telegraphs were devised, so that a single touch of one out of twenty-six keys caused instantly any desired one out of twenty-six letters or symbols to be printed" at the remote station. The mode in which letters are shown by the combined motions of the three screens is obvious from the drawing. The simplicity of the plan and the ingenuity of the invention are admirable; but the circumstance that it requires three telegraph wires is fatal to its extensive adoption as a practical system.

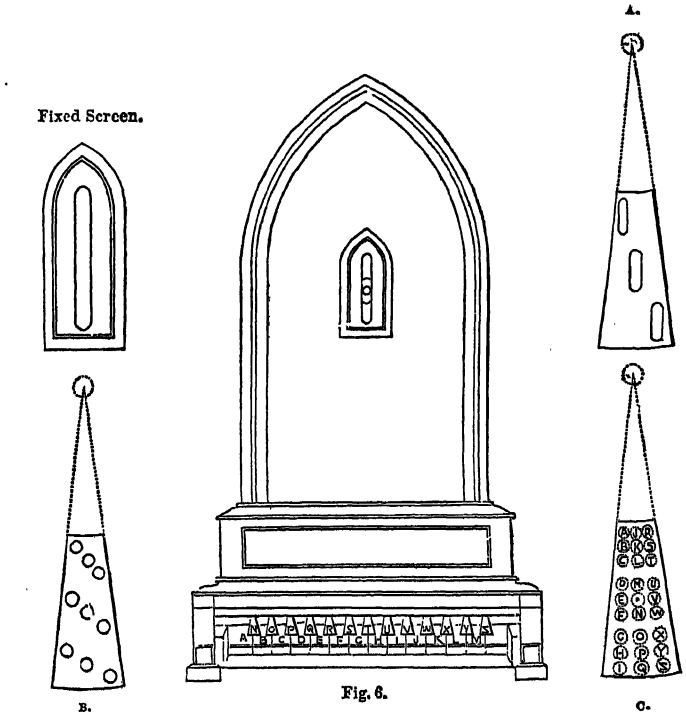


Fig. 6.

Messrs Highton's direct letter-showing telegraph for three-line wires. In this instrument, the desired letter is brought instantly into view in the centre of the dial, by a motion of one or simultaneous motions of more than one of three moveable screens, A, B, C.

Another very remarkable telegraph instrument which, as we have been informed, has been introduced in actual practice, although to no great extent, the subject of an earlier patent (1846), invented by the Rev. H. Highton alone, is thus described in his brother's treatise:—"A small slip of gold-leaf, inserted in a glass tube, was made to form part of the electric circuit of the line-wire. A permanent magnet was placed in close proximity thereto. When a current of electricity was passed along the line-wire, the strip of gold-leaf was instantly moved to the right or left, according to the direction of the current." The annexed figure (fig. 7.) represents this instrument. The signal system here clearly is of the Steinheil class, as defined above. The alphabet represented on the dial of the instrument is the same as that of the Highton single-needle instrument.

Description of Telegraphs distinguishing Three Degrees of Current.

4. A great improvement on the single-needle instrument is to be made by using two needles, each resting against a stop when uninfluenced by the current, and arranged so that one of them shall be moved when the current flows in one direction through the coil, and the other when it flows in the other direction. This was suggested as a particular case of a multiple-needle instrument to distinguish any number of different degrees of current received from one line of telegraph, by the writer of the present article, in a communication to the Royal Society of London of December 1857.[1] The same idea appears to have occurred independently to various inventors, and indeed to have been used in Steinheil's recording telegraphs of 1837. An electro-magnetic receiving instrument[2] on a principle involving it was patented by Messrs Bright in 1855, which has recently been applied, with admirable effect, in Sir Charles Bright's bell relay delivering signals by sound. Wheatstone's automatic recording telegraph marks by double needle on the same principle. There are obviously many different ways of putting it in practice. Thus the two needles may be mounted so as to turn independently on one shaft. They may be magnetised with similar poles in the near ends, and while urged by a fixed steel magnet to place their magnetic axes parallel, they may be held by a stop in positions somewhat inclined to one another. The two needles thus arranged will move, one alone in one direction, under the influence of the positive current, and the other alone in the contrary direction, under the influence

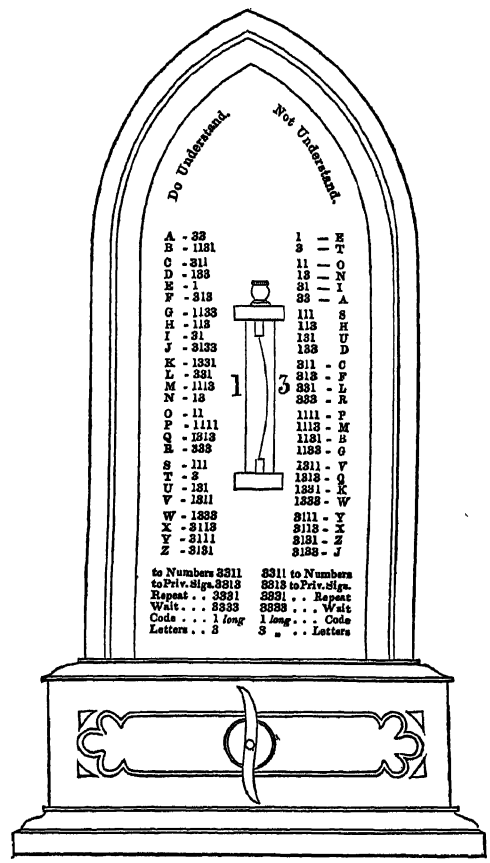


Fig. 7.

[1] "On Practical Methods of Rapid Signalling by the Electric Telegraph."

[2] A drawing of this instrument is given below, fig. 9.

Description of Telegraphs distinguishing Three Degrees of Current.

of the negative current. This is the particular plan which the author prefers. Otherwise, the two needles may be magnetised in contrary directions and held by springs or by gravity, so as to rest against a stop, with their magnetic axes parallel; and in this case one will move from the stop, under the influence of one current, and the other will move from the same stop in the same direction, under the influence of the contrary current. By arranging a second stop for each needle to limit its motion to a small angle, the time required to complete the movement for each signal may, as will be readily understood, be made extremely short.

For a sending key adapted to work in the telegraphic systems which have been described, the following plan is much simpler, and allows much easier and consequently more rapid manipulation than any hitherto adopted in practical telegraphic work. Two flat springs, EE', LL', are fixed at their ends, E and L, to a slab of vulcanite, and set so as to press upwards upon a metallic bar, PP', fixed by its ends, P, P', to two blocks of vulcanite, borne by the main slab. Under this bar, and concealed from it in the upper sketch or ground-plan, is another, shown as NN' in section below. This second bar, set in the slab of vulcanite (not shown), allows the springs (which are shown in their natural position, pressing against the upper bar) a little space to move when pressed down. The springs are, by suitable conductors, attached to them at their fixed ends, put in connection with the earth and the line of telegraph respectively. The two bars, PP', NN', are put in connection with the positive and negative poles of the battery respectively. The free ends, E', L', of the springs are coated with vulcanite, so that they may be pressed by finger applied in the positions marked (+), (—), without sensibly deranging the insulation by the body of the operator, or giving him a shock when high battery-power is employed. The action of this key will be readily understood when it is remarked that—

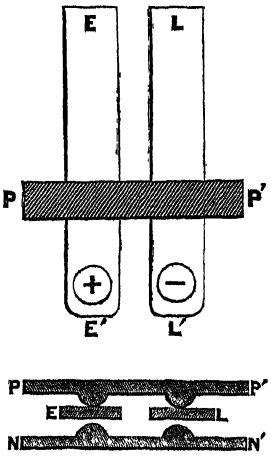


Fig. 8.

(1) The springs in their natural positions pressing upwards keep the line and earth in connection with one another, and with the positive pole of the battery, through the upper bar, and leave the negative pole of the battery insulated.

(2) When the earth spring, E, is pressed down by a finger applied at (+), the earth connection is thrown on the negative pole of the battery; and the positive pole is left on the telegraph line, which will therefore receive positive electricity.

(3) When the line-spring, L, is pressed by a finger applied at (—), the positive pole of the battery is left in connection with the earth; and the line is thrown into connection with the negative pole of the battery, and will therefore receive negative electricity.

The details of construction are too obvious to require even suggestion here. A key on this plan, with properly platinised contacts, could scarcely go wrong, and it is so free from intricacy that, even if any of the contacts were ever to fail, which could only happen from some non-conducting matter getting by accident between the pieces of platinum which should touch, it could be put right again with the greatest ease. The space allowed for the springs to move may, without producing any liability to false contacts, be reduced to the smallest across which air will insulate. This might be much less than $\frac{1}{1000}$th of an inch if only fifty cells of Daniell's are used; and if required to insulate even against the enormous power of 5000 cells, need be no more than $\frac{1}{20}$th of an inch (according to experiments by the writer of this article on the lengths of spark produced by different degrees of electromotive force absolutely measured), provided always the resistance in the line is sufficient to make the current through it too weak to originate an "electric arc" on breaking metallic contact in the key. Practically, all things considered, $\frac{1}{100}$th of an inch would be quite enough of motion to make sure of correct electrical action in the key; and any space from this to $\frac{1}{10}$th of an inch would make the manipulation as easy and rapid as possible.

5. Steinheil's beautiful idea of receiving telegraphic signals by the sound of two bells, struck by the needle or needles, when deflected by two currents (positive and negative) respectively, has been recently put into practice on a very extensive scale, by Sir Charles Bright, with the aid of a simple and effective relay, represented in the annexed figure

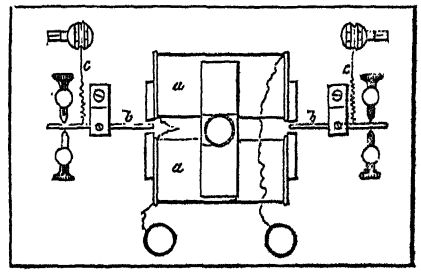


Fig. 9.

which he has invented for the purpose, and which proves most successful. This relay, with a local battery supplying the mechanical power required to strike the bells, has been substituted at the principal stations of the British and Irish Magnetic Telegraph Company in England and Scotland, instead of Highton's single needle (which is still retained on their railway circuits, and some of their less important commercial circuits); and the writer is informed, that "for ordinary circuits nothing can work better; that "more work can be got from one clerk and one wire by it than by any other receiving instrument;" and that it is gradually being extended to the utmost in the telegraphs of that company. The transmitting instrument used for sending is still Highton's key described above; and it is worked by the staff of operators and clerks trained under Highton's system. The receiving clerk sits between the two bells, and, with only the ear engaged in receiving the signals, writes down his interpretation of their meaning with a degree of ease and accuracy not attainable when one clerk has to watch the needle and dictate his interpretation to another who writes it down, as in receiving by the needle instruments or any other instrument indicating by transient visual signs.

Steinheil's system (positive and negative signals distinguished), with his recording instrument marking by dots in two rows, has been recently introduced in France, and is likely to supersede all other systems of European inland telegraph. On long lines of telegraph, his ink-marker, when attached to a needle, worked immediately by the current from the line, did not prove effective for want of motive power, but this want is supplied by the use of a relay and local battery; and the marking process is worked in a satisfactory manner either with Steinheil's ink-tubes, or with other kinds of ink-markers, or with Morse's or Bain's plans of marking, to be explained below. The Steinheil self-recording telegraph, with relay, and one or other of these forms of marker, is now in very general use on the continent of Europe, and is worked according to the alphabet of the Telegraph Union; that is to say, the common Morse alphabet (which will be explained below), with positive and negative signals substituted for the dot and the dash respectively.

Description of Telegraphs distinguishing Three Degrees of Current.

The necessity for a relay to record on the Steinheil system has been superseded by a most ingenious and beautiful invention of Professor Wheatstone's—the ink-marker of his "automatic telegraph," described below—which proves effective for marking dots by as delicate a motion of a needle as any that can be used to produce relay contacts. This, along with many other excellent contrivances for all parts of the telegraphic process, especially an instrument for perforating slips of paper to be used in an automatic sender, according to the general plan invented by Bain, but carried out in a very novel manner, forms the subject of one of his two recent patents, entitled "Electric Telegraphs," both bearing date June 2, 1858. For full information and details of construction, the reader is referred to the specification, which is amply illustrated by drawings. The following extracts explain sufficiently the general character and operation of the instruments:—

"My invention consists of a new combination of mechanism for the purpose of transmitting through a telegraphic circuit messages previously prepared, and causing them to be recorded or printed at a distant station. Long strips or ribbons of paper are perforated by a machine constructed for the purpose, with apertures grouped to represent the letters of the alphabet and other signs. A strip thus prepared is placed in an instrument associated with a rheomotor (or source of electric power), which, on being set in motion, moves it along, and causes it to act on two pins in such manner, that when one of them is elevated the current is transmitted to the telegraphic circuit in one direction, and when the other is elevated it is transmitted in the opposite direction; the elevations and depressions of the pins are governed by the apertures and intervening intervals. These currents, following each other indifferently in the two opposite directions, act upon a printing or writing instrument at a distant station, in such manner as to produce corresponding marks on a ribbon of paper moved by appropriate mechanism.

"I will proceed to describe more particularly the several parts of this telegraphic system, observing, however, that each part has its independent originality, and may be associated with other apparatus already known.

"The first improvement consists of an instrument for perforating the slips of paper with the apertures in the order required to form the message. The slip of paper passes through a guiding groove, at the bottom of which an opening is made sufficiently large to admit of the to-and-fro motion of the upper end of a frame containing three punches, the extremities of which are in the same transverse line. Each of these punches is capable of being separately elevated by an appropriate finger-key. By the pressure of either finger-key, besides the elevation of its corresponding punch, in order to perforate the paper, two different movements are successively effected: first, the raising of a clip which holds the paper firmly in its place; and, secondly, the advancing motion of the frame containing the three punches, by which the punch which is raised carries the ribbon of paper forward the proper distance. During the reaction of the key, consequent on the removal of the pressure, the clip first fastens the paper, and then the frame falls back to its normal position. The two external keys and punches are employed to make the holes, which grouped together represent letters and other characters, and the middle punch to make holes which mark the intervals between the letters."

"The second improvement consists of an apparatus which may be called the transmitter, the object of which is to receive the slips of paper prepared by the previously described instrument or perforator, and to transmit the currents produced by a voltaic battery or other rheomotor in the order and direction corresponding to holes perforated in the slip; this it effects by mechanism somewhat similar to that by which the perforator performs its functions. An excentric produces and regulates the occurrence of three distinct movements:—1*st*, The to-and-fro motion of a small frame, which contains a groove fitted to receive a slip of paper, and to carry it forward by its advancing motion; 2*d*, the elevation and depression of a spring-clip, which holds the slip of paper firmly during the receding motion, but allows it to move freely during the advancing motion; 3*d*, the simultaneous elevation of three wires placed parallel to each other, resting at one of their ends on the axis of the excentric, and their free ends entering corresponding holes in the grooved frame; these three wires are not fixed to the axis of the excentric, but each of them rests against it by the upward action of a spring, so that when a light pressure is exerted on the free end of either of them, it is capable of being separately depressed. When the slip of paper is not inserted, and the excentric is in action, a pin attached to each of the external wires passes, during each advancing and receding motion of the frame, from contact with one spring into contact with another spring; and an arrangement is adopted, by means of insulations and contacts properly applied, by which, while one of the wires is depressed and the other remains elevated, the current passes from the voltaic battery to the telegraphic circuit in one direction, and passes in the other direction when the wire before elevated is depressed, and *vice versâ*; but while both wires are simultaneously elevated or depressed, the passage of the current is interrupted. When the prepared slip of paper is inserted in the groove and moved onwards, whenever the end of one of the wires enters an aperture in its corresponding row, the current passes in one direction; and when the end of the other wire enters an aperture of the other row, it passes in the other direction. By this means the currents are made to succeed each other automatically in the proper order and direction to give the requisite variety of signals. The middle wire only acts as a guide to the paper during the cessation of the currents. The wheel which drives the excentric may be turned by hand, or by the application of any motive power."

"Instead of a voltaic battery, a magneto-electric or an electro-magnetic machine may be employed as the source of electric power In this case, the transmitter and the magneto-electric or electro-magnetic machine form a single apparatus moved by the same power, and they are so adapted to each other, that the shocks or currents are produced at the moments the pins of the transmitter enter the apertures of the perforated paper."

"The transmitters just mentioned require only a single wire of communication, and currents in both directions are available for printing the signals; but in some cases it may be advantageous to employ two telegraphic wires, and to use the inversions of current to bring back the pens or markers without the aid of reacting springs. In this case the only modification of the apparatus required is in the disposition of the insulations and contacts necessary to transmit, in their proper order, the currents from the rheomotor into the two wires."

"The third improvement is in the recording or printing apparatus, which prints or impresses legible marks on a strip of paper, corresponding in their arrangement with the apertures in the perforated paper. The pens or styles are depressed and elevated by their connection with the moving parts of the electro-magnets; they are entirely independent of each other in their action, and are so arranged, that when the current passes through the coils of the electro-magnets in one direction, one of the pens is depressed, and when it passes in the contrary direction, the other pen is depressed; when the currents cease, light springs restore the pens to their usual elevated positions. The mode of supplying the pens with ink is as follows:—A reservoir, about an eighth of an inch deep, and of any convenient length and breadth, is made in a piece of metal, the interior of which may be gilt, in order to avoid the corrosive action of the ink placed in it; at the bottom of this reservoir are two holes, sufficiently small to prevent, by capillary attraction, the ink from flowing through them; the ends of the pens are placed immediately above these small apertures, which they enter, when the electro-magnets act upon them, carrying with them a sufficient charge of ink to make a legible mark on the strip of paper passing beneath them. The motion of the paper ribbon is produced and regulated by apparatus similar to those employed in other register or printing telegraphs."

"The fourth improvement is an instrument which I call a translator. Its object is to translate the telegraphic signs, consisting of successions of points or marks, adopted in this system, into the ordinary alphabetic characters. In the system I have adopted, limiting the number of points in succession to four, 30 distinct characters are represented. The instrument presents externally nine finger-stops, eight of which are arranged in two parallel rows, four in each, and the remaining one is placed separately. The principal part of the mechanism within is a wheel, on the circumference of which 30 types are placed at equal distances, representing the letters of the alphabet and other characters; other mechanism is so disposed and connected thereto, that when the keys of the upper row are respectively depressed, the wheel is caused to advance 1, 2, 4, or 8 steps or letters; and when those of the lower row are, in like manner, depressed, the wheel advances respectively 2, 4, 8, or 16 steps. By this disposition, when the stops are touched successively in the order in which the points are printed on the paper, touching the first stop for one point, the first and second for two points, &c., and selecting the stops of the upper or lower row, according as the point is in the upper or lower row of the printed ribbon, the type-wheel will be brought into the proper position for placing the letter corresponding to the succession of points over a ribbon of paper. The ninth stop, when it is pressed down, acts to impress the type on the paper, to cause the advance of the paper, in order to bring a fresh place beneath the type-wheel, and subsequently to restore the type-wheel to its initial position."

Telegraphs using only Two Degrees of Current.

The instrument described in the preceding extracts, or "Wheatstone's automatic telegraph," as it is called, is capable of recording 500 letters per minute with certainty, through short aërial lines, which is probably the highest speed yet attained on any system.

6. A few words, and one important message, "Send alternate currents," were transmitted by the writer on board the Agamemnon, approaching the Irish coast, and were correctly read on his "marine galvanometer," on board the Niagara, approaching Newfoundland. The alphabet employed was one on Steinheil's system (agreeing with Highton's so far as having the combinations in order of brevity arranged to correspond with the letters in order of frequency), which was drawn up merely for temporary use. The mode of manipulation in the *transmission* of these signals, by means of a common three-position reversing-key, was peculiar, involving the counting of time by the beats of a watch, to produce compensations for inductive embarrassment on the principles indicated by the mathematical theory, and, without the aid of a proper instrument, would be too troublesome for general use. With a key of very simple construction for enabling the operator to apply definite electromotive forces during accurately measured intervals of time, which the writer has recently constructed, this system will probably be found more advantageous, in point of speed and certainty, than any hitherto practised through long submarine lines.

VIII.—TELEGRAPHS USING ONLY TWO DEGREES OF CURRENT.

1. In Morse's telegraph, which is the simplest conceivable, a current is, by the application of a battery, made to flow through the line for a longer or shorter time, and longer or shorter intervals of no current are allowed to elapse between such successive battery applications. The effects are recorded at the receiving station on a long ribbon of paper, made to run uniformly by wheel-work by a metal point attached to a lever, bearing the armature of an electro-magnet. The coil of this electro-magnet is put in circuit between the line of telegraph and the earth, when the signal currents are strong enough to produce the required effect by their own power. This, however, is not generally the case unless in very short or very well insulated lines, and almost universally now a local, or "relay" battery, according to one of Wheatstone's inventions, specified in 1837, is employed at the receiving station to do the forcible mechanical work of recording, under direction of the signal currents from the distant station, which make and break contact for it, and do no other work.

When there is no current through the line, the recording electro-magnet is inactive, and the lever is held by a spring, so as to keep the point off the paper. When a current is received, the electro-magnet becomes excited, either directly or by the relay battery, attracts its armature, and causes the point to be pressed on the paper, so as to indent or emboss a line upon it, of which the length is equal to the space run by the paper during the time the current flows. The result, a series of marks, some very short, called dots, and some longer, called dashes or lines, separated from one another by blank spaces of various lengths, is seen on the paper as it runs from the machine, and constitutes a record of the durations, of current by the marks, and no current by the blanks. Signals of this character may, as we shall see, be combined in a variety of ways, to constitute the letters and signs used in the communication of intelligence. The alphabet introduced by Morse is founded on the combination of dots and dashes into groups, to represent the individual letters and signs; the dots and dashes of each group being separated from one another by the shortest blank interval, and the groups separated from one another by decidedly longer blanks. The successions of letters constituting words are separated by still longer intervals when clearness requires such a distinction.

Telegraphs using only Two Degrees of Current.

The Morse alphabet is, in fact, composed from two distinct elementary signals, according to precisely the same numerical combinations as the old single needle, or Highton's perfected alphabet. Accordingly operators familiar with the Morse alphabet sometimes work a single needle instrument, using one deflection (to the right, for instance) instead of the dot, and the contrary deflection (left) for the dash. This mode of signalling, when both sending and receiving instruments are adapted to distinguish positive and negative currents, is of course more rapid than the Morse system, as it saves the time required for the prolongation of the deflections to constitute dashes. It has very recently been adopted in connection with recording apparatus for receiving, by the French government, and the Telegraphic Union.

The transmitting apparatus used by Morse, and by nearly all who have adopted his system of signals, consists of a galvanic battery, and a key for making and breaking contact with the line. The form of key most generally employed for this purpose has been taken from that in general use in America, "invented" and first made by a philosophical instrument-maker of New York. It is much the reverse of an improvement on "the rude instrument," consisting of "a slip of sheet-copper, with one end fastened to the table, while the other, being loose, yielded as a spring, and was moved with the fingers to break and close the circuit," by which Morse first worked his telegraph, and which, with the substitution of brass, as more elastic, in place of the copper slip, and with the addition of a stop to limit the upward motion of the spring, is the best and simplest possible apparatus for producing the required effects, and is immensely superior to the massive lever "Morse key" constructed by even some of the best and most scientific European telegraph instrument-makers of the present day. The upper stop is generally metallic also, and is connected with the earth, so that when the key is up, the line is thrown into connection with the earth.[1] It is true that the so-called "Bavarian Morse key," having a simple spring and no lever, sometimes gives false contacts when not pressed in exactly the right direction by the operator, and has this defect only imperfectly remedied by a certain screw adjustment; but a slight alteration in the relative position of some of the parts does away with all necessity for adjusting screws, and gives an instrument which, while simpler and cheaper than any other, can never go wrong, and presents the greatest possible facility for rapid working. A single spring-key, on precisely the same plan as either spring alone of the double spring-key, sketched above (VII. 4.), has these qualities.

2. In Bain's electro-chemical system, signals of precisely the same character as in Morse's are adopted (similar, in some cases identical, combinations of the dot and dash being used to represent letters of the alphabet, and other more or less complex elements of intelligence). They are recorded by the current itself on paper moistened with prussiate of potash, and other chemicals in solution, carried round on a brass tablet by wheel-work, and gently pressed by a metal style of steel or copper, conducting the electric

[1] For short air-lines this is not necessary, but is quite essential for rapid working through submarine telegraphs of considerable extent, when the charge accumulated in the line does not escape between signal and signal with sufficient rapidity through the receiving end alone.

Telegraphs using only Two Degrees of Current.

current between the telegraph line and the earth; the style being connected with the line and the tablet with the earth if the signal currents are positive, or the style with the earth and the tablet with the line if, as possibly ought always to be, the signal currents are made negative for the sake of preserving the line from corrosion by moisture about the insulators. The following description of Bain's receiving instrument, and the perspective drawing which accompanies it, are extracted from Jones' *Historical Sketch of the Electric Telegraph* (New York, 1852):—

"In the figure (fig. 10), the clock-work which moves the tablet is seen on the right. Its motion is regulated by a fly-wheel above, the

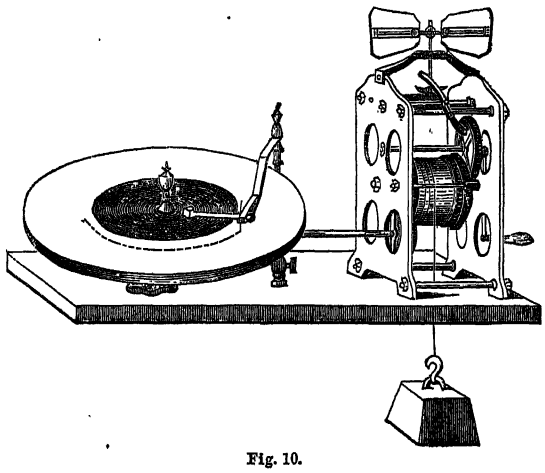


Fig. 10.

vanes of which can be inclined so as to present greater or less resistance to the air. A lever or brake bears upon the axle of the fly-wheel, by moving which lever the clock-work may be stopped, or allowed to go on. The circular disc, or tablet of brass, carried by the clock-work, is seen on the left of the figure, inclined towards the observer. In the centre of the disc, occupying the shaded portion, a spiral groove is cut, in which the guide to the pen travels. This guide is seen, attached at right angles to the penholder, which extends over the disc. The pen-wire is seen, held by a little clamp, descending so as to touch the tablet. This wire, of course, traces a spiral line of dots upon the outer ring of the disc's surface, exactly corresponding, in the distance of its lines, to the spiral groove within, which serves as a guide. By this beautiful contrivance, the writing is disposed in a close spiral line of dots, to represent letters, occupying but very little space.

"The outer part of the surface of the disc, upon which the letters are represented in the figure, is covered with a ring of moistened and chemically prepared paper. This may be renewed or removed at pleasure. The penholder is connected with the positive wire of the telegraph, and the tablet with the negative. The circuit of conductors is completed by the moistened paper which intervenes, and which the current accordingly traverses. This paper is moistened with a solution of the yellow prussiate of potash, acidulated with nitric or sulphuric acid. The pen-wire consists of iron. When the current passes, this pen-wire is attacked by the solution, and the portion of iron dissolved unites with the prussiate of potash to form the colour known as Prussian blue, which permanently stains or dyes the paper."

"The indication of the current here takes place without motion. The pen itself never stirs [except in its slow radial motion outwards]; it bears silently on the paper; and as the eye observes the point of contact, now a blank space, and now a deep blue line, appears upon the retreating surface. This is the record of the intermitting current sent over the wire from a distance."

This admirable method of recording electric signals is now used very extensively both in America and in the Old World, although in general applied not directly to the currents received from the line (which would not in most cases be strong enough to produce visible marks), but to currents generated by a local or "relay" battery at the receiving station, according to contacts made and broken by electro-magnetic action of the primary signal currents, as in the relay arrangement introduced to work the Morse recording system, as described above.

Telegraphs using only Two Degrees of Current.

The only other modification which has been applied to Bain's recording system, is the employment of a long rib-and of paper, running by wheel-work like that of Morse, which is found more convenient than the circular tablet first employed by Bain.

Another excellent invention of Bain's—a plan for transmitting apparatus—is included in the same patent (1846) as that in which he first specifies his electro-chemical recorder. It is described and commented on in the following terms by Highton:—

"A plan for transmitting a message more rapidly than can be done by hand, consisted in cutting out slits of different lengths in a long slip of paper at the transmitting station, and allowing this perforated strip to pass uniformly over a metal cylinder with a pin or spring pressing on the top of the paper. Whenever, therefore, a hole in the paper passed under the pin, the pin came into metallic contact with the cylinder underneath, and allowed a current of electricity to pass through the line-wire. All the holes in the paper, and their lengths, were therefore proportionably represented at the distant station by chemical marks of corresponding lengths on the prepared paper at that station. This form of telegraph is the quickest at present invented. It does not, however, seem suited to ordinary communications, but only to the transmission of *very long* documents on extraordinary occasions.

"If one person only is employed to punch holes in the paper, it is evident that, instead of making a hole in the paper, a current of electricity might as readily be sent, and a chemical mark made at the distant station; and thus the message might actually be sent in the same time as that required for cutting the paper. But this remark applies only to the case where there is but one attendant for a wire. If a *number of men* be employed at each station, then, by dividing the message into parts, and each man punching out his part, the whole paper can be perforated in less time than *one* man could send the message. On uniting this perforated paper, and applying it to a machine, and on turning the cylinder round, corresponding chemical marks may be made at a distant station with very great rapidity."

Mr Highton proceeds to remark—"The commercial question is, therefore, where ordinary communications are alone required, one of large working expenses *versus* a rather larger outlay of capital in the first instance." With this we cannot agree. It appears clear that the working expenses in carrying out Bain's plans, if the mechanical and electrical success were complete, must be less than would be required to do the same amount of work by hand through several wires, since only the same number of men will be required (the punching instrument being, it is to be presumed, workable at the same rate as a hand-transmitting key), and the expenses of maintaining the extra wires and battery power would be saved. The fact that this plan has not come into universal use, on all lines where there is more work to be done than can be got through one wire by one hand, does not find its correct explanation in Mr Highton's remarks. It seems more probable that some electrical or mechanical imperfection, which may be remediable, has hitherto operated against the complete success of this admirable invention; and we are disposed to conclude that perseverance in attempts to improve its details, would be rewarded by the achievement of a vast extension of the work done through the electric telegraph by land.

3. The "Magnetic Telegraph," under Henley and Foster's patent of 1848, consists of a double or single magneto-electric machine, sending through two line wires, or only one, to a double-needle or single-needle receiving apparatus, which consists of electro-magnets, with steel needles movable through small angles across the lines of force between their poles. There is no commutator and no breaking of the circuit in the sending machine; but a single motion of a key, when pressed down by the operator, produces an electro-motive impulse, which sends a current through the line; and the return motion of the key, rising by a spring, produces subsequently a reverse impulse and a re-

Telegraphs using only Two Degrees of Current.

verse current. Under influence of the first, or direct current, as we may call it, the receiving-needle moves from a stop, on which it rests during cessations of action, and strikes another stop placed to limit its motion. On this second stop it rests until the reverse current brings it smartly back to its normal position. The resting of the needle firmly on either stop is secured by the magnetic force exerted between itself and the soft iron of the electro-magnet.

In the double-needle system of the magnetic telegraph, a single motion and return of either needle constitutes a simple signal; and the alphabet is composed out of two simple signals, as Steinheil's is from positive and negative. In the single-needle magnetic system, the operator works precisely as with a Morse key, and he thus produces short and long deflections, since the needle rests deflected against its limiting stop until the reverse current brings it back; and the alphabet is composed, like the Morse, out of two simple signals, the short or dot, and the long or dash.

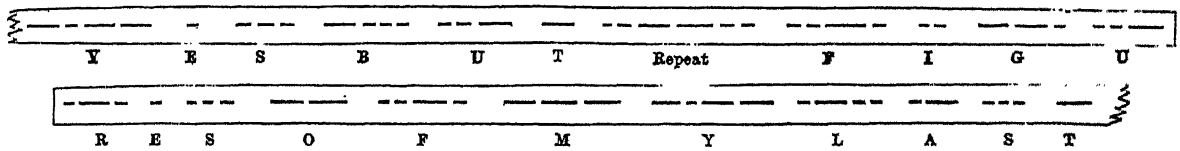
These instruments, after being very extensively and successfully used for many years, have been gradually superseded in England by Highton's instruments of the "British" Company, which, with the instruments of the "Magnetic" Company, became the property of the amalgamated "British and Irish Magnetic Telegraph Company." Henley's magnetic instruments are still used in the Irish railway telegraphs of the company. At many of the more important stations Sir C. Bright has introduced his bell relay in connection with them; the double-needle instrument being made to direct the power of a local battery to strike one bell when a current comes through one of the line wires, and another bell when a current comes through the other wire; and the single-needle instrument being similarly arranged to produce on a single bell a mere blow giving a clear sound, or a blow and sustained pressure producing a muffled sound, according as the short signal (dot) or the long signal (dash) is sent.

4. The Morse alphabet, with some modifications, recorded either exactly in Morse's manner, or by Bain's method applied to a riband of paper, with marking power, mechanical or chemical, supplied by a local battery, for which contact is made by a "relay" under influence of the signal current, is at the present moment probably more used than any other telegraphic system. It has been carried out in a remarkably perfect manner by the Electric Telegraph Company, with the aid of Mr Cromwell F. Varley's form of relay (patent No. 1318, 1855), a particular and we believe a very excellent form of the class of "polar relays," to which also belong Mr E. W. Siemens' patent, No. 13062, 1850, and Mr Whitehouse's patent, No. 2617, 1855. The general action of polar relays will be perfectly understood by supposing the moving needle, and one or other or both of the two stops in Mr Henley's receiving-instrument, described in the preceding article, to be provided with electrical contacts; so that two conductors, one connected with the needle and the other with one of the stops, shall be put in communication with one another when the needle is thrown over to rest on this stop. A speciality of much importance, involved in Mr Varley's and in Mr W. Siemens' working instruments, was, we believe, first introduced by Mr Siemens in 1850, and that is the use of a moveable soft iron bar, kept magnetic by the influence of a powerful steel magnet, instead of a moveable magnetised steel needle as in Mr Henley's receiving instrument, or a small moveable steel horse-shoe magnet, as in the form of relay which Mr Whitehouse adopted for actual use. We regret that our space does not permit us to describe particularly these several forms of relay. We believe, however, that except when signals are to be read off by sound, the use of a mechanical relay for any other purpose than that of retransmitting signals from point to point by relay batteries along a land line of telegraph exceeding 500 or 600 miles in length (which is advantageous solely in consequence of the necessary imperfection in the insulation of the line) will be discontinued, since it seems certain that mechanical power enough to make the contacts required to work a Morse instrument, or even the much lighter contacts which suffice for marking signals by Bain's recorder, must, when properly applied, be adequate either to make pencil, ink, or other perfectly visible marks, on the Morse long and short principle, or to cause type impressions to be printed, on a riband of paper, either without drawing on any local store of energy at all, or without drawing on any other than weights or spring required in any case to drive the mechanism carrying the paper along. Mr Hughes has thus managed his printing instrument described below—a very remarkable achievement of electro-magnetic mechanics; and Professor Wheatstone has superseded all other power than that of the signal current itself, to make ink marks (mere dots) on the Steinheil system. To ink a pen so that it may mark a dash on the moving paper as long as it is held on by the electro-magnetic force of the feeblest signal-current that it is in other respects advisable to use, is the invention wanting to supersede relays in recording apparatus for the Morse system.

Telegraphs using only Two Degrees of Current.

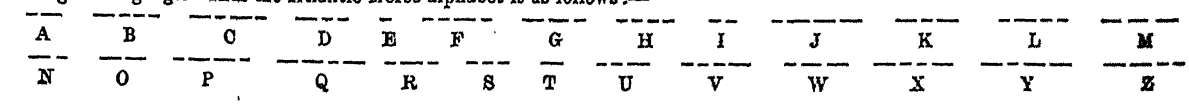
No better Morse telegraphic printing through any line, long or short, can be shown than the messages received at Valencia[1] from Newfoundland, a specimen of which is represented in the annexed fac-simile on a scale of one-fourth lineal dimensions.

SERVICE No. 222. VALENCIA, *Aug.* 21, 1858.



These messages were recorded in the following manner: The receiving clerk watched the image of a lamp reflected upon a horizontal paper scale, from a mirror galvanometer in circuit between the cable and the earth. Every time he saw the image begin to move towards the right, he pressed a Morse key placed beside him, and every time he saw it begin to come back towards the left, he lifted his hand and released the key. This action made and broke the circuit for a local battery and Bain's recorder, and thus produced marks and blanks consecutively on the riband of paper, of lengths proportional to the times during which the spot of light was moving to the right and to the left respectively. The receiving clerk, in fact, acted the part of relay, with what perfection the Valencia telegrams show, as the

[1] The Morse alphabet, as generally used through Europe, bears modifications which have been made chiefly by German telegraphists. It is on the whole better adapted to the German than the English language; and English telegraphers would do well to make several changes on important letters, which could readily be done without confusion. This has been done by the Atlantic operators in the case of the letters M and O, which have been interchanged with much advantage in consequence of the greater frequency of the letter O in the English language. Thus the Atlantic Morse alphabet is as follows:—



Telegraphs using only Two Degrees of Current.

reader may judge from the specimen of them we present. This system of receiving and recording messages by *human relay* has great advantages over every other method hitherto tried or proposed for working through long submarine lines. In the first place, the motions directly produced by the signal currents are not, as when a mechanical[1] relay records them, limited by stops. They may therefore be observed through a wide range on either side of zero, and the signals may be clearly disentangled from influences of inductive embarrassment and of earth currents, which would lay the mechanical relay over to one side or the other, and either prevent it from turning and giving any indication at all of the signals intended, or alter the proportions of blanks and marks so as to render it impossible to decipher the result. The human relay, employed in the manner which has been described, to record the motions of a spot of light on a scale, is much more sensitive and more reliable than any mechanical relay can be in the circumstances. A degree of current which cannot turn the most delicate of inanimate relays gives an ample motion to the spot of light. Even when the common relay turns, its contact often fails, or is uncertain, unless it is driven by superabundant power—more than it would be advisable ever to use through an ocean telegraph. The human relay has no corresponding liability to failure. It dispenses with the local battery and *chemicals* required for working Morse or Bain recorders in the ordinary way; and the simple pressure of the hand, direct on the lever of a Morse instrument, or on a proper appliance for carrying a pencil or other convenient style, allowing it when pressed to bear properly on a riband of paper running through regulated wheel-work, gives a most accurate and sure record of Morse signalling through a submarine line at any rate up to ten or twelve words a minute. If, however, the inductive embarrassment is so slight as to allow higher speeds than this to be regularly used, it is probable that the eye, mind, and hand of the human relay might not readily act in combination with the requisite rapidity, and that a common mechanical relay would be necessary or preferable.

The mirror galvanometer, planned by the writer of this article for receiving signals through the Atlantic cable (and available, with advantage in point[2] of speed and the smallness of battery power which it requires, for every submarine telegraph in which, through inductive embarrassment, the ordinary relay method becomes limited to any speed less than ten or twelve words a minute), consists of a very light mirror, with a small bar magnet of file steel cemented to its back, supported, within a helix of insulated wire, by silk fibre allowing it freedom to turn about an axis in its own plane and perpendicular to the magnet attached to it. The apparatus is complete with a lamp and scale attached to a frame bearing also the galvanometer; and a lens bounding one side of the chamber in which the mirror is supported, of such a focal length that rays from any point of the flame shall, after entering through the lens, being reflected by the mirror, and repassing through the lens outwards, be brought to a focus on the scale. In instruments of this kind, designed for land-use, the mirror is generally hung by a single silk fibre, about $\frac{1}{8}$th of an inch long, in the hollowed end of a plug of metal fitting half-way into the cylindrical hollow of the coil, of which the diameter is rather less than half-an-inch. The diameter of the mirror is about $\frac{3}{8}$ths of an inch, and the length of the magnet the same; the weight of mirror and magnet together being from a grain to a grain and a half. Such an instrument, with 500 yards of No. 40 copper wire (weighing ·5 grain per foot) in its coil, and with only the earth's magnetic force to direct the needle to its position of equilibrium, will at Glasgow give a deflection moving the spot of light over about 200 divisions of $\frac{1}{40}$ *i* each, on a scale 24 *i* from the mirror, when under the influence of an electromotive force equal to $\frac{1}{100}$ of that of a single cell of Daniell's maintained between the two ends of the coil.

The conductor of the Atlantic cable, which weighed from 110 to 120 grains per foot, was about 220 times as massive as that of the galvanometer coil; and therefore, if of equally good copper, 2400 statute miles of it would have resisted 38 times as much as the 500 yards of the galvanometer. Hence, ·38 of the electromotive force of a single cell would have given 200 divisions of deflection through the whole cable, if perfectly insulated and of good copper. But two or three divisions of deflection are quite sufficient for reading signals from, and therefore one cell of Daniell's would have given more than ample signal-currents through the actual copper of the Atlantic cable, if ordinarily well insulated. The quickness of the galvanometer indications under the directive force we are now supposing—that of the horizontal component of terrestrial magnetism at Glasgow—is nearly sufficient for signalling at the rate of 40 dots per minute[3] (which would give about $2\frac{1}{2}$ words per minute); as may be judged from the circumstance, that the natural rate of vibration of the needle and mirror, when deflected and left to oscillate under the terrestrial influence alone, was about 84 vibrations (that is, 42 motions in one direction, and 42 returns). In this condition of the galvanometer, however, the ordinary earth-currents through the cable (when connected with plates of the same metal, sunk in the earth or sea on the two sides of the Atlantic), would far exceed the signal-current, and might often be as much as 20 or 30 cells would produce. There would be no difficulty in compensating their effect by steel magnets properly placed beside the galvanometer, in directions perpendicular to the plane of the mirror; or in directly balancing them with an opposing electromotive force, by means of an instrument for dividing the electromotive force of a battery into any desired number of parts, which the author constructed and applied for the purpose at Valencia. Sometimes, however, in certain terrestrial and atmospheric conditions (especially when aurora borealis is seen), the changes in the earth-currents are so rapid, that they would seem like signals, and render the reading of a message for the time difficult or impossible. By rendering the galvanometer less sensitive, which is best done by introducing steel magnets to add to the earth's directing influence, and using a proportionately more powerful sending battery, this disturbing influence is diminished, and may be rendered practically harmless, or as nearly as possible so. It is convenient in other respects also to have the needle more powerfully directed than by the earth alone; and the action will probably be found in all respects satisfactory, if about nine times the earth's horizontal force at Glasgow is applied to direct the needle (as is easily done by means of a single bar, or two or three bars, of hardened and magnetized steel, a few inches long). The oscillations of the needle will be then three times more rapid (or about 252 per minute), and a battery of 5 cells will be amply sufficient for signalling. If from 10 to 20 cells be used, there will be superabundant power for Morse signalling at the highest attainable rate, with the proper compensations introduced for inductive embarrassment which the mathematical theory has

[1] That is to say, any inanimate electro-magnetic or galvanometric relay.

[2] If, for instance, the ordinary relay cannot give more than six words a minute, messages may be perfectly recorded by a mirror galvanometer at the rate of ten words a minute. When there is still more inductive embarrassment, limiting the mechanical relay to four words or less per minute, a double speed may with ease be obtained by the new method.

[3] The rate from Newfoundland to Valencia was raised from 20 dots per minute, for which the sending mechanism was prepared, up to from 40 to 42, according to instructions telegraphed from Valencia, when the experience of the mirror galvanometer as a receiving instrument was had.

Marine Galvanometer and Resistance-testing Apparatus.

pointed out. If, as is to be hoped will soon be the case, the Red Sea cable is brought into working order, it is probable that 10 words a minute or upwards will be obtained as a regular rate of Morse signalling through one of its sections of from 500 to 700 nautical miles, by using for sending a battery of 10 Daniell's, with a key constructed to produce the theoretical compensations, and, for receiving, a mirror galvanometer, adjusted with a still much higher directive force of steel magnets, recording by "human relay" on a riband of paper to be marked by hand, without local battery, either with a Morse style or pencil (or with Siemens' ink-marking apparatus, constructed on the whole in accordance with a principle brought into use by John in Vienna, and Digney frères in Paris, which has been provided already for the Red Sea Company to be worked by relay and local battery).

The "marine galvanometer" (referred to above, VII. 6.), constructed by the writer for use on board the Agamemnon and Niagara, differs from the land mirror galvanometer only in the use of still higher directive force on the needle, and in the mode of suspension of the mirror and needle, which was, by means of a fine platinum wire, or, as has since been found better, a stout bundle of 20 or 30 silk fibres, firmly stretched between two fixed points of support. This instrument, as now constructed with some improvements, is represented in the accompanying drawings. The first shows the back of the mirror with attached needle, (a piece of thin, flat file, ground smooth,) the filament bearing it, the mountings for holding the two ends of the filament, and the bobbin of the front half of the galvanometer coil, which bears these mountings.

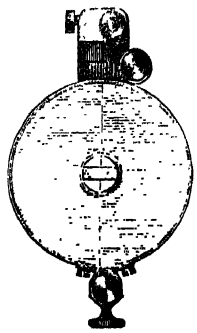


Fig. 11.

The second drawing shows a perspective view of the instrument complete, with stand and lamp, taken from a photograph. The galvanometer itself is protected by a strong plate-glass shade; in the front side of which (not seen) a slit, about $1\frac{1}{2}$ long by $\frac{1}{2}$ broad, is cut to allow the light from the lamp to enter, and to be reflected back from the mirror to the scale without loss by passing through the plate-glass. A large compound magnet of sheet-steel, bent and tempered glass hard, is seen round the galvanometer, and N marks one set of its poles: the other set, of contrary name, is diametrically opposite. By an adjusting screw, A, this magnet can be turned through a considerable angle about a vertical axis, to bring the spot of light to zero, or to any desired point of the scale. On the back of the back half of the galvanometer bobbin are seen rings and screws, forming a system of connections by which four parts of its coil may be used either singly, or connected in series, or in series of double arcs, or entirely in multiple arc. A similar set of connections, not seen in the view represented, are attached on the front, for similar arrangements of the front half of the coil. A set of connections G, on the side of the stand, allow the front and the back halves of the coil to be used either alone, or the two in series, or the two in double arc, and at any time one of these arrangements to be changed for another in a moment; also, to reverse the extreme galvanometer terminals in their connection with binding screws (not seen in the view) for attaching the outer electrodes. Some of the outer connections of a testing apparatus, to be used along with the galvanometer, are seen on a box attached to the frame between the galvanometer and the lamp. This apparatus contains 18 standard resistance coils of German silver,[1] of resistances expressed in terms of 100,000,000 British absolute units by the numbers and fractions, 1024, 512, 256, 128, 64, 32, 16, 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, $\frac{1}{64}$; also four conductors of widely different resistances, each accurately bisected (electrically), to be used any one, or in combination, one arm of one with one arm of another, to constitute part arc of a Wheatstone's balance, of which the remainder would be made up of conductor to be tested, and standards. On the remote side of the box (not seen) are connections for applying these bisected conductors in the most convenient possible manner. On the top of the box is a double spring key (not shown) for applying battery electrodes, in either direction, to proper terminals for the Wheatstone's balance when formed; and D represents another kind of double spring key for reversing instantaneously the connections between the terminals of the galvanometer coil and their proper terminals in the "balance." A set of screws on insulated studs

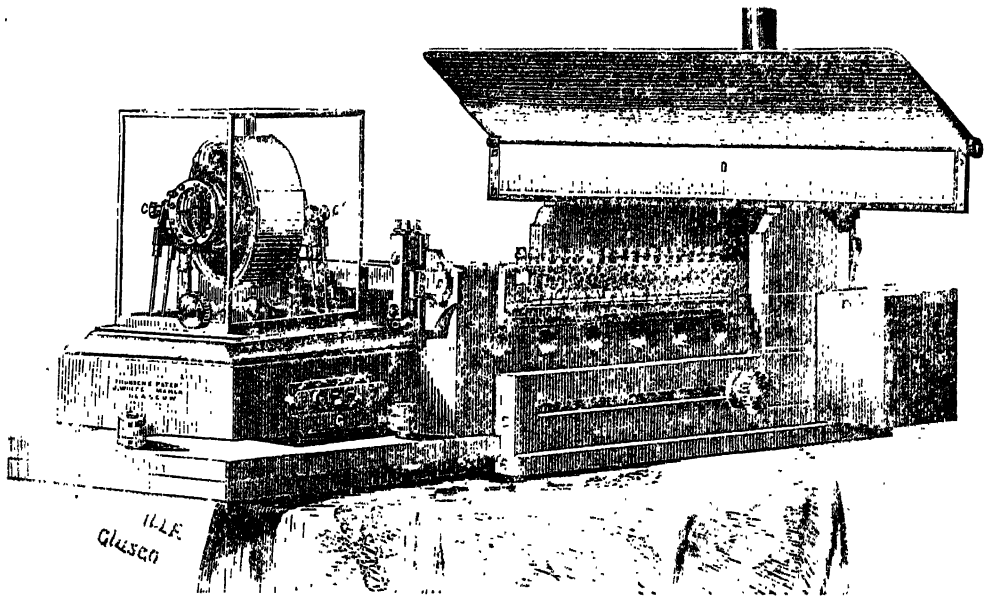


Fig. 12.

and plates, planned to connect the resistance coils in series, and to short-circuit any one or more of them, or to connect as many of them as may be desired, in multiple arc, between two main terminals, are marked F F'. The first mode

[1] Chosen because it changes less in its resistance, with changes of temperature, than any other metal yet known and available

Telegraphic Curve-Recorder.

of connection is the same as that originally reduced to practice by Mr Cromwell F. Varley, and makes up the required resistance by the addition of resistances. The second, and the combination of the two plans is entirely novel, and, by allowing *conducting powers* to be added, gives the same sensibility at the low end of the scale of resistances, that Mr Varley's does at the high end. It is essential that the graduation by 2 and the powers of 2 be followed, in the resistances, when the same set of coils is to be used in the two ways. If they were merely to be used in series, the numbers 1, 2, 3, 5, 10, 12, 13, 15, &c., preferred by Mr Varley, would be somewhat more convenient. Beyond the testing apparatus is seen the top of the lamp-glass, the scale, and the slit behind which the flame of the lamp is placed. A common flat-wicked paraffine lamp is used, with the edge of its flame towards the galvanometer. In performing accurate measurements, the slit in front of the flame is made very fine, by a screw acting on two plates of metal, so as to give a fine line of light to read from on the scale. In using the instrument for receiving telegraphic signals, the slit is made so wide as to allow the full image of the flame to fall on the scale, which will cover two or three of the $\frac{1}{10}$ *i* divisions.

In the marine galvanometer of this kind hitherto made, the adjusting magnets are so highly magnetised as to give about 200 times the Glasgow terrestrial horizontal directive power. The rapidity of the natural oscillations of the needle is so great as to show merely a spread out band of light, on the scale, when a current is suddenly made, or broken through the galvanometer coil; but dynamical principles show that it must be about $\sqrt{200}$ (or 14$\frac{1}{7}$) times what has been mentioned above as the natural rate for a similar needle under terrestrial influence at Glasgow alone; and must therefore be about 20 vibrations per second. A single cell applied to the galvanometer coil, arranged in series, gives a deflection of about 75 divisions, on a scale 18 *i* from the mirror. Care having been taken to balance the needle and mirror, so as to have the centre of gravity precisely in the line of the supporting filament, the indications of the instrument remain steady and undisturbed during the roughest usage it can be exposed to on board ship. The greatest amount of tremulous motion, in the table or support on which it is placed, does not cause vibrations in the spot of light, and the whole may be inclined to an angle of 45° in any direction, without sensibly disturbing the position of the spot of light on the scale.

By diminishing somewhat the magnetism of the adjusting magnets, the instrument may be brought to any requisite degree of sensibility suitable for receiving ordinary telegraphic signals, in the manner explained above, for which it is perfectly adapted; but for the highest degree of sensibility which has been stated, its multiple filament would be unsuitable.

The most complete possible mode of recording telegraphic signals would be to show a curve representing precisely the varying strength of the current received at every moment. An instrument executing this plan has been constructed by the writer, and found to succeed in circumstances essentially more trying to its capabilities than those of actual work through a long submarine line. In this instrument the record consists of minute perforations in a broad riband of paper, made by a very rapid succession of sparks from a Ruhmkorff's induction coil, worked by a local battery at the receiving-station. A vertical piece of platinum wire attached to a light horizontal glass index, borne by a finely but firmly suspended magnetic needle, conducts the perforating current from a vessel of water, into which its lower end dips, to the riband of paper, which is carried near its upper end in a direction perpendicular to its line of motion. This instrument will disentangle signals from inductive and other embarrassments, in cases in which even the method by mirror galvanometer and human relay fails. But it requires more power to work it, at a sufficient speed, than the mirror galvanometer. It is probable, however, that it may be improved so as to require no more than has been mentioned above as sufficient for the mirror; and, if so, it even may come to be preferred to every other method hitherto tried or proposed for receiving messages through long submarine lines.

Telegraphs using only Two Degrees of Current.

5. The first "step by step" telegraph was invented by Wheatstone in 1839, and patented by him in conjunction with Cooke, Jan. 21, 1840. Two kinds of sending instruments for working this telegraph were included in the specification; one consisting of a contact-wheel of peculiar construction, to make and break contact for a galvanic battery; the other a magneto-electric machine, with no commutator, and a wheel and pinion to carry round the coils. The wheel in each instrument was marked with the letters of the alphabet. In the galvanic instrument, contact was made, or was made and broken, every time the wheel was moved, so as to carry one letter after another to a position opposite to a fixed pointer. In the corresponding motion of the wheel of the magnetic machine, the pinion makes a half-turn, carrying the coils from one position of maximum magnetisation of their soft iron cores to the opposite. The mode of operating with either instrument was simply to turn this alphabet-wheel by hand till the particular letter to be signalled was brought opposite to a fixed pointer. The receiving instrument was so constructed and arranged as to show at the same time the same letter, by carrying it round on an alphabet-wheel, moved by the currents, and leaving it opposite to an aperture in a case inclosing the apparatus.

The annexed figure, taken from Highton's work, shows

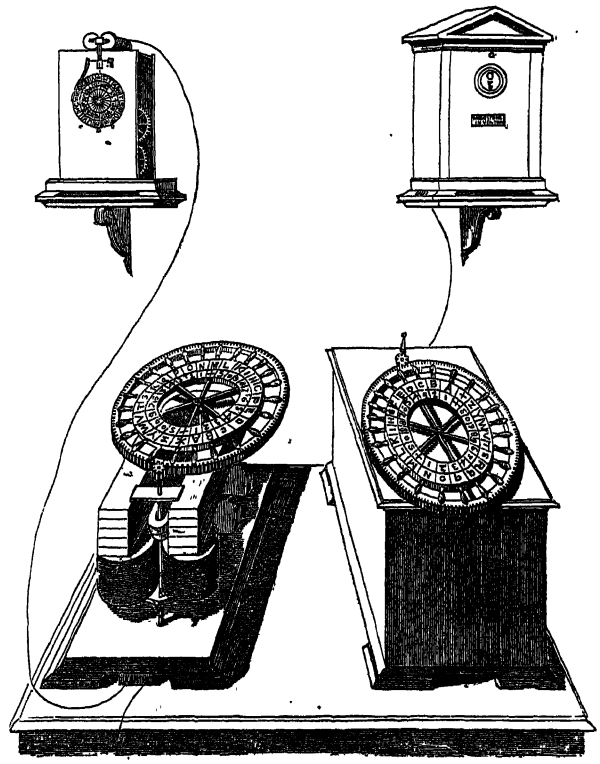


Fig. 13.

side by side two sending instruments of the magnetic kind, and two transmitting instruments connected with them respectively, one of the pairs being open to show their works, and the other enclosed in their cases as in actual use.

The general character of the receiving instrument will easily be understood by conceiving—(1) A common piece of clock-work, moved by a weight or spring as usual, but

Telegraphs using only Two Degrees of Current.

having, instead of a pendulum to regulate its escapement, a piece of iron, moved to and fro alternately by the attraction of an electro-magnet excited by the current from the telegraph line, and by the force of a spring bringing it back when the current ceases; or (2), A similar apparatus with no driving weight or main-spring, but having its motion produced as well as regulated by the force of the currents acting through the electro-magnet, and giving the reciprocating motion to the piece of soft iron.

Telegraphs of this kind, with the magneto-electric senders, were first brought into use on the Great Western Railway, where they were worked from 1841 to 1845. In 1845 Mr Wheatstone established them on the Paris and Versailles Railway, where they remained in constant use until a few years ago.

Various step-by-step telegraphs, all on the same principle, with modifications introduced by different makers, were almost exclusively employed on the continent of Europe until within the last few years, when Morse signals, recorded either by Morse's indenting style or Bain's electro-chemical method, or improvements on Steinheil's original plan of marking by ink, applied either to his own system, of positive negative and zero currents distinguished, or to the Morse system, have come to be substituted for them, except for railway purposes, for which they are still retained.

The details of this most pleasing and popular of telegraphic systems have been recently improved with admirable skill and ingenuity by its inventor. In his original instruments (to use his own words), "much remained to be done to render them capable of extensive practical application. Increased speed, greater simplicity, and portability of form, and, above all, absolute certainty of action, were required, to give them, with the advantages they possessed, decided superiority over the needle and other signal apparatus in use." By his improvements patented in 1858, he has "rendered this telegraph all that is required for practical use, combining *certainty*, *speed*, *simplicity*, *durability*, and *portability*." To avoid as far as possible more massiveness in moving parts than is required for strength, or for mechanical effects to be produced by inertia, an obvious enough principle, too often neglected by instrument-makers,

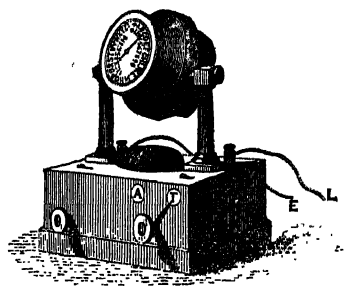


Fig. 14.

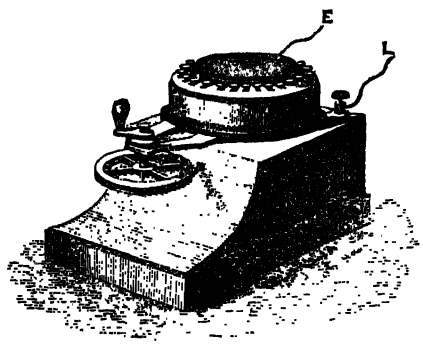


Fig. 15.

has been the chief object aimed at, so far as the mechanism of these instruments is concerned. The works of a watch or chronometer are more durable and more certain in their action than those of almost any larger machine comparable with it as to complexity, and Mr Wheatstone seems to have been impressed with this idea in designing the beautiful receiving instrument represented in the annexed figure, along with one form of "sender," adapted to work it, which, being electro-magnetic, requires no battery, and is complete as shown.

Telegraphs using only Two Degrees of Current.

For the uses for which these instruments are chiefly intended, that is to say, for short lines of telegraph, with no specially trained telegraph operators to work them, these instruments seem to be almost perfect. The facility they afford for communication between different offices, departments, or stations of government, of national defences and field operations of an army, of law-courts, and of general, commercial, and manufacturing business establishments, can scarcely be over-estimated. It is to be hoped that, at least in all matters affecting the security of the country, and the efficiency of our army, in any part of the world, they will immediately be taken advantage of to the utmost.

6. The first type-printing telegraph was patented by Wheatstone in 1841. It was described as an application of the step-by-step letter-showing telegraph in the *Companion to the Almanac for* 1843, published by the Society for the Diffusion of Useful Knowledge, Oct. 1842, in the following terms:—

"By substituting for the paper disc, on the circumference of which the letters are printed, a thin disc of brass cut from the circumference to the centre, so as to form four-and-twenty springs, on the extremities of which types or punches are placed, and adding a mechanism, the detent of which, acted on by an electro-magnet, causes a hammer to strike the punch against a cylinder, round which are rolled alternately several sheets of white paper and of the blackened paper used in the manifold writing apparatus, he has been enabled to obtain, without presenting any resistance to the type-wheel, several distinct copies printed of the message transmitted."

This telegraph was never brought into general use in Europe, but it was patented about seven years later in America, with various novel and ingenious mechanical details of execution, by Royal E. House of New York, and did the whole work of one of the three chief sets of telegraph lines of the United States for many years.

The general appearance of House's printing telegraph resembles that of a small cabinet pianoforte, with keys marked with the letters of the alphabet. The operator, in sending, commits his message to the line by touching the proper keys successively, and in an instant after his pressure on each key, the corresponding letter is printed at the same moment on two slips of paper, one running before his eyes and assuring him of the correctness of his work, and the other conveying his intelligence to be simultaneously read by the recipient at the distant station.

7. Hughes' American printing telegraph resembles House's in general appearance, and is similarly worked by means of keys corresponding to the letters of the alphabet, pressed by the operator. It is, however, essentially different from House's in the combination of electrical and mechanical arrangements by which it produces and indicates alphabetic signals. In House's telegraph the synchronous motion of two wheels—the sending contact-wheel turned by the operator, and the receiving wheel carrying the type—is produced, as in Wheatstone's printing telegraph, by the electro-magnetic escapement, worked by intermittent currents through the line, and is quite independent of any absolute uniformity of speeds or of average speeds, the time being perfectly given from one station to the other. In Hughes' the signals depend entirely on a somewhat accurate measurement of time at each station. At the sending station, battery applications are made at certain intervals of time, longer or shorter according to the letter to be signalled. At the receiving station the letter meant is discovered by measuring the duration of the interval. The

Telegraphs using only Two Degrees of Current.

principle of this mode of signalling is well known, being, in fact, the same as that on which Morse's dot and dash alphabet is founded, with only this difference, that instead of just two distinct durations, giving two distinct signals, Mr Hughes employs 28 durations[1] to give 28 distinct signals, representing the 26 letters of the alphabet and two other symbols. The mechanism by which he carries out this system of signalling is remarkably novel and ingenious. It serves—(1) To make battery applications at the sending station, with intervals between them, definitely fixed by clock-work; (2) To measure, to a sufficient approximation by corresponding clock-work at the receiving station, the intervals of time between these successive battery applications; (3) To record the measurement by a Roman type, printed on a slip of paper; and (4) To *set the clock* at the receiving station to agree with the other at the sending station, in the instant of completing the record of each measurement. One piece of clock-work for each station, serving for both the transmitting and the receiving apparatus, which are put together in one instrument, gives a rapid motion (amounting in some of the instruments to two turns per second) to a "type-wheel" moving round a horizontal shaft, and a *transmitting arm* carried round in the same period by a vertical shaft, geared to the former by bevelled wheels. This motion is regulated very accurately by an escapement and spring, as in a watch or chronometer, but vibrating at an unusually high degree of rapidity, 56 times to each revolution of the type-wheel. The annexed

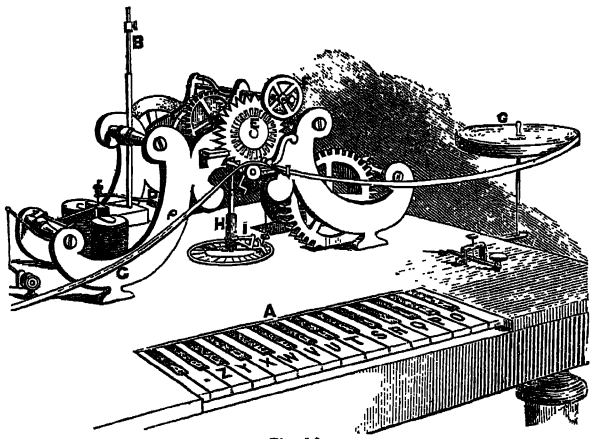


Fig. 16.

drawing will convey an idea of the general appearance of the instrument.

The "type-wheel" is so called from carrying, rigidly connected with it, the types of the different letters and signs to be singly signalled—28 in number. The paper which receives the message is brought up by mechanism started at the right instant by the signal current, so as to strike the type of the letter intended, and receive its impression as it passes. If the type is not quite exactly in the correct position, it is placed so by the mechanism for carrying the paper which, in the very act of becoming temporarily *geared* with the type-wheel, adjusts it, by making it slide round on its shaft (with which it is held in connection, not rigidly, but only by friction) until the teeth of the one piece fit perfectly into the hollows of the other. By this beautiful contrivance every error decidedly less than half the space from letter to letter is perfectly corrected each time an impression is made. Thus, during the use of the instrument to receive at one station, its type-wheel is kept in perfect agreement with the sending-wheel at the other station; and a wrong letter cannot, if the electric action keeps time, be printed unless the rate of the clock-work is at fault by some such amount as one or two per cent., which need never be the case. If the two wheels are allowed to run a long time without the electric maintenance of agreement, they will be found more or less at variance, as the pieces of clock-work, however good, cannot be *perfect*. All that is necessary to bring them into agreement is, to strike several times the key corresponding to a pre-arranged *adjustment signal*—that corresponding to the *dot type*, for instance. The receiver knows (according to the regulated system of working) that it is *adjustment*, not *message*, that is being sent; and he turns his type-wheel by hand till it prints dots. He then signals back "O. K." (the American telegraphic signal for "All correct!") and is ready to receive the message. If by any accident his type-wheel gets on a wrong letter in the course of a message, he disturbs the sender (who all the time sees the effect of his sending printed before his own eyes) by sending back a few currents on him; he receives dots by way of acknowledgment, and resets his type-wheel to print dots correctly, and, therefore, also correctly all that follows.

Atlantic Telegraph.

This system of telegraphic printing has a great advantage over the step-by-step system, in using continuous instead of intermittent currents, and so avoiding the necessity for the rapidly acting electric escapement, which, however skilfully planned and executed, is always liable to failure when worked too rapidly. Mr Hughes' instrument, in the purely chronometric system, on which it depends, takes advantage of a kind of mechanism in which accuracy and certainty have been attained to a degree which, for their present application, may be regarded as perfection; and in actual practice it appears to have proved a very decided superiority over all previous type-printing telegraphs, not only as to speed and accuracy, but in less liability to mechanical derangement by wear and tear, or by accident. Although brought out little more than two years ago, it is already in very extensive use in America, where the advantages of telegraphs delivering their messages printed in Roman type, on paper ready to be put into the hands of the parties to whom they are addressed, have been more thought of than hitherto in Europe.

Mr Hughes' beautiful instrument involves many novel features and excellent inventions in each department—the receiving electro-magnet of peculiar construction and remarkable efficiency; the transmitting apparatus, with its contrivance to prevent unintentional repetitions of a letter through the operator holding his finger too long on a key; the printing apparatus, with the "corrector" alluded to above; the type-wheel lock for each station, to be opened by its own key, one of the letter keys of any of the instruments in the circuit. Of all of these the details are most interesting, and we regret to be obliged, by want of space, to leave them undescribed.

IX. ATLANTIC TELEGRAPH.

When a great experiment is made, the materials employed are generally lost, and knowledge is too often the only form of power acquired as the result. In the year 1857, as much iron as would make a cube of 20 feet side, was drawn into wire long enough to extend from the earth to the moon, and bind several times round each globe. This wire was made into 126 lengths of 2500 miles, and spun into 18 strands of 7 wires each. A single strand of 7 copper wires of the same length, weighing in all 110 grains per foot, was three times coated with gutta-percha, to an entire outer thickness of ·4 of an inch; and this was "served" outside with 240 tons of tarred yarn, and then laid over with the

[1] Hence Mr Hughes' instrument, although capable of working at an extremely high speed through lines in which inductive embarrassment is not felt, cannot possibly be adapted to give rapid signalling through a long submarine line.

Atlantic Telegraph.

18 strands of iron wire in long contiguous spirals, and passed through a bath of melted pitch. In August of that year, about $\frac{1}{8}$th of the entire length of this compound rope was laid from the Irish shore westwards, and lost by a breakage at the stern of the Niagara. The remainder was conveyed in the two ships to Devonport, and stored for the winter in Keyham dockyard. A length of 55 miles of the portion which had been lost was lifted in tolerably good condition a few months later. During the ensuing winter and spring, about 900 miles more of similar cable were manufactured; and in the months of April and May 1858, the whole length of 3000 British statute miles was shipped on board H.M.S. Agamemnon and the U.S. steam frigate Niagara. After an experimental cruise in the Bay of Biscay, to test the appliances for laying the cable by actual trials in water 2500 fathoms deep, and some slight alteration of the machinery made in consequence on returning to Plymouth, the two ships, accompanied by H.M.S. Valorous and Gorgon, paddle-steamers—the former tender to the Agamemnon, the latter to the Niagara—set out for the middle of the Atlantic on the 10th June. After three unsuccessful, but not discouraging attempts, in which between 400 and 500 statute miles of cable were lost, the ships returned from the different points they had reached, to rendezvous in Queenstown harbour, where, on the arrival of the Agamemnon on the 12th July, the whole squadron were again together, and remained long enough to take in coal and make other requisite preparations for a final attempt. On the 17th July they again put to sea westwards. On the 29th they met at the mid-ocean rendezvous, joined the ends of the cable between the two ships bearing it, and commenced laying it in 2400 fathoms water, the Niagara continuing westwards, and the Agamemnon returning to the east. This time no accident stopped the continuous paying out; and on the 5th of August the two ships cut the cable, and left the ends on shore on the two sides of the Atlantic. The possibility of laying an electric cable across 2000 miles of ocean, in depths of from 1800 to 2500 fathoms—seriously doubted by nearly all practical engineers, and considered a perfectly chimerical project by some of the most eminent—was thus triumphantly demonstrated. The risk of failure in future attempts was brought almost within the limits of a common "sea risk;" the weather having been by no means favourable, especially on the Agamemnon's side, where, during three days of the six, strong breezes from several quarters were experienced, and at one time a fresh gale of head-wind. The telegraphic operations performed between Valencia and Trinity Bay during the remainder of the month of August will render the year 1858 ever memorable in the history of the world. The world's news was read on the same day in the capitals of Europe and America. Question and answer passed freely, and friendly conversation was held, between the operators on the two sides of the Atlantic. The Queen of England and the President of the United States interchanged congratulatory messages, and assurances of mutual good-will on the part of the two great nations under their authority. One short message saved thousands of pounds of money, and an inestimable amount of anxiety, by giving timely notice of an accident, which disabled one of the Transatlantic steamers off the American coast, bound for England. Another—nearly the last utterance of the failing cable—countermanded two British regiments under orders to embark, and prevented them from leaving the American colonies on a bootless voyage across the Atlantic. The last words of the Atlantic telegraph were read at Valencia on the 20th October 1858—"two hundred and forty t–k (? two).———————— Daniell's now in circuit." The full message—as was afterwards learned in the old, and, alas! at this moment, the only way of receiving intelligence from the other side of the Atlantic—was "two hundred and forty trays[1] and seventy-two liquid Daniell's now in circuit." This prodigious power, one thousand times as much as would have given perfect signals to the mirror galvanometer in use as receiving instrument at Valencia through the same cable, if ordinarily well insulated, proved insufficient for continuing telegraphic work, and it became certain that only mending the insulation in one or more faulty places could restore communication. Before the process of laying was complete, indications of very defective insulation had been given by the readings of the "marine galvanometer" recorded on board each ship. After the ends were landed, the insulation became farther deteriorated; every attempt to establish communication by means of the regular telegraphic instruments prepared for the use of the company proved a failure; and it was only by the introduction of the mirror receiving instrument on each side of the Atlantic that an interchange of intelligence was effected.

Atlantic Telegraph.

As soon as messages began to come from Newfoundland, they were read with very great ease at Valencia on the new system. At Newfoundland, on the other hand, three days passed, during which messages, continually being sent from Valencia, were not read or even recognised to be signals at all; and it was only by the occasional introduction of the mirror instrument into circuit, in accordance with instructions given at Devonport to special operators sent out in charge of it, that the first words were read on the other side of the Atlantic. A "detector," or common telegraph galvanometer, of a kind then much used by British practical electricians, was next tried, and it was found possible to read by it, although with great difficulty (the signal deflections scarcely amounting to half a degree), and only at an excessively slow rate (half a word per minute or less); but when, as was often the case, these attempts failed altogether, the mirror was had recourse to, to see whether any message was coming or not. Matters were conducted in this unsatisfactory way at the Newfoundland station for about a week after the first words had been read, until the mirror was permanently introduced into circuit and regularly used as receiving instrument, in accordance with an order transmitted through the cable from Valencia on the 21st of August. From that time forward the messages were read with about equal ease at the two ends; but the days of the first Atlantic Telegraph were numbered. On the 1st of September it conveyed the two military messages. On the following day it conveyed one congratulatory message for a public meeting in New York, addressed to Mr Cyrus Field, to whose untiring energy it in a great measure owed its existence; and it failed to convey a second similar message on the same day. From that time till its death-struggle, on the 20th of October, it was silent.

And now that splendid combination of matter lies on the bottom of the Atlantic, its Newfoundland end irrecoverably lost. A few miles of it—possibly 200 miles—may be lifted from Valencia, and used for some minor telegraphic work, perhaps cut up into target telegraphs; but its value can scarcely, if at all, exceed the expense of lifting it. L.375,000 have been spent in the great work; and the world, if not the sub-

[1] A form of battery introduced by the writer of this article for nautical and land telegraphic use, which has the good electric qualities of the Daniell's, without the disadvantages inseparable from the use of porous cells. It consisted of copper trays, each strewn with crystals of sulphate of copper covering its bottom, and filled with sawdust moistened with sulphuric acid and water, on the top of which an amalgamated zinc plate was laid. These trays, thus charged, were piled one with its outside copper bottom on the top of the zinc of another, in columns of from five to twenty, after the fashion of an old voltaic pile. The writer has since made many trials of different forms, and has been led to plan, with the assistance of Mr F. Jenkin, an improved "Sawdust Daniell's," from the use of which, in various applications, he anticipates much advantage.

Remarks on Telegraphic Systems and Alphabets.

scribers, will reap the profit, when Europe and America become united by a cable that will not fail.

X.—GENERAL REMARKS ON ELECTRO-TELEGRAPHIC SYSTEMS AND ALPHABETS.

Reverting to the general view of the telegraphic art with which we commenced this paper—the art of interchanging ideas between two intelligent beings by means of inanimate matter occupying space between them,—we see that in all its departments we have to deal solely with symbols and with combinations of symbols.

The physical science on which any branch of the art is founded is occupied with the dynamical action in the matter, by which the indications of these symbols are conveyed from one being to the other. The purely mathematical science of combinations constitutes the foundation of that large part of the telegraphic art in which distinct successions of signals are arranged for expressing the inconceivably great although finite number of ideas which can be communicated on any finite system, and which is in fact the art of language. The marvellous and varied development which this art has received among all races of men from the beginning of the world, presents an extremely simple and uniform problem for the special telegraphist—to produce in arbitrary succession a certain very limited number of symbols, twenty-six or thereabouts, for the letters of the alphabet, and a few others which it is convenient although not necessary to include.

The various electro-telegraphic methods to which we have referred, contain remarkably varied solutions of this problem. In the first and in the last which we have mentioned, each letter is indicated by one physical element, measured out at the sending station to indicate the letter to be conveyed, and tested by measurement at the receiving station to discover what letter was meant. In the first method, the strength of an electric current is the indicating element; in the last, it is an interval of time. Thus, in the first we have an alphabet of strengths—

$$1, 2, 3.....26; \text{ or,}$$
$$-13, -12, -2, -1, +1, +2, ...+12+13.$$

The measuring out at the one end, and the testing by measurement at the other, have been shown by the writer to be practicable with ease and certainty. It is obvious that no other method can give the same speed. The variable insulation of air-lines and of imperfect submarine lines constitutes the sole objection to its universal application; the "earth currents," which it had been supposed by some would prevent its success, having been found by the writer to exercise, in the Atlantic at all events, no influence which cannot be perfectly and easily compensated or allowed for, except on rare occasions of unusual disturbance.

In the last method, the basis of Hughes' printing telegraph, we have an alphabet of simple durations—

$$1, 2, 3,.....26;$$

where the unit is an interval of time, a small fraction of a second, when rapid working is required.

In all the other methods, the letters of the alphabet are compounded of successions of simpler signals. Thus, in the Steinheil system (the old single needle, the Highton, and the most recent recording system of Wheatstone's, all included), we have the + signal, and the − signal, and we have pauses of shortest duration (between the signals composing a letter); pauses of medium duration, to distinguish the succession of signals constituting one letter from the succession constituting the next; and, though not essential, pauses of still longer duration to mark the ends of words. This system, therefore, involves essentially strengths and durations in its elementary signals.

The Wheatstone step-by-step telegraph, including its applications by the French to mimic semaphore forms, and by its inventor and the Americans to printing, is a telegraph of simple durations, as is also the Morse system in all its varieties.

Thus all the systems of Class II., according to our previous division, are founded on purely chronometric signals, while the practical systems of Class I. involve a chronometric along with a galvanometric principle. It comes to be a question of high interest, and possibly of practical importance, *Can a purely galvanometric system be founded on the data of Class I.*—that is to say, *on means of producing, and of distinguishing when produced, three different degrees of current?* The answer to this question will be obvious as soon as its meaning is perfectly understood, but this cannot be until the true nature of a perfectly elementary signal, as defined above, is examined for the particular modes of working available. If we work by induction coils, the "change" constituting a signal is from the natural zero, or galvanic or earth current in the line, to what can be produced and tested as having been produced, by either a positive or a negative electro-magnetic impulse. Thus we have just two simple signals; and it is perfectly felt, by the receiver as well as the sender, that the *rise and fall* of current consequent on each impulse is in truth just one signal, and to be reckoned as *one change* constituting the whole effect of *one operation.* Hence very obviously *two simple signals* constitute the purely electric elements of the positive and negative electro-magnetic signals, which we may denote, for facility of reference, by the symbols α, β. If, on the other hand, we use a galvanic battery, worked by a key with three positions, or by the double key sketched above (VII. 4), a signal made in the usual manner (by means of the double key, for instance, by pressing down either spring, holding it for a short time, and then releasing it) is essentially a double signal, consisting of two operations following one another, with an arbitrary interval of time between them. A truly simple signal on this system is produced by a change of the finger from not touching the key to pressing either spring, or from one spring to the other, or to neither. Now, whatever be the position of the finger at any instant, there are only two ways in which it can be changed, and therefore, in reality, there are just two arbitrary distinct signals available; and the same holds clearly for any mode of producing and repeating successively, in any order, three different strengths of current. Thus, let the three strengths (which may be respectively negative, zero, and positive) be indicated by the numbers 1, 2, 3. Then the two distinct signals will be—

Signal α.	Signal β.
From 1 to 2;	From 1 to 3;
or „ 2 to 3;	or „ 2 to 1;
or „ 3 to 1.	or „ 3 to 2.

The question we put will be now answered in the affirmative if we can make a sufficient alphabet out of two distinct signals, without pauses of time to mark the separate successions. This may clearly be done in two ways—

1. We may retain one of them to indicate a division, and use repetitions of the other to indicate letters. The alphabet on this principle would stand as follows:—

E	$\alpha\beta$
T	$\alpha\alpha\beta$
I	$\alpha\alpha\alpha\beta$

and so on, the shortest compound symbols being chosen for the most frequent letters. This alphabet, worked by electro-magnetic impulses, would differ from the signal foundation of the step-by-step system only in substituting a negative for a pause of time to mark the beginning of a new letter. It would have scarcely an appreciable advan-

Atmospheric and Terrestrial Electricity.

tage in point of speed. When worked by battery it presents a peculiar kind of signalling, not likely to be practically useful.

2. We may use the two signals symmetrically, and represent each letter of the alphabet by the same number of them, so that the reader will find the divisions between the successions representing single letters by getting a correct beginning, and telling off in order by the number in one letter. For instance, if we take twos, we can make $\alpha\alpha$, $\alpha\beta$, $\beta\alpha$, $\beta\beta$, or an alphabet of four letters; of threes we can make $\alpha\alpha\alpha$, $\alpha\alpha\beta$, $\alpha\beta\alpha$, $\alpha\beta\beta$, $\beta\alpha\alpha$, $\beta\alpha\beta$, $\beta\beta\alpha$, $\beta\beta\beta$, or eight letters. Similarly, by fours, we can make sixteen letters, still too few. But by using successions of fives we can produce thirty-two different signs, or a full alphabet of twenty-six letters and six other signs. This alphabet, worked by battery, would give a somewhat greater rapidity of word-signalling than is obtainable with the same instruments by Highton's alphabet, the best on the Steinheil system hitherto published, provided the operator could work up to a speed limited by the capabilities of the instruments or by the electric action in the line. But with properly constructed instruments for working by hand and reading by eye or ear through any length of land telegraph hitherto used in one circuit, or through any submarine cable of less than 150 or 200 miles, it is mental and bodily "inertia" in the operator—not mechanical or electric embarrassment in the dead matter of the telegraph—that limits the speed of working; and therefore the question between the relative advantages of Steinheil's system and the system we now propose becomes entirely physiological. The former is known to be good—well adapted for rapid sending by hand, and easy and correct reading by eye or ear: the latter would probably be inconvenient and difficult, unless worked mechanically, and could not, even if perfectly realised, give any great increase of speed. We therefore do not now propose it as a useful electro-telegraphic system for air or short submarine lines; but we call attention to it as a solution of the interesting problem, *to telegraph by transitions from one to another of three phenomena, without distinguishing durations of time.*

It is probable that it will be found *most useful* for signalling by night at sea; and we believe that by it, with only two lamps and no mechanism, messages can be communicated with much certainty at the rate of one word a minute, or faster, as far as the lamps can be seen.

XI. ATMOSPHERIC AND TERRESTRIAL ELECTRICITY.

The earth is a conductor, surrounded by air, which is one of the best of insulators when not tried by too strong electromotive force. The earth is, on the whole, negatively electrified: different strata, or portions of the air, are electrified, some negatively and some positively, which, as carried about by the wind, and changed in shape by ascending and descending aerial currents, keep always, even in the most serene weather, inducing great changes in the electrification of the earth's surface at any locality. Falls of rain, hail, and snow are nearly always accompanied by strong and variable developments of atmospheric electricity, which produce inductively, and probably also by convection, in the course of a shower, rapid changes of degree, and most frequently also transitions from negative to positive and back, in the electrification of the earth's surface in the neighbourhood. When electromotive force becomes so intense in any part of the air as to break down its insulating power, a discharge (lightning) takes place, either between electrified masses of air and the earth, or between two masses of oppositely electrified air, and produces instantaneous change in the superficial electricity of the earth. All these changes, gradual or sudden, in the deposits of electricity on the surface, require currents through the interior, to fulfil the actual conditions of tendency to equilibrium. The whole quantity of electricity thus flowing through the earth at any time cannot, in general, so far as the writer can judge, be sufficient to produce any sensible current in a submarine wire, or a *perfectly insulated* air-wire, connecting two metal plates buried in different localities.[1] On the other hand, actual telegraph wires stretched high in the air, from pole to pole, have their aerial insulation constantly broken, either by disruptive discharges ("electric brushes," or "St Elmo's fire"), or by convection of watery or other particles flying away from contact with them. They therefore keep constantly "collecting" atmospheric electricity like Beccaria's "exploring wire," and sending it down (as by his "deferent wire") into the telegraph stations, and through the coils of the receiving-instruments to the earth, producing currents almost always sensible to a delicate galvanometer, not unfrequently strong enough to interfere with signalling, and, during thunder-storms, sometimes melting the wires and destroying the instruments. Want of space prevents us from describing means which have been adopted for guarding against such accidents.

Atmospheric and Terrestrial Electricity.

Electricity is never found quiescent except for an instant at a time, in an insulated wire connecting two copper plates buried in the earth, or sunk in the sea, at any considerable distance asunder. A galvanometer, if placed in any part of the line of conduction, always indicates a current in one direction or the other, except at instants of transition through zero. The strength of this current is always varying,—in general, gradually from minute to minute: on some extremely rare occasions it changes so abruptly as to throw the galvanometer needle into vibration. A day seldom if ever passes without the direction of the current changing several times; but no relation has yet been discovered between the times of such changes and either solar or lunar hours. These "earth currents," as they are called, have been observed in all submarine cables, but as yet they have been only very imperfectly studied.

In the failure of the Atlantic cable in September 1858, the portion terminating at Valencia came to give nearly the same indications as an insulated conductor about 270 miles long, laid out westward, and connected with a copper plate sunk at a little 'ess than that distance in the Atlantic. In these circumstances, the writer found that from one to nine or ten twentieths of the electromotive force of two Daniell's elements was generally sufficient to balance the earth-current; not unfrequently 14 or 15 were required; sometimes, although very rarely, 20, or the full electromotive force of two elements, was insufficient; and once or twice, in the course of the month of September, earth-currents were received so strong that five or six Daniell's elements would have been required to balance them.

Earth-currents are certainly related to the irregular variations of terrestrial magnetism, since they are always found unusually strong during brilliant displays of aurora borealis; for it has long been known that, on these occasions, the magnetic disturbances are unusually strong. Being related to the variations of terrestrial magnetism, it is probable that the earth-currents also will be found to have daily periods; but, in the meantime, we only know that, while the diurnal variation in terrestrial magnetism is observable in general every day, and is only on rare occasions overborne by irregular disturbances, the earth-currents vary each day from hour to hour, like the wind, under some overpowering non-periodic influence, and can only show daily periodicity in residual averages derived from lengthened series of observations. It is probable that careful synchronous observations of aurora, earth-currents, and variations of terrestrial magnetism, will lead to a discovery of the primary influence, whether in the earth, or terrestrial atmosphere, or surrounding interplanetary air, which causes these phenomena. (W. T.)

[1] He observed, however, on the night of 23d–24th August 1858, most violent deflections of the mirror at Valencia during a thunderstorm at Trinity Bay, when each end of the cable was kept to earth. A not very bright aurora was seen at the same time at Valencia.

TELESCOPE.

Telescope.

(1.) THE Telescope, as its name imports, is an instrument for rendering distant objects more clearly visible, which it does by enlarging their apparent angular dimensions, and by introducing into the eye a quantity of the light emanating from them, superior to that which it naturally receives from them.

(2.) The early history of this admirable invention is given in detail in the article on OPTICS, in another part of this work. The limits allowed us in this article will not permit us to recapitulate it, and we have no comment to make on its exactness. We shall only remark that it seems scarcely possible to read the passages in the works of Roger Bacon, Dee, and Thomas Digges, which bear upon this subject, without feeling satisfied that there must have existed some real, practical, experimental ground for their distinct and reiterated assertion of the increased visibility and magnified appearance of distant objects, produced by some combination, of whatever nature, of reflecting or refracting surfaces, prior to the not improbably alleged independent invention of the refracting telescope in Holland.

General notions.

(3.) When a convex lens or concave mirror is placed before a luminous object (by which we understand any object, whether luminous *per se*, or illuminated by exterior light), a picture or image of it is formed at a certain distance behind or before the refracting or reflecting surface, determined by the distance of the object from it; whose magnitude is greater or less, according as it is formed farther from or nearer to the surface. This picture is distinct only at one particular distance from the surface, which is called the focal distance; and the place where it is formed, the focus. At every other distance it is hazy and confused. It may be received on a screen of white paper, and viewed on the same side on which it is formed, by an eye anyhow placed within sight of the paper; and either by one or by any number of persons at once; and examined more closely, if needed, by a magnifier. Or it may be formed on a screen of roughened glass, and viewed, in a similar manner, from the hinder side of the screen. In either case, however, we have here, not a telescope, but a *camera obscura*. Or the image may be fixed photographically, and thus, becoming a real object, may be preserved and subsequently scrutinized at leisure with a microscope. In both methods of procedure it may be very possible to perceive details and minutiæ in the picture, which the unaided eye was not competent to discern in the real object. In the telescope, however, no picture is actually produced elsewhere than on the retina of the eye itself; which is so placed as to receive the rays uninterrupted by the screen: the office of the telescope being only to prepare them for forming on the retina a picture larger and clearer than would be formed without its help.

(4.) How this preparation is effected the reader will find described at length in that part of the article on OPTICS already referred to, which treats of reflections and refractions on spherical and other surfaces; of the formation of images; and of the conditions of their visibility, either by the naked eye, or through convex or concave lenses. To that article, also, we shall refer for most of the data we shall require in the treatment of this special branch of the general subject—the indices of refraction and dispersion of the various kinds of glass or other media used in the construction of telescopes; the reflective powers of different metallic substances; and a variety of other matters which it would lead us too far from our special object to explain *ab initio*. To the article, also, on the ACHROMATIC TELESCOPE, we may refer for the history of that instrument, and for a general *apperçu* of the principles of its construction, which may be read as a preparation for what we shall have to say upon it.

Telescope.

(5.) We see distinctly any point of an object when the rays which it sends to every part of the surface of the eye are sensibly parallel; or, at least, form so small an angle with each other as to be uniteable on one point of the retina, by the adjusting power of the eye. Assuming, then, that the normal eye does this without fatigue in the case of parallel rays, the first condition which a telescope must fulfil is—that it shall dispose all the rays emanating from any single indivisible point in the object, so as to emerge from the instrument parallel to each other, in the usual or medium situation of the mechanism; the next, that the mechanism itself shall be adjustable, so as, by a small movement of its parts *inter se*, to convert this parallelism into a slight divergence or convergence, to suit the eyes of near or long sighted persons. In the former case, the telescope is said to be *in focus*, or adjusted for parallel rays; in the latter, to have its focus adjusted for near or long sight.

(6.) The next condition on which the use of a telescope in viewing objects depends, is, that the several pencils of parallel rays which it sends into the eye from *different* points of the object, should be inclined to each other at angles, differing in some certain ratio from those actually subtended at the eye, by the respective intervals between the points themselves. If the former be greater than the latter, the object will appear magnified when seen through the telescope; if less, diminished. The number expressing this ratio is the measure of the *magnifying power* of the telescope. The apparent linear dimensions of an object seen with a telescope being in proportion to its magnifying power (n), the apparent enlargement of its superficial area will be as the square (n^2) of the magnifying power (it being of course understood that when n is a fraction less than 1, the term *magnifying* must be replaced, in common parlance, by *diminishing*), and that of the apparent solid dimensions as the cube (n^3). Thus, a magnifying power of 100 gives an apparent enlargement of surface to 10,000, and of bulk to 1,000,000 times that seen or judged of by the naked eye. In speaking of magnifying power, the apparent *linear* enlargement is always understood.

The simple refracting telescope.

(7.) *Of the simple refracting telescope.*—The simplest construction of a telescope is that in which the images, formed in the focus of a convex lens or *object-glass*, is viewed by an eye placed behind it (or in the direction of the rays after passing through it), by the intervention of a second lens or *eye-glass*, so placed as to have the image in the place of *its* focus for parallel rays incident in the contrary direction, and its axis coincident with that of the other. For, in such a combination, the rays converging to the focus of the object-lens will, after passing through the eye-lens, emerge parallel, and therefore in a condition for distinct normal vision. This parallelism will be slightly deranged, and converted into a slight divergence or convergence, by shifting the place of the eye-lens somewhat to or fro along the common axis of the two lenses; which is accordingly the means by which adjustment to near or long sight is effected, the eye-lens being fitted into a sliding tube for that purpose. And this mode of adjustment is common to every form of telescope.

The Galilean telescope.

(8.) In applying this principle, two cases arise, so practically dissimilar as to afford telescopes of very different characters. The one is that originally made by Galileo and the Dutch artists, and thence called the Galilean or Dutch telescope; and which, from its property of showing

objects erect, or in their natural position, was for a long time the only one in use, until superseded, at the suggestion of Kepler, for astronomical purposes, by the other, or "astronomical telescope," in which they appear inverted. In the Galilean construction, the eye-lens is concave, and is placed at a distance from the object-glass, equal to the difference of their focal lengths, as in fig. 1, in which

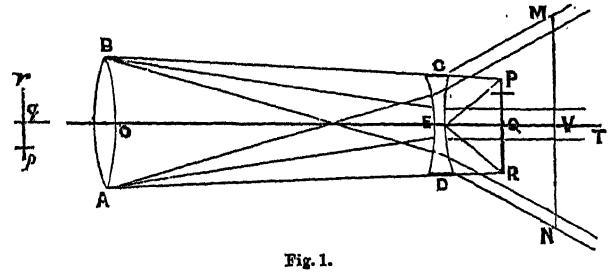


Fig. 1.

OEQ is the common axis, and Q the common focus of the object-glass Q, and the eye-glass E. Were the rays proceeding from the several points of a distant object, pqr, after being respectively converged by O to their several foci, P, Q, R, received on a screen at Q, they would depict on it an inverted image PQR; but, being intercepted by E, they are refracted, as in the figure, the several pencils converging to form P, Q, R, respectively, being converted into pencils severally parallel to EP, EQ, ER, which being received by an eye behind E, large enough to take them all in, will be collected on corresponding points of its retina. And it is evident that the image of the *lower* extremity (p) of the object, being seen by rays entering the eye in the direction EP, will appear as if situated in the direction PES, which, prolonged out into space, falls below the axis QEO, in which direction q, the middle point of the object, is seen; and *vice versâ* for the upper part, r. The object, then, will appear through the telescope in the same position as without it, or erect. But 2*dly*, it will appear magnified. For the rays by which its extreme points, p, r, are seen, being parallel respectively to EP and ER, include the angle PER, which is greater than POR or pOr, or that subtended at O by the object itself, in the ratio (when the angles are very small, as they always are in telescopes) of the focal lengths (OQ and EQ) of the object and the eye-glass. Representing then by (F and f) these respective focal lengths, the magnifying power of the telescope will be expressed by $\frac{F}{f}$.

(9.) The practical defect of this construction is the smallness of the "field of view" of the telescope, or the small angular extent of the visual area which can be brought at once under inspection. For it is evident that, let the object be of whatsoever extent, the portion (pr) of it which can be seen at once is determined by the extent of the image (PR) which can be seen, and which, itself, is determined by joining the *corresponding* extremities (BC, AD) of the apertures of the object-glass and eye-glass, the course of the extreme rays after refraction being (CM and DN) parallel to EP and ER, and therefore divergent. To receive them, therefore, the eye must be brought close up to the eye-glass, CD, and its pupil must cover the full area of that glass, which is therefore limited in area—*or at least its effective portion is so limited*—by the natural size of the pupil, or about a quarter of an inch. And if the eye be withdrawn, ever so little, from the lens, the field is diminished, some portion of the divergent cone (CN, DN) escaping and falling outside of the pupil.

(10.) To calculate the field of view in a telescope of this construction, call A and α the apertures of the object-glass and of the pupil of the eye, to which CD is supposed equal (the eye-lens in telescopes of this construction being, however, always made so large as to allow a wide margin all round the opening of the pupil); and F, f, being the focal lengths of O and E, it will be readily seen, by considering the construction of the figure, that we shall have for the measure of the visual angle, POR (or its tangent $\frac{PR}{OQ}$) which will be expressed by $\frac{\alpha F - Af}{F(F-f)}$ which is necessarily less than $\frac{\alpha}{F-f}$ or than the angle which the pupil of the eye subtends at the object-glass.

(11.) In the astronomical telescope the eye-glass is convex, and is placed at a distance from the object-glass, equal to the sum of their focal lengths, as in fig. 2, which repre-

The astronomical refracting telescope.

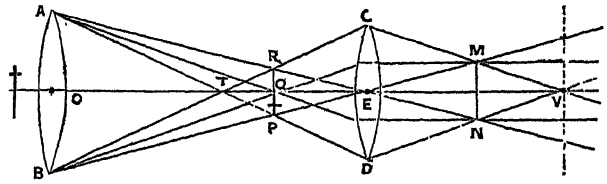


Fig. 2.

sents the course of the rays entering the eye, after forming an image (PQR) on the distant object (pqr), in the air between them. The rays from p being converged by the object-glass O to P, a point distant from the eye-glass by its focal length, will, after refraction, emerge parallel to PE, joining P and E the centre of the latter, and forming a pencil, of which DV is the extreme lowermost ray, and fit for distinct vision to an eye placed at V, or at any point nearer to the lens, so as to receive the whole of the cone, CVD; as at MN, which represents the aperture of the pupil, whose distance from E, when the aperture (α) of the eye-glass is larger than that of the pupil, is expressed by $\left(1-\frac{\alpha}{a}\right) \times (F+f)\,\frac{aF}{aF-Af}$, A, α, F, and f representing the same things as in the former construction. The field of view, then, in this telescope, is determined, not by the aperture of the pupil, but by the magnitude of the image (PR) intercepted between the lines AB, CD, whose angular measure, as seen from O, is given by the expression $\frac{PR}{OQ} = \frac{aF-Af}{F(F+f}$. Moreover, since the image of a point, p, *above* the axis is seen in the direction DV or EPS, which, prolonged into space, falls *below* it, objects seen with a telescope of this construction appear inverted, and magnified in the ratio of the angle REP : ROP giving the same expression $\frac{F}{f}$ for the magnifying power as in the Galilean construction. With the same magnifying power, then, the astronomical telescope is longer than the Galilean by twice the focal length of the eye-glass.

(12.) From the explanations above given, it will be evident that, in either construction, the object and eye glasses are similarly related to the image which occupies their common focus, and are therefore convertible, so that the telescope may be used to view objects, either end foremost —the only difference being that, when so inverted, it diminishes, instead of magnifying objects; and instead of bringing them apparently nearer, seems to throw them to a greater distance—the distance in either case being judged of by the apparent magnitude. This property is not without its use in certain optical experiments where it is desirable to obtain a sunbeam of less angular divergence than the apparent diameter of the sun itself.

(13.) The earlier Galilean telescopes magnified but little, the utmost power obtained by Galileo himself, "with great trouble and expense," not exceeding 33 times. The difficulty of finding and keeping an object in view with a very small field of vision opposed a great obstacle to pro-

Telescope.

gress in this direction, which was much less felt in the other construction. This, accordingly, very generally and early superseded the Galilean construction, which is now retained only for opera-glasses, and for that other little pocket telescope, formed of a single piece of glass, of a conical form, having a polished convex spherical surface in front, and a concave one next the eye; and roughened and blackened over the rest of its surface (to destroy extraneous light), as in fig. 3; which realizes the notion of Descartes (*Dioptrica*, p. 105) of the mode of action of a telescope, regarded as a prolongation and enlargement of the eye itself, by the substitution of an artificial cornea for the natural one, more remote from the retina, so as to form there a larger image.

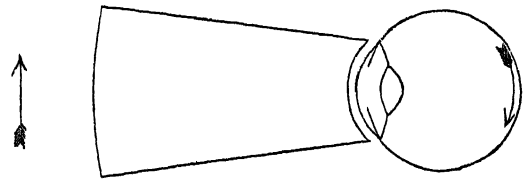


Fig. 3.

(14.) The advantage, as regards the field of view, which the astronomical form of construction possesses over the Galilean, was found to be partly neutralized in practice by an inconvenience of another kind. For it was found that, length for length, and magnifying power for magnifying power, a much higher degree of distinctness was obtained with the latter than with the former telescope. This has been attributed, erroneously, to the crossing of rays in the focus of the astronomical telescope (as if they could jostle), or to the comparative thinness of a concave eye-glass. It arises, however, in fact, from a very different cause—the partial correction both of the spherical and chromatic aberrations of the object-glass by the concave form of the eye-glass (Optics, Pt. iii., §§ 1 and 3), whereas a convex eye-lens exaggerates both defects. The only palliative this evil admitted, before the invention of the achromatic telescope, consisted in obtaining the required magnifying power, by giving great focal length to the object-glass, and so enlarging the actual *size* of the image to be viewed, while at the same time diminishing the angular deviation from a rectilineal course of the extreme rays transmitted through the edges of the lens: since the size of the image corresponding to a given angular diameter of the object is in the direct proportion of the focal length, while the flexure of the rays which converge to form any point of it is, in the same proportion, inversely. In the case of an object-lens of crown-glass, the angle over which the coloured rays are dispersed is about 1-50th of that flexure.[1] Hence it follows (as a mere inspection of the annexed figure will show, fig. 4) that, supposing the red rays from any point of

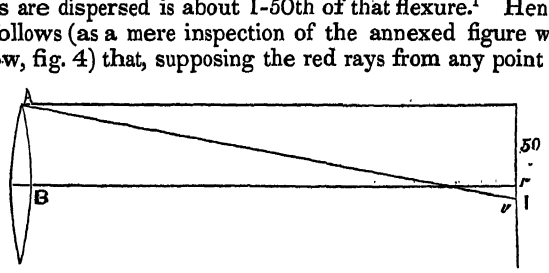


Fig. 4.

the object collected into a single point (r), the violet will be dispersed over a circle whose radius (rv) is 1-50th that of the object-glass, AB, *without regard to its focal length*, and therefore will bear a less ratio to the linear diameter of the image, the greater the image itself, *i.e.*, the longer the focus; and in like manner, the difference of focal length for central and marginal rays due to spherical aberration, being a given fraction of the thickness of the object-lens (Optics, Pt. iii., § 1), is not only diminished by making the lens less convex with the same aperture, but its effect in spreading the rays over a circular space at the focus is further diminished by diminishing the angle of convergence. Now, both the one and the other of these conditions are consequences of lengthening the focus.

Telescope.

(15.) Accordingly, as the demand for increased magnifying power on the part of astronomers grew more urgent, we find the lengths of the telescopes in use rapidly increasing from 20 or 30 inches to 6, 12, 20, and even 50, 100, or 200 feet. The observations of Huygens on Saturn were made with telescopes of 12 and 24 feet, constructed by himself; those of Cassini with 17, 86, 100 feet glasses, made by Campani of Bologna, who, with Eustachio Divini, at Rome, were the first to distinguish themselves as *artists* in this line. A telescope constructed by Huygens, of 123 feet focus, was used by Pound to furnish the diameters of Jupiter and Saturn, and the elongations of their satellites calculated on by Newton in his *Principia;* and Rieves and Cox, the most celebrated makers in England in those days, produced telescopes of 50, 60, and 100 feet focus. M. Auzout, in Paris, is stated to have executed one of 600 feet focal length, which, however, proved unmanageable. These long telescopes were of necessity constructed without a tube, and were directed to the object by means of a contrivance invented by Huygens, who placed the object-glass in a short tube or cell, mounted on a ball and socket, on a stage, raised or lowered along a tall vertical pole. The axis of the lens was directed to coincidence with that of the eye-piece (fixed on a stand below) by a long string, held in the observer's hand. This whole apparatus constituted the arrangement known as the "aërial telescope." Three of Huygens' long-focused object-glasses are still in possession of the Royal Society.

Long-focused or aërial refractors of Huygens.

(16.) The property, however, which gives the chief superiority to the Astronomical over the Galilean telescope, and renders it an instrument of precision, is the facility it affords for placing in the focus of the object-glass, in the very place where the image is formed in the air between the lenses, a fiducial thread or wire, or network of such threads, or of fine lines engraven on glass, &c.; which being at the same time in the focus of the eye-glass, are seen through it, at the same time and with the same distinctness as the image itself, and as if they formed part and parcel of it. This capital improvement in the use of the Astronomical telescope was made and practically applied by Gascoigne in 1640, and affords, not only the means of directing the axis of the object-glass, or the "line of collimation" of the telescope (as it is technically called), to a precise point of any object, or to a star in the heavens, but also of measuring exactly the angular interval between two such precise points—as, for instance, between two stars very near together, or between the two opposite borders of a planet's disc, &c. &c. This is done by clipping the interval in question between two parallel threads in the focus; one of which is fixed, the other moveable by a fine screw, whose revolutions and parts of a revolution are counted on a graduated circle: the direction of the threads being placed perpendicular to the line of the interval to be measured. Such an instrument is called a Micrometer, or a "Parallel wire micrometer," to distinguish it from other contrivances for the same purpose, which are numerous.

(17.) If a glass or a piece of thin mica, covered with a network of finely-engraved squares, be fixed in a tube halfway between two convex lenses of equal power, and in their common focus, a sort of telescope *of no magnifying power* is the result, which, as it may be made very short and small, is convenient as a pocket micrometer for esti-

[1] See table of dispersions, art. Optics, &c., p. 582.

Telescope.

mating the angular magnitude of distant objects, and thus judging of their distance, as well as for sketching their outlines in true proportion; for which reason it has been called by Martin, its inventor, a "Graphical perspective."

(18.) The great inconvenience of the aerial telescope, and the manifest impossibility of much further progress by mere increase of dimension, made it a matter of vital importance to find some mode of shortening the telescope, by throwing the magnifying power on the eye-glass to the relief of the object-glass, which could only be done by improving the perfection of the image formed by the latter. The causes of the indistinctness of the image were well understood to be—1*st*, The spherical aberration of the lens, or the non-convergence of rays transmitted centrally and marginally through it to the same exact point of intersection with the axis (see OPTICS, Pt. iii.) This might be removed, either by figuring the anterior surface of the object-lens to an elliptic, or the posterior to a hyperbolic form; the other surface being, in the former case, a concave spherical, in the other, a plane one. Proposals for mechanisms to communicate these forms were not wanting, but it does not appear that any very successful attempts were made in this direction. But to destroy the other source of imperfection, the dispersion of the differently-coloured rays, whose effect (as will easily be understood from what is said in art. 14) is much greater (600 times greater, according to Newton) in producing confusion of the image, was not to be so accomplished. It required a further step in physical optics; the discovery of the different dispersive powers of different media—a step long retarded by the dictum of Newton (grounded on a too hasty induction from imperfect experiments), that no such difference existed. This dictum, however, having been called in question on *à priori* grounds by Euler, that eminent mathematician at once perceived and announced the abstract possibility of operating a correction of the colour by combining lenses of different dispersions—an idea which received its practical application at the hands of Hall and Dollond, and resulted, in those of the latter and of succeeding artists (Tulley, Fraunhofer, Cauchoix, Merz, &c.), in the wonderful achromatic telescopes of modern times.

Analytical theory of the achromatic telescope.

(19.) The principle of the achromatic telescope cannot be more clearly explained, in a practical manner, than is done in the article on that subject already referred to. In a form adapted to analytical calculation, it may be briefly put as follows:—Let λ', λ'', λ''', &c., represent the focal lengths, and L', L'', L''', &c., their reciprocals, (or the optical *powers*) of a series of thin lenses placed in contact; the signs being + for convex and − for concave lenses, or those which singly act as such, whether both their surfaces be of like curvature or not. Then will $L'+L''+L'''+$ &c., be the joint *power* of their combination, and, putting this $=L$, the focal length of the combination will be given by taking $\lambda=\frac{1}{L}$, which will be positive (or the compound lens will act as a convex one, and form an image), if $L'+L''+$, &c., be so—*i. e.*, if the powers of the convex lenses predominate over those of the concave. Now, that the compound lens shall be achromatic, it is necessary that its focal length λ, and therefore L the reciprocal of that length, shall be the same for rays of all refrangibilities; or, in other words, shall not vary when μ' μ'', &c., the indices of refraction of the several lenses, change from their values corresponding to red rays into those corresponding to other colours of the spectrum. Suppose, now, that μ, μ', &c., represent the refractive indices of the several lenses for the less refrangible of any two coloured rays which it is proposed to unite in one focus, and $\mu'+\delta\mu'$, $\mu''+\delta\mu''$, &c., the same respective indices for the more refrangible, and ($\delta\mu'$, $\delta\mu''$, &c., being very small in proportion to μ' μ'', &c., so as to allow their squares and higher powers to be neglected) suppose $\delta L'$, $\delta L''$, &c., to be the small variations of L', L'', &c., *separately* and independently produced by the change from one ray to the other. Then will the condition of achromaticity in the compound lens be expressed by the equation,

$$\delta L = o, \qquad \text{or} \qquad \delta L' + \delta L'' +, \text{ &c.} = o.$$

Suppose, now, we denote by C', C'', &c., the effective convexities of the respective lenses, or the values of $\frac{1}{r}-\frac{1}{\rho}$ for each; in which r and ρ denote the radii of the anterior and posterior surfaces, regarding as *positive* the radii of *anterior convexities* and *posterior concavities*, and *vice versâ*. Then, by Optics, we have $L'=(\mu'-1)\,C'$; $L''=(\mu''-1)\,C''$, &c.; and C', C'', &c., being invariable,

$$\delta L' = C'.\delta\mu', \qquad \delta L'' = C''.\delta\mu'', \qquad \text{&c.};$$

and eliminating C', C'', &c.,

$$\delta L' = L'.\frac{\delta\mu'}{\mu'-1}; \qquad \delta L'' = L''.\frac{\delta\mu''}{\mu''-1}, \qquad \text{&c.};$$

or putting, for brevity, $\delta\pi'$, $\delta\pi''$, &c., for the values of $\frac{\delta\mu}{\mu'-1}$, &c., or, as they are termed, the respective *dispersive powers* of the media of which the lenses consist (*i. e.*, supposing $\pi'=\log.(\mu'-1)$, &c.) we have $\delta L' = L'\delta\pi'$, $\delta L'' = L''\delta\pi''$ &c., and therefore

$$\delta L = L'\delta\pi' + L''\delta\pi'' + \text{&c.} = 0.$$

(20.) If there be only two lenses, this equation becomes $L'\delta\pi'+L''\delta\pi''=o$, or $\frac{L'}{L''}=-\frac{\delta\pi''}{\delta\pi'}$, the negative sign of which expresses that to unite two differently refrangible rays, the two lenses must have *contrary* characters, and their *powers* must be inversely proportional (or, which comes to the same, their focal lengths λ and λ' directly proportional) to the dispersions of the media of which they consist. And if λ the focal length, or L the power of the compound lens, be given, the equation

$$L = L' + L',$$

combined with the foregoing, will give the focal lengths and powers of both lenses.

(21.) In this case the problem is a determinate one. Take, for instance, crown and flint glass for the convex and concave lenses, the dispersion $\delta\pi'$ of the former being $=0{\cdot}033$, and of the latter $\delta\pi''=0{\cdot}050$ (Table, p. 582, OPTICS), and we find $L''=-\frac{2}{3}L'$; which shows that a flint concave lens of a power $=2$, will achromatize a crown convex one of power 3, leaving the difference of powers (1) outstanding; in other words, a convex with a focal length 33, acting against a concave, focus 50, will produce a compound achromatic lens, focus 100.

Triple and multiple object-glasses.

(22.) If there be more than two lenses, the problem is indeterminate, there being only two conditions, $L=L'+L''+$ &c., and $L'\delta\pi'+L''\delta\pi''+$ &c. $=0$, and more than two quantities, L', L'', &c., to be determined; so that we may obtain another and similar condition by uniting in the same focus, not two, but three rays of three different refrangibilities. Denoting then by $\delta\pi'$, $\delta\pi''$, &c., the dispersive powers as estimated from the separation of two of the rays (A from B), and by $\delta p'$, $\delta p''$, &c., those of other two (B from C), we shall have simultaneously, to satisfy the three equations,

$$\begin{aligned} L &= L'+L''+\text{ &c.},\\ o &= L'\delta\pi'+L''\delta\pi''+\text{ &c.},\\ o &= L'\delta p'+L''\delta p''+\text{ &c.}, \end{aligned}$$

which becomes a determinate problem when three lenses are concerned, and so on.

(23.) For a double object-glass, it is not desirable to unite the very extreme red and violet rays of the spectrum. For the dispersions of crown and flint glasses not following the same law or scale of progression in passing through all the colours from red to violet, the rigorous union of these

Telescope.

extreme rays, which are very feebly luminous, would leave the intermediate green, which is a very luminous and effective ray, still uncorrected. It would be found far preferable, therefore, in practice, to unite two intermediate and powerfully luminous rays, such as the red and indigo rays, corresponding (Optics, Pt. iv., § 5, p. 590) to those marked, in Fraunhofer's chart of the spectrum, as C and G. These give, for such glasses as occur in practice, $\delta\pi' = 0{\cdot}027525$, and $\delta\pi'' = 0{\cdot}047663$, whence $L'' = -0{\cdot}5772\ L'$.

Dr Blair's fluid object-glasses.

(24.) The only very successful attempts to unite more than two coloured rays in the same focus, are those admirable ones of Dr Blair, who enclosed liquid media between lenses of flint and crown glass. A full account of Dr Blair's researches in this direction having, however, been given in both the articles already referred to, especially in Optics, Pt. iv., § 3, we shall not here recapitulate them.

Destruction of spherical aberration.

(25.) The great practical difficulty in the way of shortening the refracting telescope being removed by the correction of the coloured aberration, it remained only to deal with that far less obnoxious, but still troublesome, cause of indistinctness which arises from spherical aberrations. What proportion this bears to the former, in an extreme case, may be understood from a computation of their relative values by Newton, in the case of an object-lens of 4 inches in diameter and 100 feet focal length, which results in a ratio of only 1 to 8151, and therefore for the same aperture, and 10 feet focus, 1 to 81·51, the diameter of the least circle of aberration being as the square of the focal length inversely. The spherical aberration, however, is completely removable from a compound object-glass, consisting of two or more lenses, by a proper adjustment of the curvatures of their several surfaces, and that without compromising the achromaticity of the combination. As a problem in analytical optics, this has exercised the ingenuity of many mathematicians. Among the works which treat of this branch of the subject, the reader may consult Euler, *Dioptrica*, Petersburg, 1769; Clairant, *Mem. de l'Acad. Sci.* 1757; D'Alembert, *Opusc.*, vol. iii.; Lagrange, *Miscel. Taurin.*, III. ii., 152.; and *Mem. Acad.*, Berl., 1778; also Schmidt's *Lehrbuch der Analytischen Optik.*, and *Santini's Teorica degli Stromenti Ottici;* or he will find in *Phil. Tran. R. Soc.* 1821, a memoir on the subject by the author of this article, where the approximate formulæ which appear best adapted to practical computation are deduced; and to which the practice of the best opticians at present is generally understood pretty closely to conform. They are too complex, and the process of their derivation far too long for insertion here; but as a general conclusion, within the limits of refractive and dispersive power most commonly met with in crown and flint glasses, they indicate a form of object-glass, like that represented in *fig. 5, a, b, c*, where the anterior or crown lens is double-

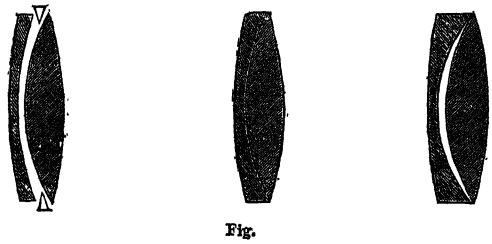


Fig.

convex, the second surface being much more curved than the first; and the posterior, concavo-convex, the concavity being turned towards the light, and of much deeper curvature than the convexity. The two interior surfaces, through the whole practical range of the data, approach very nearly indeed to exact coincidence, and under certain conditions exactly fit each other, so as to admit of being cemented together.

(26.) The formulæ in question are limited by the conditions, 1*st*, That the apertures of the lenses of the object-glass are small in proportion to their focal lengths; 2*d*, That their thicknesses are inconsiderable; and, 3*d*, That they are placed close together. When these conditions cease to hold good, as in the case of very large achromatics, such as modern art is becoming familiar with, they still afford an available first approximation to the proper curvatures; and there is no real difficulty of a mathematical nature, though there is much of tedious and laborious calculation, in following out by trigonometrical computation the course of the rays in any assigned case; and in determining, to any required precision, the proper forms of spherical surfaces which shall unite the central and marginal, or these and intermediate rays, in one point, for any two refrangibilities. For a general and perfectly rigorous process of this kind, the reader is referred to an excellent memoir by the late M. Littrow, in vol. iii., *Mem. Astron. Soc. Lond.*

Telescope.

Difficulty of procuring pure flint-glass, and improvements in its manufacture.

(27.) The mathematical difficulties presented by the construction of a perfect achromatic object-glass may be regarded, then, as completely overcome. The only practical ones consist, first, in a sufficiently delicate workmanship; and, secondly, in obtaining discs of perfectly pure and limpid glass, free from veins, of any required size, and differing sufficiently in dispersive power. To a very considerable extent, modern art has overcome this difficulty. When Dollond first commenced the manufacture of achromatics, discs of flint-glass of more than two or three inches in diameter, free from veins, were hardly procurable. Up to the year 1820, specimens of 5 or 6 inches were of the utmost rarity; and even so late as 1839, Mr Simms reported a disc of 7⅜ inches (and that perfect only over 6) to be, up to that time, unique in the history of English glass-making. A Swiss artist, M. Guinand of Brenets, near Neuchatel, however, devoting himself to the object, succeeded, in the early part of the present century, in manufacturing discs of large dimensions, with considerable certainty. He is stated (*Biblioth. Universelle*, Feb. and Mar. 1824) to have been engaged, on the strength of this success, by Messrs Fraunhofer and Utzschneider, to conduct the manufacture of the glass used in their celebrated establishment at Benedictbaüern, in Bavaria, where he worked for nine years, from 1805 to 1814. From that period, achromatics of 6, 7, 8, and 9 inches in aperture, of exquisite quality, began to emanate from that establishment: to be followed, after the decease of Fraunhofer, by still larger, and, if possible, more perfectly executed instruments of the same kind, from their successors, Merz and Mahler of Munich, as well as from M. Cauchoix of Paris.

(28.) The ultimate perfection of the achromatic telescope would be attained could other species of glass be manufactured, having either a much lower dispersive power than crown or plate glass, or a widely different scale of action on the rays of intermediate refrangibility from those of the last-named glasses. In the former case, by forming the convex lens of the less dispersive medium, we should greatly diminish the total amount of colour to be contended with, in consequence of being enabled to use crown-glass for the concave lens, and so to render the secondary spectrum of little or no importance. This is far from hopeless. The fluoric compounds are well known to hold a remarkably low place in the dispersive scale. The dispersive index, both of cryolite and fluate of lime, is 0·022, or only two-thirds of that of plate-glass (0·033), and therefore holding nearly the same place relative to this glass that the latter does to flint. It is probable, moreover, from the very low dispersion of sulphate of strontia, as compared with that of sulphate of lime, that the fluoride of strontium would be found to possess a dispersion inferior to that of any yet known substance. Now, it does not seem too much to hope, in the present advanced state of the chemical arts, that

Telescope. glasses into which one or both of these elements enter largely should one day be manufactured. M. Jamin, by replacing the oxide of lead by that of zinc in flint-glass, has succeeded in forming a zinc-flint glass of the most exquisite limpidity, of low refractive and dispersive power, and capable of being wrought into discs of any size.

(29.) In the other direction, the salts of lead are no less remarkable for their high dispersion. The borate of this metallic oxide was indicated by the author of this article so long ago as 1820 (on account of its definite chemical composition, its easy fusibility, and the tendency of the boracic compounds to form glasses), as eminently fit for optical uses. A specimen produced in Sir James South's laboratory in that year, had a refractive index of 1·880, and a dispersion considerably exceeding that of flint-glass. Subsequently (1829), in the hands of Prof. Faraday, in union with silicate of lead, it has been made the basis of a "heavy glass" of extraordinary refractive and dispersive power (1·8735 and 0·0703), perfectly adapted for the use of the optician. On the whole, then, we are justified in regarding the manufactory of new species of glass as a field still open, and holding out every prospect for the future. Telescope.

(30.) The following list comprises some of the most considerable achromatic telescopes which have been constructed up to the present time:—

Artist's Name and Residence.	Public or Private Observatory of	Aperture in English Inches.[1]	Focal length in Do.
Peter Dollond, London	Sir James South, Camden Hill, Kensington	3·75	60
George Dollond ,,	G. Bishop, Esq., Regent's Park, London	7	129
Tulley, London	Dr Lee, Hartwell House, Aylesbury (formerly Adml. Smyth's)	5·9	102
Tulley ,,	Sir J. Herschel, Slough and Feldhausen, Cape of Good Hope	5	84
Tulley ,,	Radcliffe Observatory, Oxford (Equatorial)	7·1	120
Fraunhofer, Munich	Imperial Observatory, Dorpat (Equatorial)	9·6	174
,, ,,	Royal Observatory, Berlin (Equatorial)	9·6	174
,, ,,	Royal Observatory, Munich (Equatorial)	11·2	192
Merz and Mahler, or Merz and Son, Munich	Royal Observatory, Palermo, Sicily	9·8	173
,, ,,	Observ. of Collegio Romano, Rome (Equatorial)	9·6	...
,, ,,	Royal Observatory, Cape of Good Hope (Equatorial)	7	102
,, ,,	Observatory, Liverpool (Equatorial)	8·5	144
,, ,,	Royal Observatory, Greenwich (Equatorial)	12	210
,, ,,	National Observatory, Washington, United States (Equatorial)	9·6	183
,, ,,	Observatory of Cincinnati, United States (Equatorial)	12	204
,, ,,	Observatory of Cambridge, United States (Equatorial)	15	270
,, ,,	Imperial Observatory, Poulkova, Russia (Equatorial)	15·9	289
Cauchoix, Paris	Northumberland Equatorial Observatory, Cambridge	11·5	234
,, ,,	Sir J. South, Camden Hill, Middlesex	11·7	228
,, ,,	Sheepshanks, Equatorial Royal Observatory, Greenwich	6·7	98
,, ,,	E. Cooper, Esq., Observatory, Markree, Ireland	14	302
Simms, London	Royal Observatory, Greenwich (Transit Circle)	8·0	138
,, ,,	Do. do. Cape of Good Hope, do. do.	8·0	142
,, ,,	Observatory, San Fernando, do. do.	8·0	142
Lerebours, Paris	Imperial Observatory, Paris (only 8·4 in., quite perfect)	9·2	132
,, ,,	Do. do.	12·8	192
,, ,,	Observatory, Madras (Equatorial)	6·3	96
Ertel and Son, Munich	Imperial Observatory, Poulkova, Russia (Vertical Circle)	6·3	90
,, ,,	Do. do. (Great Meridian Telescope)	6·2	109
,, ,,	National Obs., Washington, United States (Refraction Circle)	7·0	102
Alvan Clarke, Boston, United States	Rev. W. R. Dawes, Hopefield Lodge, Haddenham, Berks	8·25	110
,, ,,	Observatory, Amherst College, United States (Equatorial)	7·25	101
A. Ross, London	—— Strutt, Esq., Worcester	5	...
,, ,,	—— King, Esq., Ipswich *	5	76
,, ,,	Made by order of W. Delarue, Esq. *	5	60
,, ,,	In process of completion by Mr Dallmeyer *	8	...
Cooke and Sons, York	J. Fletcher, Esq., Tarn Bank, Cockermouth (Equatorial)	6	84
,, ,,	In progress for Mr F., to replace the above, and nearly completed	9·4	144
,, ,,	—— Barclay, Esq., Walthamstow (Equatorial)	7·5	120
,, ,,	Sir W. K. Murray, Ochtertyre	9	156
,, ,,	Rev. C. Pritchard, Clapham (Equatorial)	6·6	100
Secretan, Paris	Observatory, Madras	6·0	90
,, ,,	Imperial Observatory, Paris (Equatorial)	12·4	206
Repsold, Hamburg	Imperial Observatory, Poulkova (Meridian Circle)	6	84
Porro, Paris	Under trial at the Imperial Observatory, Paris	9·45	163
,, ,,	In progress. (No precise report of performance)	20·5	590
Pistor and Martens	Washington, United States (Prime Vertical Transit)	5·0	78
,, ,,	Royal Observatory, Berlin (Meridian Circle)	5·5	60
Grubb, Dublin	Queen's College Observatory, Cork, Ireland	8	126
,, ,,	Equatorially mounted, complete	12	232

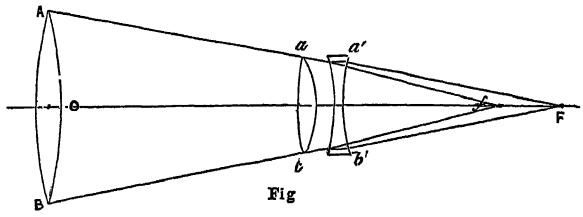
* Mr Dallmeyer (son-in-law of the late A. Ross), working for the latter, with his mechanism and under his instructions, is understood to lay claim to the personal execution of these glasses, and the computation of their curvatures.

Dialytic telescopes. Mr Rogers's construction.

(31.) *Dialytic Telescopes.*—Attempts, however, have not been wanting to evade the difficulty of constructing large object-glasses, arising from the small sizes readily obtainable of *good* flint-discs, by effecting the correction of the coloured dispersion of a single crown object-lens, by a smaller concave lens, or combination of lenses of high dispersive

[1] The *effective* aperture is in a few cases acknowledged to be some few tenths of an inch less than the nominal aperture here set down. Thus, in the Markree telescope of Mr Cooper 13·3 is considered by its owner to be the effective aperture. We cannot, of course, answer for the performance of all these glasses, but there can be no doubt that the large majority of them are of first-rate excellence.

Telescope. power, placed at a distance in the narrower part of the converging cone of rays. This is the principle of Mr Roger's construction, fully described in *Mem. Astr. Soc.*, vol. iii., p. 229 (1828); and since (1839) reduced to practice under the name of the *Dialytic Telescope*, by M. Plössl of Vienna, a very artificial and beautiful invention, highly deserving further trial.[1] The construction is as follows:—AB is the large crown lens, which, acting alone,



Fig

would unite the red rays in F and the violet in *f*. They are intercepted, however, at G, by a smaller compound lens, consisting of a convex crown lens (*ab*) and a concave flint (*a'b'*) of *equal and opposite powers for red rays*, so that the red ray shall pass through both undeviated, and continue its course to F; but the flint lens (*a'b'*) being more dispersive, will more than counteract the crown (*ab*) for violet rays. On these, then, the combination will act as a concave lens, and throw the violet focus *f* farther from O, and that the more, the greater the *power* of either of these two lenses separately. By properly adjusting their *powers*, then, the violet focus may be brought to exact coincidence with the red. Thus, a correction of colour is operated, while leaving the *radii of the four surfaces* of the small lenses, as well as those of the large one, free to satisfy the other essential condition, the destruction of spherical aberration in the triple combination; inasmuch as the *power* of a lens depends on the *difference* of the curvatures of its surfaces, and not on the absolute curvature of either. Thus, both the corrections are completely under command, and radii may be calculated to suit any given state of the data. But what gives this construction a capital advantage is, that, in point of practice, no calculation is necessary beyond the very simple one which suffices to determine the *powers* of the lenses. For these once ascertained, and the lenses placed close together *in situ*, if it be found, on trial, that the colour is not completely destroyed, we have only to bring the double lens nearer to the object-glass, if the violet focus be longer than the red; or withdraw it farther, if shorter, to bring about an exact union. And as regards the correction of the spherical aberration: by constructing the two lenses so that, when placed close together, their compound spherical aberration shall somewhat over-compensate the convex aberration of the object-lens, which is easily accomplished, the excess may be destroyed, and the compensation rendered exact, by merely separating the two lenses from each other by a very small interval. Both these adjustments are of the readiest practical attainment. The two glasses are mounted in a common cell, allowing of being separated from contact by a fine screw motion; and the cell itself is made moveable along the axis by a sliding motion, tube within tube. Mr Rogers gives the following formula for finding the powers of the correcting lenses (L' and $L''=-L'$), or their focal lengths (λ' and $-\lambda'=\lambda''$),

$$L'=F\cdot\frac{\delta\pi'}{\delta\pi''-\delta\pi'}\times\frac{A^2}{a^2};\qquad \lambda'=\phi\cdot\frac{\delta\pi''-\delta\pi'}{\delta\pi'}\times\frac{a^2}{A^2},$$

where ϕ and F are respectively the focal length, and the power of the object-glass and A, *a*, the apertures of the object-glass and of the compound smaller lens, a formula whose correctness is evident on a mere inspection of the figure. Telescope.

(32.) Another construction, bearing considerable analogy to this, has been proposed and practised with much success by the late Mr P. Barlow. It consisted in placing in the narrowing cone of rays from a plate-glass object-lens, a concave lens consisting of two plate-glass capsules, of equal thickness throughout, enclosing between them a very highly dispersive fluid,—that selected being the bi-sulphuret of carbon, whose refractive index is 1·678, and dispersive power 0·115, or more than double that of flint-glass. The fluid lens is made concavo-convex, and the curves are calculated to destroy the spherical aberration, the power of the lens being so adjusted as to destroy, as nearly as by calculation it can be done, the chromatic. When this is the case, it has been shown by Mr Airy, in *Camb. Phil. Tr.* vol. ii. p. 238, and by the author of this article (*Encyc. Metropol.* art. *Light*, sec. 479), that an exact achromaticity can be produced by varying the distance between the two lenses. The principle was tested by Mr Barlow, by the actual construction of a telescope, of 8 inches aperture, and 12 feet focal length (the shortening might be carried farther), the cost being borne by the Board of Longitude. The trial proved highly satisfactory, and thus, to use his own expression, "less than an ounce of sulphuret of carbon, value three shillings," was made to perform the office of a very costly flint disc of eight inches. Mr Barlow's account of his invention, and of the construction and performance of his telescope, will be found in the *Transactions of the Royal Society*, for 1828, 1829, and 1831. Mr Barlow's construction.

(33.) In a work by Wolfius, about the early part of the last century, we find it suggested, to interpose between the object-glass of the common astronomical telescope and its focus, a concave lens, as a means of increasing the magnifying power, without a proportional corresponding increase of the length of the telescope. The mode in which it effects this will be evident on inspection of the figure 7, Wolf's construction.

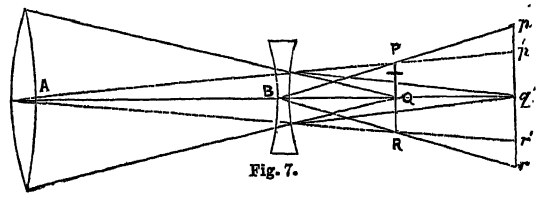


Fig. 7.

where A is the object-glass, Q its focus, B the interposed lens, *q* the focus after refraction through B; PQR the image formed by A alone at Q, and *pqr* the enlarged image virtually formed at *q*. If AP and AR be joined and produced, they will mark out on *pr* the portion, *p'r'*, which would be the magnitude of the image formed by A were its focal length A*q* instead of AQ. Practically speaking, this construction is objectionable in its simple form, as proposed by Wolf, on the ground of colour produced by the refraction through B, which, supposing the object-glass achromatic, would destroy the achromaticity of the image. Nothing, however, prevents a negative or concave lens from being rendered achromatic, as well as a positive or convex one. In the equation of art (20) $L=L'+L''$, L may be negative as well as positive. We have only to make the stronger lens of the combination (the crown) concave, and the weaker convex, and the result will be a *negative achromatic lens*, which, interposed on Wolf's principle, will be free from the objection. Such is the modification embodied in the "Barlow lens," which forms The intermediate Barlow lens.

[1] Meyer (Grosse *Conversations-Lexicon*, art. "Fernrohr"), in describing this invention, suppresses all mention of Mr Rogers, and ascribes it wholly to M. M. Littrow and Plössl, with what justice may best be inferred from M. Littrow's own memoirs in the *Trans. Astron. Soc.* Nor does he once mention Mr Barlow in reference to the fluid-correcting lens of art. 32 which he describes! It is not in France only that English invention is ignored.

Telescope.

the subject of two papers by Messrs Dollond and Barlow (in *Phil. Trans.* 1834), and which has been found by Mr Dawes (*Ast. Soc. Notices*, vol. x. 175) to work with excellent effect when applied to a good achromatic object-glass. It is evident that, by giving the interposed concave a motion to and fro along the axis, the magnifying power may be varied within very extensive limits, so that it becomes a sort of variable eye-piece, though, as Mr Barlow justly remarks, the interposed lens is rather to be considered as part and parcel of the object-glass, and may be used with any description of eye-piece. And this leads us now to speak of this latter adjunct to the telescope.

Of eye-pieces. Rheita's eye-piece.

(34.) The telescope, generally considered, consists of two parts—an object-glass, to form the image; an eye-glass, to view and magnify it. We have seen what may be done towards producing a perfect object-glass; in other words, a perfect image. But we have hitherto said nothing of any improvement at the other end of the instrument. The "eye-piece" is, however, no less an essential feature of the telescope, and its perfection no less important than that of the object-glass or speculum. The first, or nearly the first, step in its improvement, consisted in obviating one of the chief annoyances in the use of the achromatic telescope, when directed to day objects, viz., its inverted representation of them. It is obvious that, if optical means can invert an object, a repetition of the same means can re-invert the picture, and so rectify the representation. This, accordingly, was the first application of a *compound eye-piece*, due to Rheita, and called by his name. He applied behind the convex lens constituting the original simple eye-glass, a second short telescope, consisting of two convex lenses, their distance being the sum of their focal lengths. This is the simplest form of the "day eye-piece," or "common terrestrial telescope."

The Huygenian eye-piece.

(35.) The next improvement was of a more thoughtful and elaborate kind. It is known as the Huygenian eye-piece, from its inventor, Huygens, one of those enlightened men of the Archimedean, Galilean, and Newtonian school, who make science walk hand in hand with common sense, and, of the two, work out the directive power of all human progress. It consists of two convex lenses, as in fig. 8, the anterior or "field-glass," having its focal length to that of the posterior or "eye-glass," as 3 to 1, the distance between them being twice the focal length of the latter, and the combination being so placed as to form the visible image half-way between the two. This combination possesses several capital advantages. 1*st*, It is achromatic, *in the sense in which an eye-piece is said to be so*, viz., that a colourless image, or real white object, seen through it, does not appear bordered with coloured fringes, which is the case when a single lens is used, or Rheita's eye-piece. This is a consequence, not, as in the achromatic object-glass, of all the central coloured rays being collected in one focus, which, in the case of an eye-piece, is a condition *comparatively* of little moment, but of its *possessing the same magnifying power for rays of all colours*, on an object of sensible angular diameter, so as not to form overlapping coloured pictures of it on the retina. *This* condition it is, which, translated into algebraic language, furnishes the "*equation of achromaticity*" of an eye-piece. An expression for the magnifying power of a telescope provided with a certain eye-piece, is formed in general terms, involving the focal length of its lenses, their distances from each other, and their refractive indices; and this being made to vary by the variation of the last-mentioned elements only, the variation is equated to zero. The algebraic working, even for a two-glass eye-piece, is a little complex, and for a more compounded one, very much so. The reader will find it very well given in Dr Lloyd's *Treatise on Light and Vision*, and in an elaborate paper by Professor Littrow, in the fourth volume of the *Trans. R. Astron. Soc.*, p. 599, from the former of which we extract the following proposition, viz., that an eye-glass of two lenses of the same medium, is achromatic when the interval between the lenses is an arithmetical mean between their focal length, a condition which the Huygenian construction evidently satisfies. The rationale of this, in the case of that eye-piece, will be obvious, independently of algebraic analysis, by inspection of the course of the rays in fig. 8, where AC, BD, are the lenses, PQ the image which would

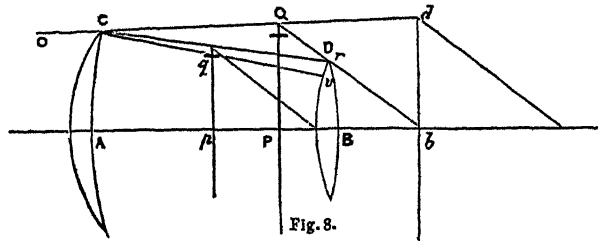


Fig. 8.

be formed by the object-glass alone, *pq* that really formed by the action of the field-glass. The object-glass being supposed achromatic, a ray, as OC, of white light going to form the image of a point, Q, will be refracted by the field-glass at C towards the corresponding point, *q*, of the new image, but not as a single white ray. It will be separated into coloured rays, following different courses. The red ray (C*r*) being less refracted, will fall on a point (*r*) of the eye-glass more remote from its centre (B) than the violet ray (C*v*), and (the prismaticity of the lens increasing from the centre outwards) will be *more* bent aside by the second transmission, in proportion, than the violet, and thus a compensation is effected, and the two rays finally emerge parallel, their exact parallelism being secured by the proportion of their focal lengths.

Its advantages

(36.) The Huygenian eye-piece possesses, also, other important advantages. The total deflection of the light, to produce the magnifying power, is, in this construction, *equally divided* between the two glasses, a condition the most favourable for diminishing that distortion which is always perceived in looking obliquely through a lens; and finally, the field of view is greatly enlarged, in proportion to the size of the eye-lens, being such as would require to produce the same magnifying power, a single lens, of the much greater semi-diameter, *bd*, found by drawing *Qb* parallel to *q*B, and erecting *bd*.

and disadvantages.

(37.) The inconvenience of this eye-piece (which has occasioned its being improperly termed a negative eye-piece) is, that the image being formed between the lenses of which it consists, undergoes a certain amount of distortion by the field-glass; owing to which equal linear portions of it do not correspond precisely to equal angular measures of the distant object. Equal parts, then, of a micrometer, applied at the place of the image, so as to be seen at the same time through the eye-lens, will not correspond to precisely equal angular intervals.

Best forms for its lenses.

(38.) To give the greatest distinctness to the Huygenian eye-piece, Mr Airy recommends that the first lens should be a meniscus, having the radii of its surfaces as 11 : 4, and its convexity towards the object-glass; and the second, a "crossed lens" (radii as 1 : 6), with the more convex side towards the first; and that a "field-bar," or pierced diaphragm, should be placed in the focus of the eye-lens. (Airy on the "Spherical Aberration of Eye-pieces," *Camb. Phil. Trans.*, vol. iii., i. p. 61.)

Ramsden's positive eye-piece.

(39.) The common *astronomical* (or positive) *eye-piece*, described by Ramsden (*Phil. Trans.* 1783), consists of two plano-convex lenses of equal lengths, having their convexities turned towards each other, and separated by two-thirds of the focal length of either, as in fig. 9. This combination is placed behind the image PQ, formed by the object-glass, at a distance, AP, equal to *one-fourth* of the focal length of A. The first, or field-glass, therefore, forms an enlarged

Telescope. image, *pq*, at a distance *one-third* of that focal length, which places it in the focus of the eye-glass. This eye-piece is not properly achromatic, but its spherical aberration is much less than in any of the other constructions, and it has the advantage of giving what is called a *flat* field of view, requiring no change of focus to see the centre and borders of the field with equal distinctness.

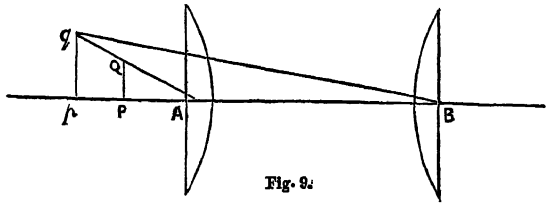


Fig. 9.

Dollond's four-glass eye-piece.

(40.) Lastly, if for the third or eye-lens of the Rheita eye-piece, as described in Art. 34, we substitute a Huygenian eye-piece, we shall have the *four-glass eye-piece*, devised by Dollond, for his admirable day-telescopes or perspective glasses; and finally rested in by him, and by many succeeding opticians, as combining, with a proper adjustment of the distances and foci of the two anterior lenses, the greatest number and amount of advantages, viz., an erect representation, achromaticity, a large field of view, and a high degree of distinctness in all parts of it. If this eye-piece be divided into two, by separating the first pair of lenses from the last, and mounting the latter in a tube, sliding within that which carries the former, while at the same time the whole combination is adjustable, bodily, by a sliding movement along the axis of the telescope, we have the late Mr G. Dollond's "Pancratic" eye-piece, whose magnifying power may be varied within considerably extensive limits. For astronomical purposes, however, the Huygenian eye-piece, for low magnifying powers, or, in some cases, a combination of two equi-convex lenses placed close together (which, by dividing the refraction, materially diminishes the distortion at the edges of the field); the Ramsden double eye-glass for higher powers; and for extremely high ones, a single lens of short focus,—are those most generally employed.

The Pancratic eye-piece.

Fraunhofer's eye-pieces.

(41.) Professor Littrow, in the memoir referred to in Art. 35, gives the following table of the focal lengths and distances of several of Fraunhofer's four-glass terrestrial eye-pieces; in which F represents the focal length of the object-glass in inches (Vienna measure); f, f', f'', f''', those of the four lenses of the eye-piece; M, the magnifying power; and D, D', D'', the respective intervals between the first and second, second and third, and third and fourth lenses, reckoning from the object-glass:—

M=	F=	f=	f'=	f''=	f'''=	D=	D'=	D''=
26	20·22	1·56	1·91	2·18	1·20	2·23	3·58	1·84
42	31·15	1·45	1·78	2·02	1·11	2·16	3·32	1·71
60	56·56	1·82	2·23	2·55	1·40	2·72	4·19	2·15
66	58·61	1·71	2·09	2·38	1·31	2·55	3·92	2·01
70	44·43	1·22	1·49	1·70	0·94	1·81	2·79	1·43

in all which $\frac{f}{f'}=0{\cdot}82$, $\frac{f}{f''}=0{\cdot}71$, $\frac{f}{f'''}=1{\cdot}30$, $\frac{D}{D'}=0{\cdot}65$; and $\frac{D}{D''}=1{\cdot}26$; ratios which he finds to accord almost precisely with those which the theory delivered by him would assign as productive of a very large field of view, with complete achromaticity.[1]

Telescope. Groves's mode of correcting aberration.

(42.) In achromatic telescopes of the ordinary construction, it is a common defect, to find the chromatic aberration somewhat over-corrected (or the violet focus somewhat longer than the red), and, at the same time, the spherical aberration rather *under*-corrected (or the focus for central rays somewhat longer than that for marginal ones). Mr Grove (*Notices of Ast. Soc.*, xiii. 80) has lately shown that both these defects may be exactly, or in great measure, remedied by interposing between the object-glass and its focus a *plano-convex* lens of plate-glass, of a somewhat longer focus than the object-glass itself, having its distance from the focus from a fourth to a fifth of the focal length of the latter, and its plane side towards the eye. "The effect of such a lens," he remarks, "is threefold: 1*st*, It brings back the over-correction of the object-glass; 2*dly*, Being of a glass acting somewhat differently on the coloured spaces, it causes them to overlap, and gives a greater residuum of white light; and 3*dly*," (? ?) "upon the principle of the Huygenian eye-piece, it lessens the *spherical aberration*, by receiving the more refrangible at a less oblique incidence than the less refrangible rays." The additional lens being movable within certain limits, is adjusted to its best position by trial. Its diameter need obviously be only a fourth or a fifth of that of the object-glass, and the whole instrument will be shortened by its employment.

Centering of the lenses of an object-glass by Wollaston's method.

(43.) One of the most important adjustments of an achromatic telescope consists in the due centering of the lenses, *i.e.*, placing them so that all the centres of curvature of their surfaces shall lie in one straight line, and *that* coincident with the common axis of the telescope and its eye-piece. An ingenious mode of accomplishing this end has been pointed out by Dr Wollaston (*Phil. Trans.* 1822, p. 32). The lenses of the eye-piece being removed, a candle is placed at its orifice. The rays from this, reflected on any one of the surfaces of the object-glass, will form an image (real or virtual), but which cannot be seen by an eye looking through that glass towards the candle, since the reflected rays go the other way. Each of these images, however (except that formed at the surface nearest the candle), may be considered as performing the part of a luminous object, and forms again a second image by reflection, at each of the surfaces nearer to the candle than itself; and as the rays from these proceed *towards* the eye, these twice-reflected images can all be *seen*, and their number will be equal to the number of combinations, two by two, of the surfaces, viz., six for a double object-glass, fifteen for a triple, and so on. Now, if the lenses be exactly centered, all these ought to be situated in a right line directed *from* the candle. By placing the eye at a proper distance beyond the glass, and somewhat aside of the axis, they are all visible, and their exact linear arrangement may be very accurately judged of, especially when, as is most commonly the case, two or more of them are situated *very* nearly at the same distance from the eye, or on the same point of the common axis; in which case they may be reduced to a rigorously linear arrangement, by scrutinizing them with a magnifier, and altering the position of the several lenses in their common cell by fine adjusting screws. In the paper cited, Dr Wollaston has given rules for doing this in the case of a triple object-glass of the original Dollond construction (a double concave of flint, between two equi-convex ones of crown-glass). Practically, however, in any assigned case, a small motion given to either lens will point out which among the images is affected by it, and supersede (by placing the matter of fact under ocular inspection) the necessity of resorting to any written rule or theory, in performing the adjustment.

[1] We find an eye-piece of four glasses, by Ramsden, strongly recommended, as perfectly achromatic, and possessed of extraordinary distinctness, formed by placing the four lenses A, B, C, D, whose focal distances are in the proportions of 0·775, 1·025, 1·01, and 0·79 respectively, at the following respective distances from each other: AB=1·18, BC=1·83, CD=1·05. A, is plano-convex, plane side first, the others equi-convex.

Telescope.

Of Reflecting Telescopes.

(44.) An optical image may be formed by reflexion on a polished surface of glass or metal, wrought into a regular convexity or concavity, on the same principles of the divergence and convergence of the reflected rays as by refraction through polished transparent surfaces. There seems, indeed, some reason to believe that the contrivances for distant (*i.e.*, telescopic) vision, obscurely indicated in the passages of Roger Bacon's and Digges's works, which have been cited in support of their possession of some means for effecting it, refer rather to images originally formed by reflecting, than by refracting surfaces. Be that as it may, the idea of employing metallic concave mirrors, instead of convex lenses, very early suggested itself to Mersenne, as an abstract theoretical possibility; to Gregory, as a practical application by which the length of a telescope might be deduced, and (perhaps) the image improved; and, finally, to Newton, who clearly perceived that it would be so, his discoveries having led him to form a just estimate of the vastly greater amount of indistinctness produced by the aberration of colour than by that of sphericity. From this cause of indistinctness reflectors enjoy an inherent immunity; and it was this consideration which led Newton, despairing of a remedy for the coloured aberration, to turn his thoughts to the construction of reflecting telescopes, and to that improvement on the construction first suggested by Gregory, known as the Newtonian reflector.

Reflecting telescopes. The Gregorian construction;

(45.) *The Gregorian Telescope.*—The construction of this telescope, first described by James Gregory in his *Optica Promota*, in 1663, is as follows:—A and B are two concave mirrors, a larger and smaller, having a common axis, and their concavities facing each other. The larger A, in strictness, should be a segment of a paraboloid, forming in its focus at q an inverted image $p\,q$ of a very distant object PQ, which we will suppose to subtend a very small angle (1″) at the centre of A. The small mirror B should be a segment of an ellipsoid of revolution, having its two foci, the one in q, the other in q', the centre of an aperture in AA, equal to the diameter BB of the small mirror. Under these circumstances, by reason of the property of the ellipse, in which lines drawn from the two foci to any point in the curve make equal angles with it, q and q' will be *conjugate optical foci;* and therefore, taking C for the centre of curvature of BB, or of a sphere approximately coincident with the ellipsoid, and bisecting BC in E, G will be the principal focus of the small mirror for parallel rays, and $q\mathrm{G} \times q'\mathrm{G} = \mathrm{GB}^2$. These distances, therefore, being so adjusted, a second image $q'p'$, or an image of $q\,p$, will be formed by reflection at B, inverted with respect to $q\,p$, and therefore erect with respect to the object QP, and enlarged in the ratio of $q'p'$ to $q\,p$, or of $q'\mathrm{C}$ to $q\mathrm{C}$; that is, of $\mathrm{B}q'$ to $\mathrm{B}q$. This image is then viewed either by a simple convex lens placed behind it, as at O, or by means of any of the eye-pieces already described. We will here suppose the simpler case. The magnifying power, then, will be thus determined. The first image and object subtending equal angles at the aperture in A, the linear magnitude of the image or $q\,p$ will $= \mathrm{F} \times \tan 1''$, calling F the focal length of A; and therefore that of the second will be $\mathrm{F}\,\frac{\mathrm{B}q}{\mathrm{B}q} \cdot \tan 1''$, which, at the distance of the eye-glass from it (f), will subtend the angle $\frac{\mathrm{F}}{f} \cdot \frac{\mathrm{B}q'}{\mathrm{B}q} \times 1''$, so that the magnifying power will be expressed by $\mathrm{M} = \frac{\mathrm{F}}{f} \cdot \frac{\mathrm{B}q}{\mathrm{B}q}$. F′, then, representing the focal length *for parallel rays* of the small mirror, and D, d, denoting the distances $\mathrm{B}q'$ and $\mathrm{B}q$, we have, by the principles of optical reflection, $\frac{1}{\mathrm{D}} + \frac{1}{d} = \frac{1}{\mathrm{F}'}$, and $\mathrm{M} = \frac{\mathrm{F}}{f} \cdot \frac{\mathrm{D}}{d} = \frac{\mathrm{F}(\mathrm{D} - \mathrm{F}')}{f\mathrm{F}'}$, from which expression, where all the focal lengths, and the distance between the mirrors, are known, the magnifying power can be calculated. The field of view may be computed from the formula $\frac{1}{\mathrm{M}f}\left(a + \frac{\mathrm{A}}{\mathrm{M}}\right)$ where M is the magnifying power determined as above, a the aperture of the eye-glass, and A that of the large mirror. This expression supposes the aperture of the small one to be equal to $\mathrm{A} \cdot \frac{d}{\mathrm{F}}$ or $\mathrm{A} \cdot \frac{\mathrm{DF}'}{\mathrm{F}(\mathrm{D} - \mathrm{F}')}$, which will just enable it to receive the whole cone of reflected rays incident parallel to the axis of the telescope. It will evidently, therefore, *not* receive the whole of a cone reflected obliquely to form a point of the image out of the centre of the field, and the defalcation will be greater the greater the obliquity. The illumination of the field, therefore, will degrade in intensity in proceeding from the centre outwards, unless the small mirror be made somewhat larger, which will be attended with some additional interception of light from the large mirror, but will afford a central area uniformly illuminated.

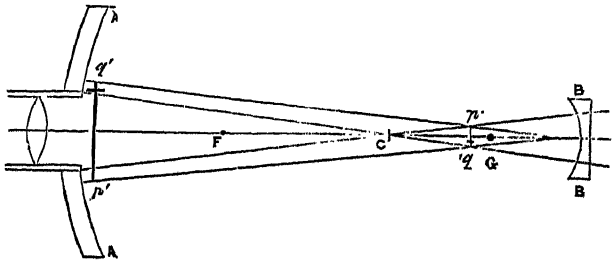


Fig. 10.

(46.) Among the advantages offered by the Gregorian construction, besides its affording an erect image, is, that a considerable proportion of the magnifying power is due to the action of the small mirror, and is therefore so far performed without introducing colour, so that a feebler eye-glass, *cæteris paribus*, being necessary to produce a given amplification, *its* defects of achromaticity, if any, is of less moment. This advantage, however, is balanced by some serious practical defects, viz.:—1*st*, The loss of light consequent on two metallic reflexions at a nearly perpendicular incidence, which cannot be calculated at less than 0·44 of the whole; 2*dly*, The necessity for a deep concavity in the small mirror, which renders it extremely difficult to give a truly elliptic form to its surface, without which its aberration is very injurious, and the more so, since, supposing both the mirrors worked to spherical forms, their aberrations conspire; and that of the large mirror is even violently exaggerated by the action of the small one. This will be evident on inspection of fig. 11, where c is the focus of central rays incident on AC and a; that of marginal ones, lying (Optics, § iii.) nearer to C or farther from D than a. Were the figure of DB then truly elliptic, and such as to form the image of c at C, that of a would be formed, not at C, but at a much nearer point a', because conjugate optical foci move in contrary directions, and the

advantages and disadvantages.

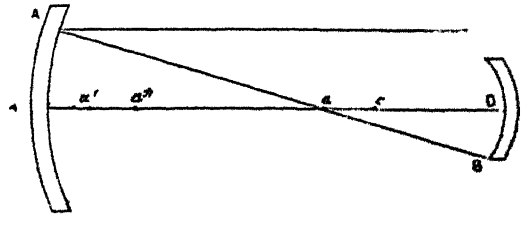


Fig. 11.

Telescope.

motion of the more distant is much the more rapid. But DB being supposed spherical, the ray aB being lateral, will not be converged to a' the focus of a for *central* rays, but to a point (a'') still nearer to B. Optics, *ut supra*, fig. 65.

(47.) It does not appear that Gregory ever succeeded in getting a satisfactory trial of his invention. Artists in later times have, however, produced telescopes of no contemptible merit on this construction; and some of "Short's Gregorians" (an Edinburgh artist of great reputation as a constructor of reflectors about 1734) have attained celebrity.

Cassegrain's construction;

(48.) *The Cassegrain Telescope.*—Before describing the Newtonian, we shall here briefly pass in review a construction of the reflecting telescope suggested by Cassegrain in or about 1672, which differs only from the Gregorian in the substitution of a convex hyperbolic for a concave elliptic small mirror. Granting the perfection of the forms, it is evident that this construction would equally fulfil all the conditions of a rigorously perfect image; and *that* with the advantage of requiring a shorter tube—the distance of the mirrors being the difference, instead of the sum, of their focal distances. The Cassegrain construction possesses another, and that not an inconsiderable, advantage over the Gregorian, analogous to that pointed out in art. 14, when comparing the Galilean with the astronomical form of refractors. The aberrations of the two mirrors tend to correct each other (as is easily seen by following out the reasoning of art. 46, for a convex form of BD *mutatis mutandis*); and this renders it more readily possible than in the Gregorian form, by trying one and the same large mirror in combination with several small ones, to select one whose defects shall suit and counteract the opposite defects of the other, and so produce perfect vision. In spite of this (partly by reason of its forming an inverted image), the construction is now almost entirely disused, though excellent telescopes (by Short and others) have been so constructed; and so lately as 1813, Captain Kater found, or conceived himself to have found, with equal apertures of both mirrors, and equal magnifying powers, not only better definition, but a greater illumination, in the Cassegrain (in the proportion of three to two); a fact (if really such) which would seem altogether inexplicable on any theory of light yet put forward.

its advantages;

its alleged superiority of light.

(49.) In both these constructions, the adjustment of the focus to distinct vision is performed by giving a small motion to or fro along the axis of the tube, by a fine screw. The eye-piece most commonly used is the Huygenian, on account of its great aperture and field of view.

Newtonian construction;

(50.) *The Newtonian Reflector.*—In this construction, the image which would be formed by a large speculum placed at the bottom of the tube is simply deflected, and thrown out, laterally, by a small plane-reflecting surface, inclined at an angle of 45°, to the axis of the large one. It is thus rendered visible to the observer's eye, placed outside of the tube, as in fig. 12, in which AB is a parabolic

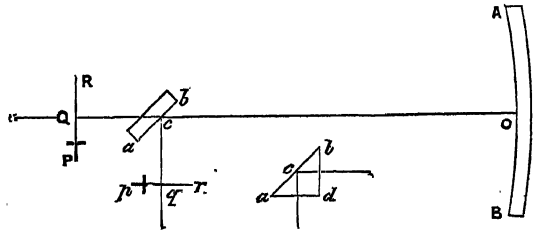


Fig. 12.

reflector, which alone would form an image (PQR) of a distant object in its focus, but the rays being intercepted by the small oval plane reflector $a\,b$, inclined as aforesaid, nearer than the focus by somewhat more than half the linear aperture (AO) of the large one, the image is really formed at $p\,q\,r$, just outside of the tube, and is viewed by an eye-glass at E. In this construction, as will be sufficiently obvious on tracing the course of the rays, the object is seen inverted, and in a direction at right angles to the real one.

Telescope.

its practical advantages

(51.) The practical advantages of this, as compared with either of the former constructions, are—1*st*, That the excessive difficulty of truly figuring the small mirror is avoided; it being far less difficult to give a truly plane surface to a *small* reflector, than a very concave or convex elliptic or hyperbolic one; 2*dly*, That by placing the small mirror properly, the emergent central ray may be diverted out horizontally, or obliquely upwards, so that the observer is not constrained to gaze upwards, which is very distressing when long continued, but may look horizontally, or, if he please, obliquely or vertically downwards, without fatigue; 3*dly*, That the second reflexion is performed at an incidence of 45°, by which materially less light is lost than at a perpendicular incidence, and the loss may be still further diminished by effecting the second reflexion (as suggested by Sir David Brewster) at a more oblique incidence, elongating for that purpose the oval form of the small mirror, from an ellipse, whose axes are as $\sqrt{2}$ to 1, into one more excentric. Or, which is far preferable (as originally suggested by Newton himself) a glass prism $b\,d\,a$ may be substituted for the metallic reflector $a\,c\,b$, having a right angle at d, and the angles $a\,b$ each 45°. In this arrangement the second reflexion is performed internally at the hypothenuse, or base of the prism $a\,b$, and whether in the case of crown or flint glass, is *total;* so that no more light is lost by this second reflexion than would be lost in passing through a thick plate of the same kind of glass; that is to say, about *5 per cent.*, if the glass be quite limpid and colourless. So effectual was the construction for a reflector found, that very soon after its proposal by Newton, Hadley constructed (in 1723) one of $5\frac{1}{2}$ inches in aperture, and 62 inches focus, which bore a magnifier from 190 to 230 times, and surpassed in effect Huygen's aërial telescope of 122 feet.

magnifying power and field of view.

(52.) The magnifying power and the field of view, in the Newtonian reflector, are found in the same manner as in the simple astronomical telescope, provided the small mirror be sufficiently large to catch the rays reflected from the extreme margin of the great one to the opposite extreme border of the eye-glass; just as, in the construction last named, would be the case were a plane reflector interposed between the object-glass and its focus. If A be the semi-aperture of the large mirror, and F its focal length, the shorter semi-diameter of the small mirror must not be less than $\frac{A^2}{F}$; but if limited to this precise measure, the central point only of the field of view (as in the Gregorian) will be fully illuminated.

(53.) The usual method of mounting the Newtonian reflector, when the large speculum is not very weighty, or of more than a few feet in focal length, is to suspend the tube in such a manner, that when its inclination to the horizon varies, the situation of the eye-piece shall change but little, so that the observer shall not need to shift his position much. This may be done *precisely*, by making the eye-tube itself one of the two opposite pivots of a metal frame, embracing the eye-end of the tube (being pierced along its axis, to admit a sliding-tube, carrying the eye-lens or lenses). In this arrangement, the small mirror must be fixed; and the focus must be adjusted, not (as is usually done) by moving it to and fro along the axis, but by sliding in or out the eye-tube within the hollow pivot. If destined to carry a micrometer, the place of the small mirror must be so near the large one as to throw the focus out to a distance beyond the bearing of the pivot. For an instrument destined

Telescope.

for meridional astronomical observation only, this construction might be adapted to a reflector of any size. The eye-axis might be supported on a pier of convenient height above the ground, enlarged into a platform for the observer and his writing materials, &c., who might sit at his ease (and under shelter), while the lower end of the tube might be depressed when necessary, into a pit or sunken area below the ground level, by suitable mechanism, whose working might be eased by applying a counterpoising weight, nearly but not quite equal to that of the tube charged with the speculum, applied at the centre of gravity of the tube so loaded, according to an ingenious principle devised by Lord Rosse (of which more hereafter).

(54.) When a prism of glass is used for the second reflexion in the Newtonian telescope, it requires to be protected from dew, the deposition of which on its surface is fatal to its performance. The same may be said of the object-glasses of refracting telescopes. No dew forms on the surface of polished metal, but glass, from its peculiar relations to radiant heat, is extremely liable to contract it, when exposed to a clear sky at night. This may be obviated by slightly warming the prism, and by embedding it in a case stuffed with warm felt or other non-conducting substance; or by the same means which succeed perfectly in the case of a refractor, viz., prolonging the tube of the telescope some distance beyond it, either permanently or by attaching to it a "dew-cap," *i.e.*, a light tube of thin metal, blackened within and polished without, of a length about three times the diameter of the tube.

The simple, or front view, reflecting telescope.

(55.) *The Simple Reflector.*—When the aperture of a reflecting telescope is so large that the interception of the light from a few square inches of its area, by the portion of the observer's head outside of his eye, will cause a less loss of light than would arise from the interposition of a small mirror, together with the imperfect reflexion from its surface, the small mirror may be suppressed, and we have then the construction first imagined by Le Maire (and afterwards adopted by Sir W. Herschel), and hence sometimes called the Herschelian telescope. In this construction the axis of the mirror is inclined to that of the tube of the telescope, so as to bisect the angle between the axis of the latter and a line from its centre to the edge of the opening of the tube, and thus to form an image in its focus, on that edge where the eye-piece is placed to receive it. The loss of light, by the intervention of the observer's head, and the greater inconvenience arising from the disturbance of the air by its warmth, may be avoided by applying a right-angled prism close to the last lens of the eye-piece, so as to effect a total internal reflexion on its base at right angles, outwards; or still better, by working the faces of the prism itself into spherical convexities (thereby converting it into a thick lens), and suppressing the eye-glass entirely if a single lens, or else using the prism-lens to supply the place of any one of those of which it consists, as may be most eligible.

(56.) A great advantage of this construction, besides its economy of light, is, that the observer, in astronomical observations (for which alone it is ever used), looks always downwards. Those only who are in the habit of observing for many hours consecutively can appretiate this benefit. Among its disadvantages, it must be considered that the aberration of the mirror is much increased by the oblique incidence of the central rays; inasmuch as the area of the mirror must be regarded as a circular portion cut out from the half of a *centred* reflector of twice the aperture. It is evident, too, that in grinding and figuring such a reflector, it is needless to insist on a parabolic form in preference to a good spherical one, unless it were possible to work the surface to a portion of a paraboloid, having its vertex at the circumference of the mirror. And here we may once for all remark, that *that* is a good form which gives a good image; and that the geometrical distinctions between the parabola, sphere, and hyperbola, become mere theoretical abstractions in the figuring and polishing of specula, there being no practical mode of ascertaining, by any system of measurements on a scale, *what* form the surface has, apart from its optical effect on the rays of light. How great the delicacy of workmanship required in such operations may be apprehended by considering that the *total* thickness to be abraded from the *edge* of a spherical speculum 48 inches in diameter and 40 feet focus, to convert it into a paraboloid, is only one 21,333d part of an inch.

Telescope

(57.) In the large reflectors which are at present used for astronomical purposes, the two last forms of construction are exclusively employed; and, from the facility with which glass prisms of sufficient purity and silver mirrors on glass can now be obtained, it seems probable that the Newtonian will supersede all other forms. At the epoch when Sir William Herschel commenced his astronomical labours (1776), the apparent hopelessness of constructing very large achromatic object-glasses, rendered the reflecting principle the only one which offered the prospect of an unlimited increase of optical power. Devoting himself to this object, he succeeded in constructing reflectors gradually increasing in dimension from 7, 10, 14, up to 20, 25, and even 40 feet in focal length, and with apertures proportional of 6, 8, 12, 18, 24, as far as 48 inches. (See *Phil. Trans.* 1787.) Even this limit has been surpassed by Lord Rosse, who, after satisfactorily testing his new and refined modes of casting, figuring, and polishing, by the successful construction of two specula of 36 inches aperture and 27 feet focus (described by him in *Phil. Trans.* 1840), finally surpassed every former attempt, by the completion of a reflector, on the Newtonian principle, of 6 feet aperture and 53 feet focus (*Phil. Trans.* 1848). Mr Lassell has also succeeded in constructing reflectors of very great size and perfection. Commencing about the year 1819, with Newtonian telescopes of 7 and 9 inches aperture, and 7 and 9 feet focus, and proceeding onwards, in 1844, to 24 inches aperture and 20 feet focus, he has quite recently succeeded in the construction and equatorial mounting of a Newtonian reflector, 4 feet in aperture and 39 feet focus. M. Delarue, also, and Mr Nasmyth, have achieved great success in this line of optical construction. Before proceeding, however, to give any more particular account of these instruments, and the processes employed in their construction, it will be advisable to devote some attention, 1*st*, To the kind of advantages accruing from increased dimensions as a source of optical power; and, 2*dly*, To the comparative advantages and defects of large reflectors and refractors, both in reference to their convenience in use and construction, and to the conditions which determine the perfect action of each.

Sir Wm. Herschel's reflectors.

Lord Rosse's.

Mr Lassell's.

Mr Delarue's and Mr Nasmyth's.

(58.) *Illuminating, Magnifying, and Space-penetrating powers of Telescopes.*—Perfect distinctness being supposed, illuminating and magnifying power are the two great elements of telescopic vision. Except an object, whether a real one or an optical image, be sufficiently bright, it cannot be seen at all; and except the details contemplated cover a certain angular area, or subtend a certain amount of visual angle at the eye, they cannot be distinguished, however great the illumination. Experience assigns, for the generality of eyes, an angle of about 2½ or 3 minutes, as the minimum below which the form of an object (whether round, square, &c.) cannot be decerned, though its *existence* as dark on a light ground, or *vice versâ*, may be perceived under a much smaller angle. A printed page, for instance, may be read in a good light, if the letters subtend this angle. If further removed, they must be magnified by the intervention of a telescope. Now, at first sight, it would seem that, as the magnifying power of a telescope may be increased indefinitely (supposing a perfect image), we need only apply a sufficiently powerful eye-piece to see any

Illuminating, magnifying, and space-penetrating powers of telescopes.

Telescope. details, as to read a page, however distant. This, however, is not the case. As the magnifying power is increased, the degree of illumination of the magnified surface diminishes. For, supposing the whole light which goes to form the image of (say) one square second of an object's visible surface received into the eye, it will be spread on the retina over an area greater in proportion to the *square* of the magnifying power; and the illumination of the sensitive surface will of necessity be diminished in the same ratio. Now, considering only the illumination of the centre of the field of view (which that at the borders can in no case exceed), and denoting by A and a the linear apertures of the object-glass (or speculum) and the eye, and by m the magnifying power of the telescope; if *the whole* light incident on the object-glass from $(1'')^2$ of the object were received into the eye, it would illuminate the magnified image of $(m'')^2$ in the radio of $\frac{A^2}{m^2}$ while that of the natural image formed by the eye alone would be $\frac{a^2}{1^2}$. The ratio of these is $\frac{A^2}{a^2} \times \frac{1}{m^2}$. And if we take e for the extinction of light due to imperfect transparency of glasses or imperfect reflexion of metal, this will be further reduced to $(1-e)\frac{A^2}{m^2 a^2}$. Now, in no case can $\frac{A^2}{m^2 a^2}$ *exceed* unity. For even in the extreme case of $m=1$, in which case the eye-lens E must equal the object-glass O in aperture, and be equally distant from the focus F (see fig. 13), if a be

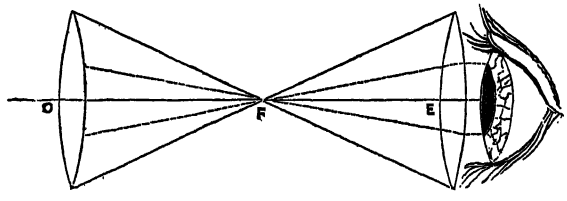


Fig. 13.

less than A, all the light exterior to the cone marked by the dotted lines will fall outside of the pupil; in other words, the effective portion of the object-glass will be limited to a, and therefore $(1-e)$ is the maximum of superficial illuminating power of which any telescope is susceptible.

(59.) The value of $1-e$, or the ratio of the effective to the incident light, after any number of successive transmissions or reflexions in a telescope, may be found by multiplying together the numbers set down in the following table for each surface, in whatever order the surfaces occur:—

	$1-e=$
After transmission through one surface of glass not in contact with any other surface	0·957 (a)[1]
After transmission through the common surface of two glasses cemented together	1·000
After reflexion on polished speculum metal at a perpendicular incidence	0·632 (b)
After reflexion on polished speculum metal at 45° obliquity	0·690 (c)
After reflexion on pure polished silver at a perpendicular incidence	0·905 (d)
After reflexion on pure polished silver at 45° obliquity	0·910 (e)
After reflexion on glass (external) at a perpendicular incidence	0·043 (f)

And thence we calculate the effective light in refracting telescopes composed of lenses not in contact, or the percentage of the incident light transmitted by simple or compound eye-pieces, as follows, viz.— Telescope.

Percentage transmitted through 1 lens	0·915
Do. do. do. 2 lenses	0·838
Do. do. do. 3 do.	0·767
Do. do. do. 4 do.	0·702

A mean of Sir W. Herschel's and Lambert's experiments would make these values somewhat higher,—viz., 0·94, 0·89, 0·84, 0·80, respectively.

And for the effective light in reflectors (irrespective of the eye-pieces), as follows:—

Herschelian (Lord Rosse's speculum metal)	A	0·632
Newtonian (both mirrors ditto)	B	0·436
Do. small mirror a glass prism	C	0·632
Gregorian or Cassegrain	D	0·399
The same telescopes, all the metallic reflections being from pure silver	A	0·905
	B	0·824
	C	0·905
	D	0·819

(60.) When the visual angle, subtended by an illuminated surface, is too small to be discerned as a *thing having figure*, its impression on the eye (all other light being absent) is simply proportional to the total quantity of light which it brings to bear on that (sensibly) one and indivisible point of the retina on which it falls. Such is the case with stars seen either with the naked eye or in telescopes, provided the quantity of light is not so much increased as to give rise to the curious phenomena of spurious discs and rings (see Optics, vol. xvi. p. 618); and hence it arises that, as the aperture of a telescope is increased, it brings into view, when directed to the heavens, still smaller and smaller stars, and *that*, apparently, *ad infinitum*; while those which telescopes of inferior dimensions barely render visible as just discernible points of light, appear more conspicuous and brilliant, *though not magnified into any visible size or shape.* From this (which is purely a physiological effect, and of which no *à priori* reason can be rendered) arises what is termed the space-penetrating power of a telescope. Taking as unity the "space-penetrating power of the eye," or that which just enables it to see the least visible star at its actual distance (1), a telescope which collects in one point of the retina a quantity of light n^2 times as great, would render it equally visible at n times the distance; and n therefore is the space-penetrating power of such a telescope. It is evident that this is independent of the magnifying power; so that the power in question (P) will be represented by $\sqrt{1-e}\frac{A}{a}$ in the notation above employed. Thus, for a telescope on the Newtonian construction, of 72 inches aperture, with a glass prism for a second reflector and a double eye-piece, we find

$$P = \sqrt{0{\cdot}632 \times (0{\cdot}915)^2} \times \frac{72}{0{\cdot}25} = 209{\cdot}5;$$

and for one of 18·8 inches aperture on the Herschelian construction, with a single eye-lens,

$$P = \sqrt{0{\cdot}632 \times 0{\cdot}915} \times \frac{18{\cdot}8}{0{\cdot}25} = 57{\cdot}2.$$

(61.) When the natural illumination of an object is very feeble, magnifying power in a telescope will to a certain extent compensate for deficiency of light. Thus it is that we can read with spectacles in the fading light of evening long after the page becomes illegible without their aid; and thus Sir Wm. Herschel found that, with a telescope whose space-penetrating power was thirty-nine times that of the natural eye, he could read the figures on the dial-plate of a distant church-clock when the daylight had so

[1] (a) By Fresnel's formula, taking refractive index for glass = 1·525; (b) by Jamin's results for the yellow rays—*Annales de Chim.* xxii. 1848, p. 230; (c) by Jamin's calculation from Cauchy's formula—*Ann. de Chim.* xix. 1847, p. 305; (d) do. do.; (e) by Steinheil's experiments; (f) concluded from (a).

Telescope.

far failed that the steeple itself was invisible to the naked eye.

(62.) *Comparative merits of Refracting and Reflecting Telescopes, and conditions requisite for securing distinct Vision with either.*—The great obstacle to the indefinite increase of dimension of metallic reflectors is their enormous weight. The 48-inch reflector of Sir W. Herschel weighed 25 cwt.; the 6-feet speculum of Lord Rosse no less than 80 cwt. Not only does this necessitate the use of very powerful and very costly machinery, both for their construction and their management when constructed, but it entails a great and serious inconvenience of another kind. The metal of which they are made, though highly elastic and rigid, perhaps as much so as glass, is yet so much heavier that, with an equal thickness, it is far more liable to bend by the mere action of its own weight in different positions of the mass; and what is of still more importance, such flexure, by altering the inclination of the polished surface to the incident rays, acts *directly* to deviate the reflected rays from their proper paths, and produce aberration. Now this is not the case in a glass lens. In refraction through an object-glass, single or compound, the convergence of the ray towards its focus is effected by the prismaticity of the surface or surfaces at the point of incidence, and so long as this prismaticity remains unaltered, is very little affected by a minute change in the inclination of the surfaces to the incident light, such as flexure of the general mass would produce. The flexure of an object-glass by its own weight, then, is productive of little or no appreciable disturbance of its optical action, and it is fortunate that it is so, since no way of supporting it could be devised without the obstruction of its light. In reflectors the case is far otherwise. A speculum of 18 inches, an aperture 20 feet focus and 2 inches in thickness, was found to be totally spoiled by supporting it on three points at its circumference; and when reclined against a flat and strong wooden back, with a single thin pack-thread interposed down the middle, all trace of figure was destroyed, and the surface divided into two lobes, each producing its own image of a star, and that a most imperfect one, connected by an irregular burr of light. No thickness that can be given to a mirror (unless quite extravagant) can obviate this;[1] and hence a perfect uniformity of support over every part of the back, and in every angle of inclination to the horizon, is the first requisite (after a good original figure) towards the good performance of a speculum. The necessity of such equable support is not obviated, it must be observed, only palliated, by the use of glass as the material of the speculum.

Comparative effects of flexure in lenses and specula.

(63.) There are several ways of giving such support. The first and most obvious is to rest the back of the reflector on a soft and equable cushion of elastic material. This succeeds perfectly well when the weight of the metal does not exceed 200 or 300 lb., in which case, a bed consisting of several layers of even-textured woollen blanket, or other similar material, is completely successful, and leaves nothing to desire in respect of simplicity, economy, or efficacy, *provided the whole be supported on a back so strong as not to yield under the pressure in any part more than a small aliquot of the total compression of the cushion.* A similar condition is requisite if the mirror be sustained by a multitude of feeble springs distributed over the whole extent of its back. For small mirrors or light ones, as of glass, an air cushion may be advantageously used. For very heavy ones, however, the following ingenious contrivance has been adopted by Lord Rosse. The back of the mirror, supposed of uniform thickness, may be considered as divided into three sectors of 120°. Suppose the centre of gravity of each of these to be sustained by a projecting knob at one of the angular points of a slab of iron, in the form of an equilateral triangle, which is itself sustained by a supporting point under *its* centre of gravity. Under such circumstances it is evident—First, that each sector being separately and independently supported, would bring no strain on the others; and, secondly, that the whole weight would be equally distributed among the three points of support. It remains now to obviate the separate individual flexure of each sector. To effect this, each may be conceived as again subdivided into three of equal area (or rather of equal weight), and the centre of gravity of each of these being found, suppose each again to be sustained by making it rest on a pin or knob at one angle of a smaller, or secondary, iron slab, which in its turn should be supported on *its* centre of gravity by making it rest on one of the points of our primary triangle. Lastly (for a 6-feet speculum), each of these secondary areas may be again conceived as subdivided into three equal tertiary areas, which may be in like manner supported on tertiary triangular slabs, each sustained at its centre of gravity on one angle of a secondary one. Thus the whole mirror would be ultimately subdivided into twenty-seven equal areas, each separately and independently supported at its centre of gravity. A speculum thus sustained would obviously be quite secured against flexure from its own weight. The idea is an extension of that of the common "splinter bar," by which, or by a combination of which the pull of two, four, or eight horses drawing at once is equalized so as to distribute the work equally among them. In its practical application by Lord Rosse, it is modified by the introduction of certain levers, which add somewhat to the complexity of the mechanism, and whose action could not be rendered intelligible in few words, or without diagrams, but which do not alter the principle of the method.

Modes of supporting specula.

Telescope.

(64.) To give perfect freedom, however, to every part of the metal to take its bearing on its cushion, or any other support, it is absolutely necessary that it should be quite free from *stickage* of any kind, and therefore that it should not be in any way fastened to its points of support, but be free to glide upon them with the least possible amount of friction; and moreover, that it should not *rest on its edge* on any fixed support when in an inclined position, or be pressed against any ring in front of it, but should lie against its cushion, pendulum-fashion. This may be accomplished (see *Results of Cape Observations*, p. xii., 1847) by *suspending* it from above in a strap or band of leather, or, for very heavy mirrors, of steel strong enough to carry it, from a point in its own medial plane in the upper part of the tube. In the 6-feet speculum of Lord Rosse, the stickage caused by friction, when resting on the bottom of the tube, amounted to two tons, or would require the full force of six horses to overcome it; and its operation was totally to defeat the good effect of the equable back support till relieved by suspending the whole mass in a chain. Mr Lassell, also, has found it necessary to have recourse to a similar mode of suspension. The annexed figure[2] (fig. 14) exhibits a simple and easily constructed suspending frame on this principle.

Suspension by a band or chain.

(65.) Another very material obstacle to the good performance of a telescope is the disturbing effect of currents of unequally heated air in the tube. In refracting telescopes, closed at both ends, there is little circulation. When the angle of elevation is suddenly altered, a temporary disturbance arises, but soon subsides. In reflectors, however,

[1] Lord Rosse found that a strong pressure of the hand, applied at the back of his 6-feet speculum, nearly 6 inches in thickness, produced flexure enough to distort the image of a star. In one of M. Foucault's silvered glass mirrors, the excess of central pressure of an air-cushion, slightly over inflated, destroyed all distinct vision, which was instantly restored on allowing the excess of air to escape.

[2] From a drawing made about the year 1845.

Telescope. whose front aperture is necessarily open, as night advances

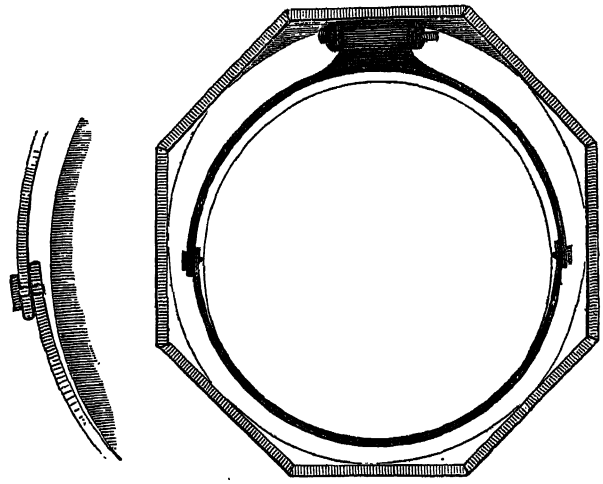


Fig. 14.

and the air cools, there is a constant current and counter-current of warmer and colder air ascending along the upper and descending along the lower part, or occasionally taking on spiral motions, which cause great and singular distortions and movements in the images of objects. The remedy is to dispense with a *tube*, and use only a light but stiff skeleton framework of iron to connect the large speculum with the small one and the eye-piece. (*Results of Cape Observations*, p. xv., note.) Lord Rosse has recently mounted a 3-feet reflector on this principle, which has also been adopted by Mr Lassell in that of 4-feet aperture mentioned in art. 56.

(66.) The performance of an achromatic object-glass is often very materially improved by stopping out the central rays by a small circular disc (exactly centred), of from a twelfth to a tenth part of its diameter, which intercepts only $\frac{1}{144}$th to $\frac{1}{100}$th part of its light, the increased distinctness much more than compensating for this sacrifice. Limiting the aperture of the object-glass or speculum, also, to its inscribed equilateral triangle, is often useful in stellar observation, as it reduces the "spurious discs" of *stars* to very small points. (See Optics, *ut supra*.)

Telescopes with silvered glass specula.

(67.) *Of Telescopes with Glass Specula.*—Newton was the first to suggest the idea of employing a concave glass, silvered on the back, for the larger reflector of his telescope (Opt. i., prop. viii.), on account of the alleged greater facility of polishing glass than metal, and its non-liability to tarnish. The unwieldy weight of large metallic specula (which in Newton's time could not be contemplated as ever likely to become a practical obstacle to their enlargement), has given importance to this line of construction, and induced several eminent persons to turn their attention to it, and in the first place, to obviate a material defect in that proposed by Newton, viz., the production of colour by oblique transmission through glass supposed of equal thickness throughout. The first construction of this kind we have to notice is that proposed by Caleb Smith in 1739 (*Phil. Trans.*, 1740, p. 326). ABC (fig. 15) is a glass meniscus, silvered on the convex surface B. This will collect rays of *red* light incident on its concavity parallel to REB, the common axis of its surfaces, in a point Q in front of it, because the lens being a positive one,[1] will give the rays in their first transmission through it a certain degree of convergence, which will be increased by reflexion on a concave surface, and still further increased by re-transmission through the lens. And it is evident, that as the reflexion tends to produce no separation of the coloured

Caleb Smith's construction.

rays, the place of the violet focus P will lie nearer to the lens H than Q, those rays being more refracted, *i.e.*, made Telescope.

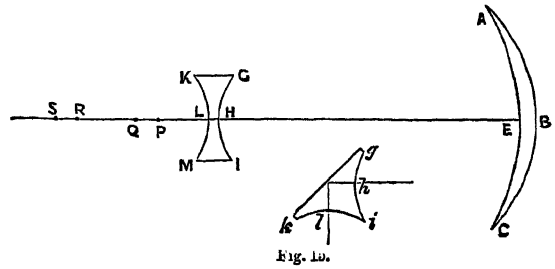


Fig. 15.

to converge more, in both their transmissions through AC. Now, let the rays be incident on a concave glass surface, GHI. Then, if its curvature be properly chosen, the red rays, instead of converging to Q, will, after refraction, converge to R, a point more distant. Suppose, then, a pencil of violet rays to be incident on H, converging to the *same* point Q, this would be brought to a focus at a point S more distant (as having their convergence more counteracted). And as the conjugate foci of a lens move in the same direction, if the focus of incident violet rays, first supposed to be at Q, be moved towards H up to P, its real place, their conjugate focus S will move in the same direction or towards R, and by assigning a proper concavity to the surface H, may be made to coincide with it. This condition, as the reader may easily satisfy himself, is equivalent to the following relation between $\frac{1}{R}$, the radius of the convex silvered surface $\frac{1}{\phi}$, the focal length of the meniscus regarded as a lens, $\frac{1}{\delta}$, the distance EH, and $\frac{1}{\rho}$ the radius of the concave surface H, viz.:—

$$\rho = \delta\ (1+\frac{\delta}{V}) + \frac{2\mu}{\mu-1}\left(\frac{\delta}{V}\right)^2.\varphi; \quad . \quad . \quad (a)$$

where μ is the refractive index of the glass used, and $V = 2(R+\phi)-\delta$.

(68.) Thus, after refraction at the first surface H of the lens, all the coloured rays will converge to one point R beyond the lens; and if the second surface be worked to a spherical concavity, having R, so found, for its centre, this convergence will not be altered; so that an achromatic image will be formed at that point. The radius of concavity requisite for this being denoted by $\frac{1}{\rho'}$, will be given by the equation—

$$\rho' = -\delta\ (1+\delta\frac{\delta}{V}) - 2\varphi.\left(\frac{\delta}{V}\right)^2; \quad . \quad . \quad . \quad (b)$$

As an example, Smith takes the case of a meniscus worked to radii of 40 and 48 inches respectively, so that $R=\frac{1}{40}$; from which, by assuming $1{\cdot}56 = \mu$ for the refractive index of the glasses, its focal length as a lens comes out 428·45 in., and as a reflector, 18·293 in. Taking, then, 15·963 in. for the distance of the glasses EH, he assigns 2·8 in. for the radius of the surface GHI, and 6·7 in. for that of the surface KLM. We find, from the formulæ given above, 2·695 and 7·062 for the exact values, the difference arising from a slight arbitrary alteration made by him in one part of his calculation, which destroys its numerical exactness.

(69.) If the silvered lens, instead of a meniscus, be concavo-convex, the refracting lens must be a meniscus. In either case, for the latter lens, it is obvious that in practice a prism of 45°, having its surfaces (*ghi*, *kli*) worked into

[1] Having a convex character, tending to produce convergence.

Telescope

concavities of the same radii as those of the lens, must be substituted to give the telescope a Newtonian form, and thus prevent the observer obstructing the light. There being two radii and a distance disposable, by assuming a proper relation between them, the spherical aberration may be also corrected; or, by leaving all the four radii arbitrary, and omitting Smith's condition that the second surface of the small lens shall be concentric with its focus, a greater latitude of choice will be afforded, and better curves, practically speaking, rendered available.

Mr Airy's construction.

(70.) The next construction of this nature is that of Professor Airy, who proposes (*Camb. Phil. Trans.* ii. 105, 1822) to silver one side of each of the two glass lenses, so as to give the resulting reflector a Gregorian or Cassegrain form. In this construction, the large mirror is either a meniscus, or a double-convex lens, silvered at the back; and the smaller (supposing a Gregorian form contemplated), a negative lens of a concavo-convex form, silvered also on its convex or posterior surface, and placed, not as in Smith's construction, between the large reflector and its focus, but beyond it, as in fig. 16. (If the Cassegrain form be con-templated, the reverse must be the case, and the small lens must have its posterior silvered surface concave. The reasoning, *mutatis mutandis*, being similar in both cases, we shall suppose the form Gregorian.) In this case, the coloured red and violet pencils (as in Smith's construction) will be brought to foci Q and P; that of the red Q being *nearer* to the *small* reflector than that of the violet. Now, in this arrangement, the small lens being negative in character, both the transmissions through it act in opposition to, and partly counteract the convergency impressed on the rays by reflexion at the internal concavity KLM. And it is by the excess of the latter action over the sum of the former, that the pencils are finally made to converge to a point at or near E. The convergent portion of the total effect is equal on rays of all colours, being produced by reflexion; but the divergent portion, arising from refraction, is greater for violet than for red, and, therefore, *the excess, or the final convergence*, greater for the red than the violet. If, then, both those coloured pencils, in their incidence on the small mirror, had diverged from one and the same point, the independent action of that mirror would bring the red rays to a *shorter* focus than the violet. But, in point of fact, the former rays (by what has been above shown) diverge on it from a point Q nearer to it; the effect of which, in the case of reflexion at a concave surface, is to lengthen the focus, *i.e.*, to act in opposition to the independent action of the small mirror as above described, and so to correct the coloured aberration. By a proper adjustment, therefore, of the powers of the two lenses, *regarded as such*, the red and violet foci may be united at E, and *therefore*, if the lenses be of the same glass, all the intermediate rays; so that in this construction (and the same is true of Smith's) *no secondary spectrum will be produced*, and a perfect achromatism attained. This

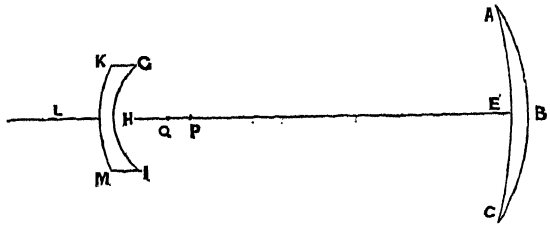


Fig. 16.

adjustment, as Mr Airy has demonstrated, will be effected by employing lenses for the two reflectors, whose powers, the one as a positive, the other as a negative lens, are to each other inversely as the squares of the distances of the first formed image from the two reflectors respectively. Telescope.

(71.) Since there are four spherical surfaces, and therefore four radii of curvature disposable, this condition establishes only one relation among them. The length of the telescopes, and the distances of its two specula from the first-formed image being assigned, this is equivalent to the establishment of two others. For the determination of all the radii, there remains yet one other relation among them which may be such as shall secure the destruction of the spherical aberration. The calculation is too complex for insertion here, but leads, as Mr Airy has shown, to a final cubic equation, which, having always a real root, such destruction is always possible.

(72.) Hitherto nothing has been said about the portions of light reflected from the first surfaces of the glass mirrors (in each reflection about 2½ per cent. of the incident light). No adjustment of the curvatures of the surfaces will unite these finally into a common focus with the transmitted portions. On the contrary, in any conceivable state of the data, they will ultimately converge to or diverge from points very remote from that common focus and from each other, and will therefore be so dispersed and enfeebled on reaching the eye-glass, and so small a percentage of them will reach it at all, as to create no perceptible haziness or confusion in the image.

Glass specula silvered by Liebig's process.

(73.) A few years ago, a method was discovered by M. Liebig, of coating glass, by an elegant chemical process, with a film of pure silver of perfect continuity, the highest possible reflective brilliancy, and exceeding thinness and evenness of substance, so much so as even to possess a certain very feeble transparency, the sun being visible through it, of a dull blue colour.[1] This has been taken advantage of, in the first instance (in March 24, 1856—*Gazette Universelle d'Augsburg*), by M. Steinheil, and somewhat later (Feb. 1857—see *Comptes Rendus*, vol. xliv., p. 330), without knowledge of M. Steinheil's results, by M. Leon Foucault, to produce silvered glass specula in the following manner:—A glass disc, of the requisite diameter, and thick enough to bear grinding and polishing without distortion (but which needs not to be *optically pure*, streaks and veins in its substance being of no moment), is worked and highly polished to a true concave parabolic figure on one of its surfaces, which is then coated with silver by Liebig's process. The thin metallic film thus formed is then polished by delicate friction, with a cotton pad covered with the finest glove leather, little or no polishing powder being needed. Its texture is so close, and its thickness so perfectly uniform, that it at once and with the utmost facility receives a perfect polish, and retains a true optical surface, identical with that of the glass paraboloid to which it adheres.[2] Construc-tions of Steinheil and Fou-cault.

(74.) The advantages offered by this construction (supposing the performance of large reflectors so executed to correspond to the reasonable expectations excited by the complete success of trials on a moderate scale) are immense. In the first place, glass, weight for weight, is incomparably stiffer than metal; so that a glass speculum, to be equally strong to resist change of figure by flexure, need weigh only one-fourth of a metallic one. Secondly, a glass disc of 6 or 8 feet in diameter may be cast, annealed, and wrought with infinitely less labour, hazard, and cost than one of speculum metal. Thirdly, supposing a slight tarnish to arise from sulphuration, the reproduction of the polish is

[1] Gold leaf in like manner transmits a feeble green light.

[2] The most successful process for silvering has been found by M. Delarue and Dr Miller to be that described by M. Liebig in the *Annalen der Chemie und Pharmacie*, xcviii., p. 132. It is also stated at length in the *Notices of the Astronomical Society*, xix., 171. An easier (possibly a better) process, is that of M. Petitjean, described in No. 57 of the *Photographic News*, iii., p. 49.

Telescope.

the work of a few minutes, and is performed without any chance of injuring the figure. Even if irretrievably spoiled, the silver coating can be instantly removed, and a fresh one laid on at a comparatively trifling cost, the parabolic figure once given to the glass being indestructible. Fourthly and lastly, the reflective power of pure silver (according to Steinheil's experiments) is, to that of the best speculum alloy, as 91 to 67, or as 1·36 to 1.

(75.) The largest reflector on this construction which we have heard of as being completed, is one by M. Foucault, of $0^m{\cdot}33$ (= 13 in.) aperture, and the singularly small proportional focal length of $2^m{\cdot}25$ (7 ft. 4½ in.), with which, under a magnifying power of 600, he has succeeded in separating the small double companion of γ Andromedæ, well known to astronomers as a test of the performance of a good telescope. M. Foucault is said to be actually engaged on the construction of others of larger dimensions, one of 15 in. being so far completed as to give an excellent view of the moon; directing his attention, however, rather to giving extraordinary perfection to the parabolic form of the glass-surface than to increase of aperture; and *that* most judiciously, inasmuch as the perfect figure, once imparted, is permanent; whereas, in metallic specula, it is destroyed, and has to be reproduced at every repolishing. His processes for this purpose are quite peculiar, and will be noticed more particularly hereafter. M. Kaiser (*Astron. Nachr.*, 1070) reports very favourably of the performance of a glass speculum by Steinheil, of 4 in. aperture and 8 ft. focus, which divides λ and τ ophiuchi, very difficult double stars; and he is understood to be engaged on one of 13 in. aperture, for M. De la Rue's equatorial.

Helioscopes with glass specula unsilvered.

(76.) Nothing prevents the adoption of Liebig's process of silvering to produce the internal reflective coating in Mr Airy's and Caleb Smith's constructions; and as the metallic film might then be preserved from sulphuration and abrasion by a coating of copal or mastic varnish, the reflectors would be indestructible.

(77.) *The Helioscope.*—There is yet another species of reflecting telescope to be noticed, the specula of which are made of unsilvered glass, employing only the portions of light reflected at their first surfaces. The object of this construction (first proposed by the author of this article in 1847 —see *Results of Astron. Obs. at the Cape of Good Hope*, p. 436) is to obviate the necessity of employing darkening glasses in viewing the sun with telescopes of great power, which break by the heat and endanger the eye, besides other inconveniences. It might be imagined that this end would be effected by simply contracting the aperture of any good telescope, and so shutting out all superfluous rays. But this does not succeed in practice. Perfect distinctness is not attainable in telescopes with very small apertures and high magnifying powers, when directed to the sun, moon, or planets: a certain ratio of the aperture to the focal length (not less than one-twelfth or one-fifteenth as the minimum) is requisite; so that, if we would obtain the full advantage of a large aperture and high power, some means of suppressing, or otherwise getting rid of, a large percentage of the sun's rays, becomes necessary. This is done by the following arrangement:—The large speculum (A) of a Newtonian telescope is a double concave crown or plate-glass lens, the radius of curvature of whose anterior or reflecting surface is twice the proposed focal length. This surface must be worked to a true parabolic figure. The back requires only to be well polished, and worked (whether accurately or not is of no moment) to any moderately deep concavity. Neither is the quality of the glass, as to veins or streaks, of any consequence, *provided it be colourless.* When the sun's rays are incident on such a glass, about 2½ (2·6) per cent. are reflected at the first surface, and converged towards a focus F. The rest falls on the second surface, and is for the most part transmitted and dispersed out at the back of the telescope (*which must be open, to permit* Telescope.

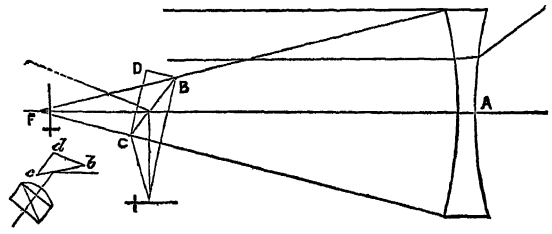


Fig. 17.

their escape into the air, so as not to heat the glass and thereby distort its figure). The small percentage reflected internally is dispersed by the joint action of this reflection and a second refraction out into the air, forwards, and so rendered incapable of interfering with the image formed by the first surface. The rays from this are received and partially reflected at 45°, on (BC) the *first* surface of a crown-glass prism BCD, having a refracting angle C (turned towards the eye) of not less than 30 or 40 degrees. The intensity of the light finally reflected then will be about $0{\cdot}026 \times 0{\cdot}030 = 0{\cdot}00076$, or about $\frac{1}{1300}$th part of the direct illumination; which, being further enfeebled by magnifying (art. 58), will allow the image to be viewed either without a darkening glass, or with a very feebly coloured one, and without any danger of fracture. The transmitted portion of the cone of rays converging to F, pursues the course indicated in the figure, and is entirely thrown out at the mouth of the telescope, the prism being set transparent for that purpose. Only the reflecting surface (BC) of the prism needs to be truly worked, and (as in the case of the large speculum) its perfect homogeneity is of no moment. M. Porro, an eminent French artist, has recently constructed an instrument (exhibited to the French Institute, Jan. 28, 1858) on a principle very similar to this, only that the second reflection, instead of being performed at an incidence of 45°, is performed at the polarizing angle for glass (incid =55°, obliquity =35°); so that the rays form an image completely polarized in the plane of reflexion; and a Nicol prism being placed between the eye and the eye-piece, the light may be enfeebled to any extent we please without the use of any darkening glass.

Binocular telescopes.

(78.) *Of Binocular Telescopes.*—One of the first conditions which the States-General of the Hague imposed on Lippersheim (the reputed Dutch inventor of the telescope), on his application to them for a patent (which they refused him, on the ground of the alleged prior publication of the invention, while agreeing to pay him a high price for a stipulated instrument), was, that it should be binocular. They had no idea of restricting the newly acquired faculty to one eye and keeping the other idle. It is no doubt more comfortable to use both eyes in looking through a telescope, as in natural vision; and the binocular principle has also this advantage (assuredly not contemplated as one of their motives for insisting on it), that when each eye looks through a separate telescope, the foci may be separately adjusted to perfect vision for each, and then a long and a short sighted eye (and few persons have both exactly alike in this respect) may be brought into precisely consentaneous action.

Usual construction.

(79.) The usual form of the binocular telescope is that of two equal and equally magnifying refracting telescopes, mounted side by side at a fitting distance, to admit of each eye being applied to its corresponding eye-piece at the same time. Of course this restricts the aperture of either telescope not to exceed the interval between the centres of the two pupils. But this is no contemptible aperture, and although for the most part the use

Telescope.

of this construction is confined to the small double opera-glasses, with which every one is familiar, it has also been employed (though without any very great practical advantage) to astronomical purposes, for viewing the sun, moon, and planets. When used for viewing near objects, the mounting must admit of a slight convergence being given to the axes of the telescopes, to direct them at once to the same object. If this be not done, the object is seen double; but so soon as the images are brought very near, they suddenly spring together, even while some minute deviation still subsists, in a very singular and striking way; while the sensation changes at once, from that of contemplating a picture, to that of viewing a real object.

Binocular telescopes. M. Vallack's construction.

(80.) No particular description of an instrument of this kind can be needed. But a binocular construction, imagined by M. Vallack (*Ast. Soc. Notices*, viii. 139), is of a higher kind, and merits notice. He proposes to place two Newtonian reflectors, of *any* (equal) apertures and magnifying powers, side by side as in fig. 18, with both their

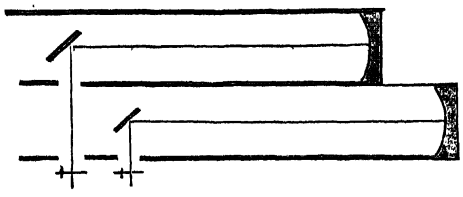


Fig. 18.

axes in the plane passing through the two pupils. The small mirror of the further telescope is placed closer to the large one than that of the nearer, by a distance equal to the whole aperture of the latter *plus* the thickness of tube, so that the two images shall be formed equi-distant from the two eyes. By this ingenious device the binocular principle is rendered available for telescopes of any aperture.

Stereoscopic principle of Mr Wheatstone

(81.) It is, however, only when used in combination with the principle of stereoscopic vision (as explained by Mr Wheatstone), in all its extent, that the full advantage of binocular vision through telescopes can be realized. When an object, at any considerable distance, is viewed through an ordinary binocular, the base afforded by the interval between the eyes is too small to bring them up to a high relief, or to define the relative situations of several objects seen together, in space. But, by artificially enlarging this base, the same advantage is gained which would arise from increasing the personal dimensions of the spectator to giant size. He will thus be enabled to view a distant complex object (as a town or a group of mountains), as a person of ordinary size would contemplate a model of it placed much nearer to him.

(82.) A very simple experiment will illustrate the way in which this takes place. On a horizontal board (ABCD fig. 19) place two looking-glasses (EF), with their planes vertical,

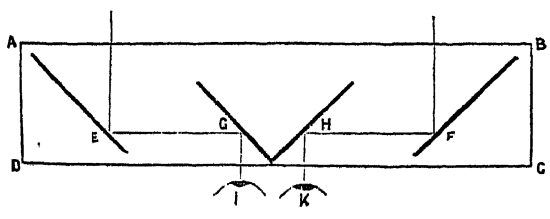


Fig. 19.

and set on stands, so as to allow of their being turned round in any azimuth. In the middle of the board place two others (GH), smaller and similarly mounted, their centres being distant from each other by the interval between the two eyes (about $2\frac{1}{4}$ inches), their planes being parallel to those of EF, and their reflecting surfaces turned towards the others respectively. All the glasses being placed at about 45° to the length of the board, their planes are to be adjusted by turning them a little in azimuth, until the two images of a distant object, seen by the two eyes, at IK, by double reflexion, are brought into exact coincidence. When this is the case, they will seem to spring into one, as described (art. 77), and the object so seen will appear *nearer* and *smaller* than when directly viewed. The increased apparent proximity is a consequence of the greater convergence of the visual pencils, by which the object is seen by the two eyes: the apparent diminution is a consequence of its being judged to be nearer, while subtending the same angle at the eye.

Telescope.

(83.) This diminution may be counteracted, and converted into an apparent augmentation, by interposing between the two pairs of reflectors (EG and FH) refracting telescopes of equal apertures and magnifying powers.[1] Or two such telescopes may be fitted with reflectors at 45°, at the object and eye-end, and fastened on the arms of a jointed ruler, to allow of adjustment to objects at different distances. Or a single tube may be fitted with equal object-glasses at the two ends, and with their corresponding eye-pieces in the middle between them, each furnished with a reflector, directing the visual pencil out at right angles, into eye-tubes at $2\frac{1}{4}$ in. apart. Reflectors, adjustable by a screw motion, may be fitted into caps and applied externally beyond the object-glasses, giving the instrument the convenient and portable form represented in fig. 20;

applied to the binocular telescope.

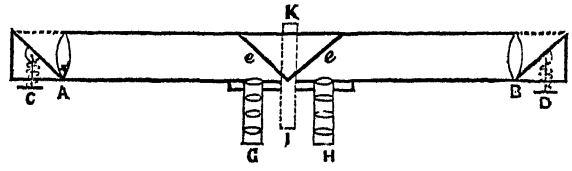


Fig. 20.

in which AB are the object-glasses; CD, the adjusting screws for the external reflectors (of silver deposited on glass by Liebig's process); *e e*, the internal reflectors, one or both of which may be made delicately adjustable by a fine screw, to bring the images into their ultimate exact coincidence; GH, the eye-tubes, with day eye-pieces; and IK, a small finder, to direct the instrument to any object.

Construction of lenses and specula; and, first, of lenses.

(84.) *Of the Methods practised in the actual Construction of Lenses and Specula.*—Having thus described the principal combinations of refracting and reflecting surfaces, which have been devised for the construction of telescopes, it remains to say something of the practical means which have been adopted for the actual manufacture of the specula and lenses. They require a delicate and difficult art, especially as regards the former, where parabolic, elliptic, or hyperbolic figures have to be communicated to the polished surfaces in the very act of polishing them. In the case of lenses, as we have seen, all the requisites of a perfect telescope can be attained by the use of truly spherical surfaces, and these it is comparatively easy to form, by reason of the natural tendency of two surfaces which grind each other by equable rubbing over every part, to work each other into a spherical concavity and convexity exactly fitting. Practically speaking, when it is intended to work a glass surface to a sphere of an exactly assigned radius, the nearly approximate spherical form of the right curvature is first communicated to it by grinding in a metal basin, of the proper concavity, which may be done to some

[1] The arrangement here described, in this its most simple form, was suggested and tried successfully by Mr A. S. Herschel in 1855. A stereo-telescope has been described, and we presume constructed, by M. Helmholz, but we are not aware (Oct. 2, 1859) of its precise form or its date.

Telescope. considerable nicety by turning the tool in a lathe, to fit a guage. The lens is then connected, or otherwise firmly attached, to the lower end of a vertical rod of wood or metal AB (fig. 21), the upper end of which terminates in a steel ball, working in a cup, to which it has been accurately fitted by smooth grinding, so that every point of the surface A of the lens, when made to oscillate or revolve conically, by a motion given to the rod by a hand grasping it at B (where it is enveloped in woollen cloth or felt, to prevent the communication of warmth), will move in a spherical surface, concentric with the ball C. Below is fixed a *small* polisher D of pitch, spread on brass coated with some fine polishing powder, mixed with water, and brought up into delicate contact with the lens by a fine screw motion, and the rod being worked to and fro, and circularly, so as to bring every portion of the lens equally over the polisher, by degrees a perfect spherical and polished surface is acquired, the radius of which can be adjusted with any requisite precision by lengthening or shortening the radius-rod by a screw adjustment. Lenses may also be figured and polished to perfect spherical, and probably also to good parabolic or hyperbolic surfaces, by any of the processes which are found to succeed in the case of specula, and indeed with greater ease and certainty, the material being little, if at all, harder, the texture at least as close and equable, and the weight much less obnoxious. Mr Grubb, of Dublin, has constructed an apparatus equally applicable to both, which has produced very successful results.

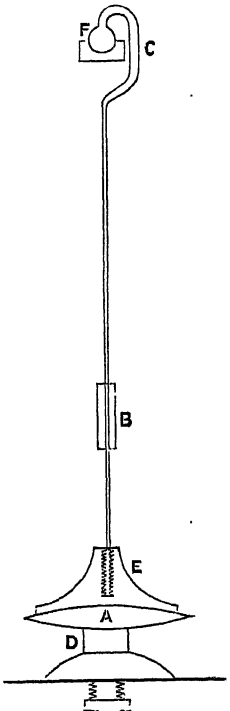


Fig. 21.

(85.) The glass discs are either cut from blocks of glass, as practised by Fraunhofer and, we presume, by his successors, or moulded out of selected fragments of such blocks, softened by heating to redness, and carefully annealed; which, when once pure glass fit for the purpose is obtained, offers no peculiar difficulty of manipulation. With metal specula the case is very different, the material being much more intractable, so that with these the peculiar difficulties of construction commence with the formation of the disc itself to be operated on.

Materials of metallic specula. (86.) The raw material of metallic specula at present in use is an alloy of pure copper with pure tin. In the origin of this art various other metals were added in small proportion. Thus Hadley recommended an alloy of 24 copper, 12 brass (copper and zinc), 12 of tin, and 1 of silver; Painter, 32 copper, 13 tin, and 1 antimony; Edwards, 32 copper, 15 tin, 1 brass, 1 silver, and 1 arsenic; the latter of which alloys gives a beautiful metal, but excessively brittle. These small admixtures of other metals are now pretty generally abandoned, as it is by no means clear that they are productive of any advantage. Mr Lassell, however, adds still a portion of arsenic. Mudge (*Phil. Trans.*, vol. lxvii., p. 298), who was the first to reject these additions, recommends the proportion of 64:29, or 31·18 per cent. of tin, approaching very nearly to an atomic composition of 4 atoms of copper to 1 of tin, which gives a percentage of 31·79. The latter is the proportion found by Lord Rosse to give the most brilliantly reflective metal, and the least liable to tarnish; labouring, however, under the disadvantage of excessive brittleness, and of such extreme hardness, that a steel file will barely mark it. Sir William Herschel found it impracticable, by the methods then in use, to obtain durable castings of a speculum 36 inches in diameter, or even with certainty of 24, with so high a percentage as 29·41, these metals, however slowly cooled, cracking in the mould; and for one of 48 inches he was obliged to lower the percentage to 25 for the same reason. For smaller specula his usual composition was that of 29·41, above mentioned, which, when well polished, he found to reflect 0·673 of the incident light. In making the mixture it is indispensable to cast the metal first into ingots, and then to remelt it (which requires a much lower heat than that required for the first melting, which must be that of melting copper), adding a small quantity of tin to replace that destroyed by oxidation, and stirring the melted metal before pouring with a wooden pole (as in the "poleing" of copper castings). Telescope.

Moulding, casting, and annealing. (87.) The destruction of the more brittle metal, by cracking in a close mould, is owing to the violent tension induced in the internal portions of the mass by the simultaneous fixation of the *whole external crust*, while the interior remains fluid, and which cannot then contract in dimension without solution of continuity. Mr Potter (Brewster's *Jour.*, N.S. iv. 18, 1831), by casting the metal into a mould, the lower surface of which consisted of a thick mass of steel, succeeded in determining the rapid fixation of the lower surface, and the subsequent abstraction of the heat by conduction through it in the same direction, and thus solidifying the mass in successive strata from below upwards, allowing each new stratum to accommodate itself in some degree to the already contracted state of the previous one. Dr Macculloch (*Journ. of Science*, June 1828) had previously recommended quick cooling to the fixing point, not to obviate fracture, but to prevent crystallization, but without a word as to the mode of accomplishing it.[1] The same principle has been adopted by Lord Rosse in the casting of his large specula, with perfect success. An iron bed was prepared of strips of iron-plate, set edgeways, and forcibly held together by an iron ring. These were turned on a lathe to a convexity equal to the intended concavity of the mirror, and the metal being then poured into an *open* mould, formed by ramming sand round a pattern laid on this bed, assumes a close-grained and even surface, free from pores, by the escape of air or vapour between the iron-plates. The difficult and costly construction of such a bed is dispensed with in Mr Lassell's practice, by using a solid one of cast-iron, inclining it slightly, introducing the fluid metal at the lowest point, in a smooth, even flow, and gradually reducing the inclination to the horizon, as the mould fills, to an exact level.

(88.) The metal, when solidified, still requires long and most cautious annealing in a furnace or oven, at first red-hot, but gradually suffered to cool for many days, or even weeks, the walls and roof for this purpose being very massive, and every aperture carefully closed. Even when thus prepared, such is the brittleness of the material, that even the sudden affusion of moderately hot water occasions fracture.

Grinding. (89.) The next process to be performed is the grinding, to prepare it for which the disc must first be *edged* or brought to a clean, round circumference, by grinding it with emery on a concave iron tool or basin, so as to give its margin a gentle convex slope, inwards, which, in the subsequent operation on a convex tool, allows of its passage over the coarser grinding particles without splintering or tearing the edge. It is then ground on such a tool, turned by a gage as nearly as possible to a segment of a sphere of the intended radius, which should be of iron; and if for very large metals, divided into squares by grooves cut into its surface, to allow the free circulation of the grinding powder,

[1] In all other respects his paper is a wonderful example of what a multitude of words can do towards obliterating meaning.

Telescope.

and the water with which it is mixed. If the metal be of moderate size, not exceeding 20 inches in aperture, and strong enough to bear rather rough handling, this process is most easily performed by working it to and fro, with short strait strokes, and with a regular rotation on its centre, *upon* a solid and massive cast-iron tool of the same diameter as the metal, or only a very little larger, avoiding to go much over the edge. When this is done the tool must not be divided into squares, as the lodging of coarse particles in the grooves would be fatal to the operation. By this adjustment the abrasion takes place uniformly over the whole surface, and the curvature has no tendency to alter. If the tool be smaller than the mirror, it is obvious that, the central portions of the latter being always ground, while the circumferential alternately escape, the centre will be more abraded than the rest; and as the mirror and tool react on each other, and always tend to a common curvature, the curvature of both will increase, and the focus be shortened. On the other hand, if the tool be much larger than the mirror, and its edge be little or not at all overpassed at each stroke, *its* centre will be more abraded, the curvature of both flattened, and the focus lengthened. On this principle, by lengthening or shortening the stroke in grinding, on a tool but little larger than the mirror, a certain (though not a great) command over the focal length is obtained.[1] Coarse emery is used at first; but so soon as the whole surface is found to be attacked, it must be changed to finer, and, as the scratches disappear, for still finer, obtained by washing and allowing the coarser particles to subside, till at length the smoothness is so perfect, and the fitting of the surfaces so equable, that it seems to float on the tool, and (however heavy) requires no more force to move it than if it literally did so. For very large and massive specula, however, both Lord Rosse and Mr Lassell have found it preferable to lay the metal down on its back, and grind it from above by a lighter and more manageable tool, divided into squares, as above described.

Polishing and figuring.

(90.) When the metal is reduced by grinding to a perfectly true and even surface, free from the smallest perceptible scratch, it will be found reflective enough to afford an image of a star, or of a distant white object, sufficiently distinct to try whether its focal length is correct; and, if it be so, the process of polishing may be commenced, the object of which is not merely to communicate a brilliantly reflective surface, but at the same time a truly parabolic form.[2] If the material of the tool on which this operation is performed were perfectly hard and non-elastic, it is evident that this would be impracticable, since none but a spherical form could arise from any amount of friction on such a material once supposed spherical; and even if parabolic, it could not communicate that form to a more yielding body worked upon it otherwise than by a rotary motion about a common axis, which, with the slightest inequality of hardness in the metal, would infallibly work it into rings of unequal polish. Happily, however, there exists a material which, with sufficient hardness to offer a considerable resistance to momentary pressure, is yet yielding enough to accommodate its form to that pressure when prolonged, and at the same time sufficiently elastic to recover it if quickly relieved; that substance is pitch, whose properties, in this respect, were at once taken advantage of by Newton, with that sagacity which distinguished all his proceedings, as the fitting material for a *polisher*. A coating of this substance, liquefied by heat, is spread over the surface of a convex tool of a radius equal to the concavity of the speculum. The tool which has served for the grinding process will be well fitted for this use; but if the metal be a very large one, and it is intended to polish it face uppermost, a lighter tool will be preferable, and Mr Lassell even employs one of deal plank, crossed in two thicknesses, and glued together, to obviate warping (a glass or slate slab would perhaps be better). If the tool be of iron or brass, its weight will require to be partly counterpoised. On such a tool the pitch should form a coating, which need not be more than a quarter of an inch in thickness. For small specula, however, which are intended to be polished face downwards, the tool may be a heavy mass of lead or iron, covered to a depth of half an inch with the pitch. In either case, the pitch, when laid on and cooled, must be moulded to the exact form of the mirror, either by very gently warming the latter (by the affusion of tepid water), or by similarly warming the polisher itself, which is safer when very brittle metals are concerned. A first approximation to the exact form will be attained by interposing a sheet of fine muslin, wetted and strained over the surface. The pitch must then be cut into small squares, not exceeding 1½ inch, or 2 inches in the side, separated by angular grooves or gutters, whose office is to receive the liquid necessary to moisten the polishing powder, to allow of its circulation, and to suffer the atmospheric pressure to act on the lower surface, and thus prevent adhesion in the act of lifting off, or when the surfaces do not exactly fit. In Lord Rosse's practice the tool itself is cut into such squares, which are not filled up by the very thin coating of pitch he applies; what does get in being removed by a cutter. In Sir W. Herschel's (who almost always operated by laying the speculum on the polisher, and working it face downwards) the squares were cut with a peculiar oblique-edged chisel or cutter, kept from sticking by frequent wetting, to very clean and definite edges; and, to promote the even distribution of the polishing material, the surfaces of the squares themselves were scratched or scarified, so as to subdivide them into still smaller ones. Circular gutters, crossed by others radiating from the centre, are sometimes employed, but are objectionable, and, on the whole, a uniform system of squares is both easiest and most effectual. Their free communication, *inter se*, is however of the last importance.

Telescope.

Formation of a pitch polisher.

(91.) The proper quality and consistency of the pitch, also, is of great moment. Mr Lassell's test of hardness is the impression left by a sovereign standing vertically on its edge upon it, which in one minute ought to leave three complete impressions, of three milled notches at the then temperature of the atmosphere. Sir W. Herschel used a "pitch gage," being a weight of about half a pound, resting at one end of a wooden lever, on a supporting blunt edge of a piece of brass, by the depth of whose impression, in one minute, he was enabled to judge of the hardness. If pitch be too soft, it may be hardened by remelting with heat enough to vaporize some of the essential oil of turpentine it always contains; if too hard, a little of this oil, or of a softer pitch, may be added. But, besides the hardness, pitch varies exceedingly in quality, some specimens being quite unfit to communicate a fine polish. The best in Sir W. Herschel's experience was a mixture of brown Swedish or Stockholm pitch and a darker coloured and less glutinous variety, formed by boiling down American tar to a hard consistency. It is almost needless to remark, that the pitch employed should be fresh, taken from the centre of the barrel in which it was imported, and quite free from gritty or fibrous particles.

Quality and consistency of pitch.

---

[1] If this latitude be not sufficient, the tool may be rendered flatter by grinding upon it a much smaller mirror or a flat disc; or the mirror be rendered more concave by laying it face upwards, and grinding it for a time with a much smaller tool, after which the grinding must be repeated in the regular way on the proper tool.

[2] An intermediate step is sometimes interposed—viz., that of figuring the metal so ground on a bed of hones, imbedded in hard pitch, and previously brought to a true figure. Messrs Nasmyth and Delarue lay great stress on this part of the process.

Telescope.

(92.) In the practice of all previous artists, followed both by Sir W. Herschel and Mr Lassell, the operation of polishing was performed by the surface of the pitch itself. Lord Rosse, however, uses this substance as, strictly speaking, only an elastic and yielding cushion, coating it over with a layer of harder substance, consisting of resin, melted with dry wheat-flour, and a small quantity of turpentine. So far as the experience of the author of this article extends, he is disposed to believe this additional preparation unnecessary.

Polishing material;

(93.) That the final operation of polishing and figuring a speculum is one of great delicacy may be concluded from what is said in art. 56, of the thickness of metal which, in one of the largest dimensions, makes the difference between a spherical and parabolic surface. How far the processes now to be described are commensurate in delicacy to such requirements, may be gathered from the following experiment:—A speculum, 18¾ inches in diameter, was polished with sesquioxide of iron (*rouge* or *colcothar of vitriol*, in the language of the old chemistry). After 1000 strokes of reciprocating motion, each 4·5 inches in length, the whole of the polishing material, with all the matter abraded, was very carefully washed off both from the mirror and polisher, collected by subsidence, digested with nitro-muriatic acid, precipitated, and the copper taken up by ammonia, and re-precipitated by sulphuretted hydrogen. The sulphuret obtained weighed 2·6 grs., corresponding to 1·75 grs. of copper, or to 2·33 of abraded metal. This quantity distributed uniformly over the surface would form a coating only 0·0000045, or less than a two hundred and twenty thousandth of an inch in thickness.

its preparation.

(94.) The "rouge" in question is sold for the use of jewellers, and is an exceedingly sharp and cutting material. Lord Rosse prepares it by precipitating the sesquioxide of iron from its solution by ammonia and igniting. We have found it easiest prepared by fusing together, in an earthen crucible, sulphate of iron, sulphate of soda, and nitre (first fritted together to drive off the water), in the proportions 1, 2, 3, and after half an hour's ignition, pouring the melted mass into water. The salts being thoroughly abstracted by copious edulcoration, the finer particles are washed over (adding a minute quantity of gum-arabic to the water), and subsided for use. When the polisher is duly guttered and scarred, a paste or cream of this sediment and water is laid on over the whole surface with a fine camel-hair brush, and the polisher moulded to exact fitting by suffering the metal to rest on it (or *vice versâ*) for a few minutes, shifting its position, however, every five or six seconds, and then slowly and cautiously giving it a continuous motion over the whole surface.

Mudge's process for giving figure.

(95.) The earlier artists who occupied themselves with the construction of specula, having to deal with metals of no great weight, were content to work them by hand, the back of the speculum being cemented to a wooden block for convenience of handling. The process is described with great minuteness by Mudge in the Memoir already cited. In the beginning of the operation, when fresh from the emery grinding, the metal is worked round and round upon the polisher, carrying the edge but little over that of the latter, and now and then interrupting the circular movement with a cross-stroke. The effect of this is to drive the pitch inwards and force it to accumulate towards the centre of the polisher, and in consequence he found that in this way of working the polish invariably commenced in the centre, and extended itself gradually to the circumference of the metal. The form being originally perfectly spherical, it is evident that the figure thus communicated must deviate from that form by a continual and regular increase of curvature towards the centre, or, in other words, in the direction of that of the paraboloid. This process, then, was continued until the polish nearly reached the edge, when the circular motion was exchanged for short strait strokes carried across the centre, the operator meanwhile walking round the table on which the polisher is firmly bedded. The polish thus is extended equally over the whole surface, the figure meanwhile reverting to the sphere. Finally, the polish being perfected, which is known by the perfect smoothness of the working, recourse is again had to the circular motion to restore the parabolic figure, which is accomplished in a few minutes, but if overpassed, can only be brought back by going again over the whole process of working out a spherical figure by cross-strokes, and finishing by circular ones as before. It does not appear how Short worked his admirable specula, but Mudge, with whom he was contemporary and in habits of communication, considers himself as having strong reasons for believing their processes identical.

Telescope.

Sir Wm. Herschel's processes.

(96.) Sir William Herschel commenced his labours in this department of practical optics, on small metals, by hand-working, but this proving impracticable for large specula, he was led to the adoption of machinery, not, however, merely for the advantageous application of power, but by reason of the regularity of movement so attainable. Our limits will not permit us to give any account of the innumerable contrivances and experiments, failures and successes, by which he was gradually led up to the form of machinery and course of procedure in which he finally rested, which we shall here briefly describe, and whose availability we have ourselves repeatedly tested by successful operations on three specula of 18¾ inches in diameter, as well as on others of smaller dimensions.

(97.) In this system of operations the speculum is worked (as already stated) face downwards, by strait, or nearly strait, strokes, on a polisher constructed as described in art. 90, of a diameter very little larger than the speculum, if circular, or, if oval, having the larger diameter in the direction of the stroke, and not exceeding that diameter by more than one-fifth. On an average of a great number of the most successful experiments with specula of all sizes, the proper diameter for a circular polisher may be taken at 1·06, and the larger and shorter diameter of an oval one at 1·12 and 0·97, that of the speculum being 1·1. When an oval polisher is used, and retained in a fixed position, the gutters must be cut at angles of 45° with the longer axis, so that the stroke shall always carry the metal across, and in no case *along* them.

(98.) The mechanism is adapted to give the following movements to the speculum and the polisher—viz., 1st, *The stroke*, being a reciprocating movement by which, acting alone, the centre of the speculum would describe a strait, or nearly strait, line, to and fro in a nearly invariable direction. 2dly, *The side-motion*, by which the track of the centre is shifted laterally at every stroke, or every alternate one, through a short interval, so as to carry it backwards and forwards by regular steps to a certain distance on either side of the centre of the polisher. 3dly, *The round motion of the speculum*, by which it is turned at each stroke, or alternate stroke, through a certain angle on its own centre, so as to vary the relative direction of the stroke in reference to the speculum all sorts of ways; and, 4thly, *The round motion of the polisher* (when a circular one is used), by which the gutters are presented successively at every angle of obliquity to the direction of the stroke.

(99.) The polisher being duly anointed with the creamy sediment, above described, the speculum (carefully cleaned) is laid down on it; and a "polishing ring," of a construction represented in fig. 22, is laid upon it. This apparatus consists of, 1*st*, A cylindrical outer ring AAA, whose depth is such that its lower rim shall not graze the polisher when moved across it. 2*dly*, A claw BCB, attached to the ring by two pivots BB, and having a hole C, to connect it by a pin to the lever which communicates the motion. 3*dly*, A flat interior ring of thin iron *a a a*, not attached to the outer

Telescope. ring, but sustained in loose contact with it by three pins DDD above, and other three (not shown in the figure) be-

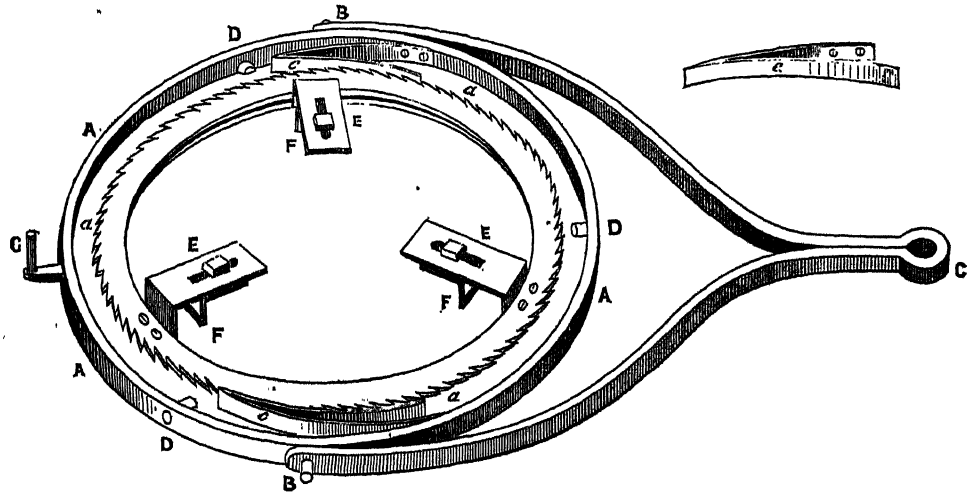


Fig. 22.

low it, between which it can revolve freely in its own plane. This ring carries three cocks EEE, which rest upon the speculum, and so carry the whole apparatus, whose weight is small in comparison with that of the speculum, and, if necessary, may be counterpoised. By means of the flanges FFF projecting downwards, covered with felt, and adjustable by screw-pins, the speculum is held concentric, but not pinched or constrained, the felt being so adjusted as to touch the speculum a little below the middle of its thickness. Over the attachments of these cocks is screwed a ratchet-ring, by the action of an arm on whose notches the interior ring and the speculum with it can be carried round on its centre. *c*, *c* are two long springs, of the form shown in the margin *e*, whose office is to keep the arm, or arms, in question up to the ratched edge. *Lastly*, From the exterior ring projects a connecting-pin G, on which can be hooked a *tail*-piece for communicating the side motion.

(100.) The mode in which motion is communicated to this apparatus is shown in fig. 23. The loop C of the polishing

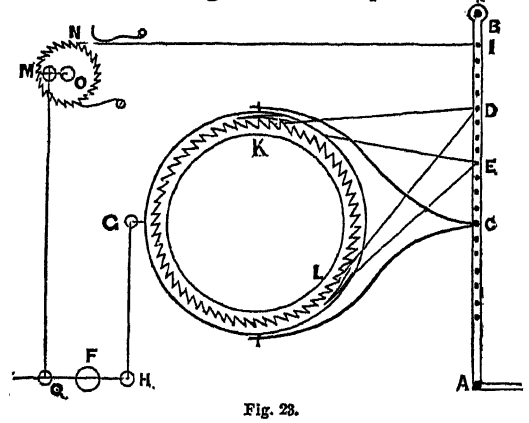


Fig. 23.

claw is pinned on a fixed point of the lever AB, movable to and fro by a force applied at A, round a firm centre B. This would carry the centre of the speculum to and fro over the same space which C describes, which is the "length of the stroke," and can be measured on a scale by a traversing point projecting beneath the lever. To prevent the centre from wandering, a tail-piece GH is looped on to G, either working at the other end H, on a fixed centre F, or on a stud-joint in a lever HF, which gives the "*side motion*," in a manner presently to be described. By proper adjustment of the length of the arm GH, H being on the side of CG, opposite to B, it is evident that a very nearly rectilinear motion in any one stroke will be given to the centre of the speculum. Telescope.

(101.) The round motion is given to the speculum by two arms DI and DK; the one a pushing, the other a pulling one, acting on the ratchet-wheel by claws at the ends, as represented in the margin at *f*, being lightly held against it by the springs *cc* (fig. 22). The other ends of these arms work on a pin D, attached to the lever at a distance from B, the centre of motion, less than BC, so that in the reciprocating motion of the lever, D traverses a less space than C, and the difference of motion causes the claws at K and L to work along the ratchet, and turn the mirror round, with the whole interior ring, on its centre, through an arc determined by the number of teeth of the ratchet brought into action at each stroke. The round motion of the polisher, when a rotating polisher is used, is similarly communicated by placing it on a bed, revolving horizontally on rollers on a solid metal ring, consisting of a flat circular iron plate, ratched at its circumference the contrary way of the speculum's round motion, and worked round by two claws attached at E to a pin at the under side of the lever, and pressed home by springs against the ratchet in the same manner. This is not shown in the figure, to avoid confusion. The angular amount of both these rotations can be varied within pretty extensive limits, by shifting the pins DE which attach the arms to the lever into one or other of a series of holes arranged along it.

(102.) A similar arm, attached to a pin at I, gives its impulse to the side motion, by acting on a ratchet-wheel N, carrying an arm OM; but as it is necessary that the tail-piece GH, and the lever arm BC, should be on contrary sides of the line of stroke, the revolving motion of the crank-arm OM is communicated by a rod MQ acting on the opposite arm of the lever FH, and thus gives a reciprocating motion to H, and therefore to G, at right-angles to the line of stroke. The extent of the side motion is varied *ad libitum* by altering either the length of the crank-arm OM, or of the lever-arm FH, or both.

(103.) All these movements, then, are completely under command, and adjustable in their relative extent. The stroke, too, or the side motion, if needed, may be made excentric, or non-symmetrical, with respect to the polisher, by varying its situation, or that of the pin C, or the length of the arm GH. Every change in these dispositions is found, as a result of experience, to have its peculiar influence on the figure; and by a long induction from innumerable experiments (all minutely recorded), Sir W. Herschel was enabled to communicate at pleasure an elliptic, parabolic, or hyperbolic form to his specula, or to change any one of these forms into any other. The length of the stroke, and the extent of the side motion, would seem to be the most influential elements; and a similar average, from the record of the same experiments as those employed in deducing the averages of art. 97, assigns 0·47 for a good working length of stroke on a round polisher, without side motion, and 0·29 stroke, and 0·19 *total amount* of side motion (from

Telescope.

side to side) with it, as good average adjustments, the diameter of the speculum being 1. In our own personal experience, however, an oval polisher, fixed in position, and guttered at 45° to the axis, has given results so satisfactory, at least for specula of 18¾ inches, as to lead us to rest in that construction, which is of simpler mechanism. The round motion of the speculum corresponding to the other adjustments above set down, taking an average of the same series of experiments, is, *without* side motion, once round in 61 strokes; and *with*, once in 114.

(104.) Lord Rosse's system of polishing is also one of strait strokes, with a side motion and a rotatory motion, both of the speculum and of the polisher; the latter spontaneous (being produced by the friction of the speculum on it); the former under control, and produced by a special arrangement for that purpose. His machine is shown in section in fig. 24, in which A is a shaft connected with a steam-engine, or other source of power; B an excentric, adjustable by a screw-bolt to any given length of stroke, from 0 to 18 inches; C a joint; D a guide; EF a cistern

Telescope. Lord Rosse's process.

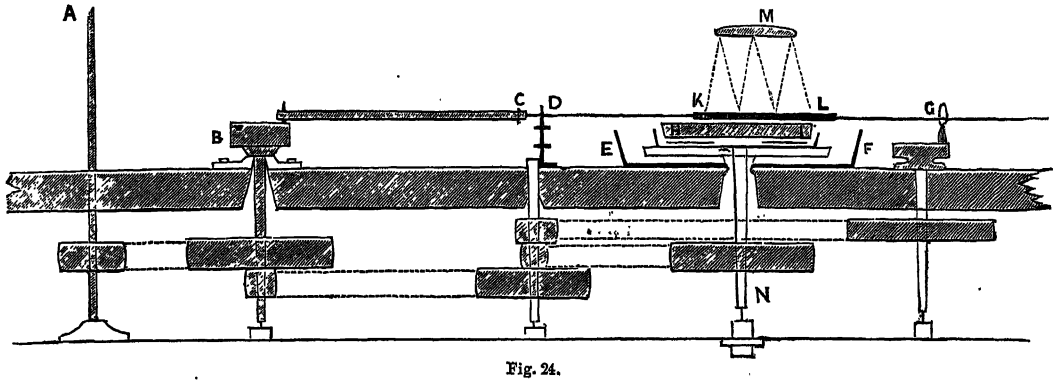


Fig. 24.

for water, in which the speculum revolves, and which is maintained at a temperature of 55° Fahr., the hardness of the resinous coating of the polisher being adjusted to that temperature; G is another excentric, adjustable, like the first, to any length of stroke, from 0 to 18 inches. The bar DG passes through a slit, and therefore the pin at G necessarily turns on its axis in the same time as the excentric; HI is the speculum in its box, immersed in water to within an inch of its surface; and KL the polisher, which is of cast-iron, and weighs (for a 36-inch speculum, to which also the other dimensions above specified correspond) about 2½ cwt.; M is a round disc of wood, connected with the polisher by strings hooked to it in six places, each two-thirds of the radius from the centre. At M there is a swivel and hook, to which a rope is attached, connecting the disc with a lever and counterpoise weight, so adjusted as to sustain the whole weight of the polisher, all but 10 lb., which is therefore the amount of pressure upon seven square feet of surface, or 1·43 lb. on each square foot. The bar DG (seen here in section, but in fact opening into a ring) fits the polisher nicely, but without tightness, so that the polisher turns freely round, usually about once for every 15 or 20 revolutions of the speculum, and it is prevented by four guards from accidentally touching the speculum, and from pressing upon the polisher by the guides through which its extremities pass. The wheel B makes, when polishing a three-feet speculum, 16 revolutions per minute; but for smaller sizes the velocity is increased by changing the pulley on the shaft A; for larger, diminished. For a six-feet speculum 8 strokes per minute was found to be a proper velocity. The length of the primary stroke, or that given by the crank-movement B, is one-third the diameter of the speculum, that of the excentric G (or the side motion) one-fifth that diameter, from side to side, and variable according to the ratio of the diameter to the focal length. The period of rotation of G is once round in 15 strokes, while the speculum is made to revolve on its centre by means of the vertical axle N, which supports it, in 26 strokes. These adjustments have been found by Lord Rosse to command a good parabolic figure.

(105.) During the act of polishing, the speculum is supported in its box on the very same system of triangular plates and levers, which constitute its bed when in use. In fact, these supports are never removed, and the metal is transported on them in a horizontal position from the polishing apparatus to the telescope in the very same state of equilibration as when polishing. So sensitive has Lord Rosse found even the largest and most solidly constructed specula to any deviation in this respect, that the mere act of lifting them off their supports has produced a *permanent* alteration of figure, a result certainly which could not have been expected with so highly elastic a material.

(106.) The best and most satisfactory test of the perfect figure of a speculum, is its optical performance under favourable atmospheric conditions. When the *spurious* disc of a single star (or both those of a very close double one) is seen under a high magnifier, perfectly round and neatly defined, without rays or diffused light (other than the coloured rings due to diffraction, and which, when the apertures are very large, are much less offensively developed than in small telescopes); and when, too, on throwing the telescope out of focus, first one way and then the other, the area of the circle into which the image is dilated presents a similar distribution of light (proceeding from the centre outwards) on either side of the focus, the foci of all the annuli into which the speculum can be supposed divided cannot but coincide; and should any difference exist, the several annuli may be tested separately by covering the speculum, or the aperture of the telescope, by a circular screen, out of which is cut an annular opening corresponding to the area to be examined. If, on so dividing the area of the speculum into three or more annuli, and a central circle, the central, middle, and outer portions are found to agree in giving the same precise focal length under a high magnifier, the mirror may be pronounced perfect, so far as its figure is concerned. Another test, which can be applied without waiting for opportunities of weather, consists in the dial-plate of a watch, or a very white card, with clear small printed characters on it, fixed at a great distance, which should be seen with equal distinctness for all the annuli, without altering the focus, or rather, *which should all give the same focus when thrown out of focus and restored.* M. Foucault employs a peculiar method, different from either, which will be described presently.

(107.) Mr Lassell's system of polishing depends entirely on circular movements, and the combination of such; in virtue of which, every point of the polisher (in this system, as in Lord Rosse's, lying *on* the speculum) would, if not allowed to rotate on its own axis, describe in reference

Mr Lassell's process.

Telescope. to the speculum an epicycloidal or hypocycloidal curve, alike for every point in the surface; but when allowed, or obliged so to rotate, a curve which, for the central point of the polisher only, is such an epi-or hypocycloid, and for any other point one of a higher order, and not the same for every point in the surface. The mode in which this is accomplished will be readily understood from the annexed fig. (25),[1] in which A is the speculum resting on its lever-supports (one of which is seen at B) in a cistern of water maintained at a proper temperature (of not sufficient depth to cover the surface). This cistern is not shown in the figure. It is carried (with the speculum) concentrically, on a wheel C, which revolves on a vertical axle D, being driven by a worm E acting on an oblique-toothed edge, and turned by a spindle F with adjustable grooves, and a cross-band G communicating with an upper similar spindle H, in immediate connection by a strap and gearing-wheel II with the moving power. Thus the speculum is maintained in *slow* and *smooth* rotation. On it rests the polisher J, of light material, as already described (art.), to which motion is communicated by a pin at its centre, which, in Mr Lassell's original construction, is not fixed into the polisher, but merely enters loosely a hole or cup in its centre, so that the area of the polisher is carried bodily about over the surface by this pin, while it is thrown into rotation on its centre by the difference of friction on its different parts, arising from differences both of relative velocity and of adhesion. To this movement we shall presently have occasion to return. Meanwhile the centre-pin is carried round in a hypocycloid by the following mechanism. Telescope.

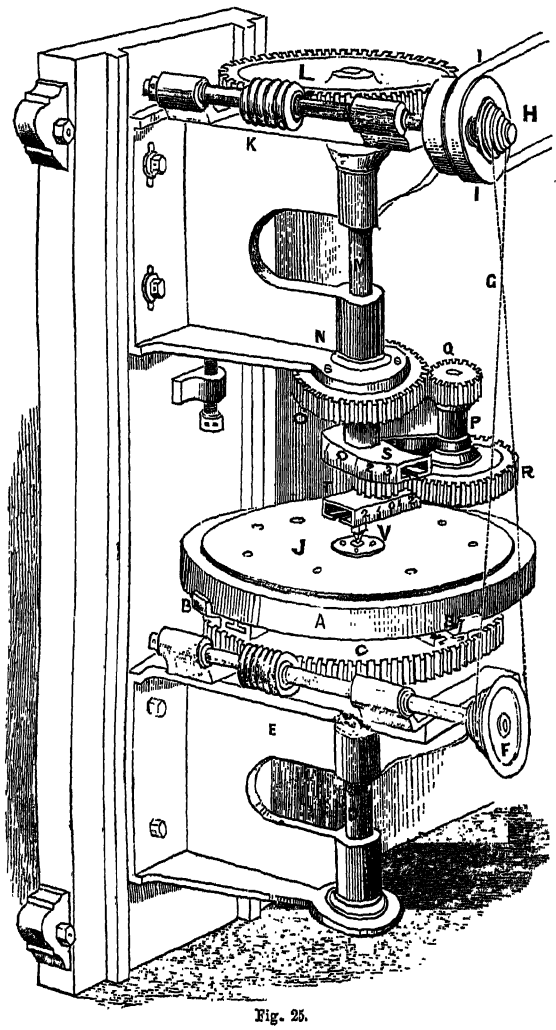


Fig. 25.

(108.) The spindle-head H turns a worm K, similar to E, and acting on the oblique-toothed wheel L, similar and equal to C, and having its axle M, in the prolongation, in a right line with the axle D, though not continuous with it. This axle passes down through the horizontal arm N, and through the centre of a toothed wheel O, *fixed* on and making a part of that arm. The prolongation of the axle below O carries, attached to, and revolving with it, 1*st*, a broad vertical iron arm PP, which is hollowed at its farther extremity, so as to allow the passage of another vertical axis, which it carries round with it, and which is itself thrown into more rapid rotation, in the same direction, by the pinion Q, at its upper extremity, which gears into the teeth of the fixed wheel O; 2*dly*, a sector S, a portion of a circle concentric with the moveable axle P, hollow and grooved internally, so as to allow a pinion T, projecting beneath it, to revolve on an axis adjustable to any place in the groove, and this pinion being kept always in gear with the wheel R, is thrown into yet more rapid rotation in a contrary direction. Finally, to the under side of this pinion is attached another hollow and grooved crank-arm V, in which the pin that works the polisher can be fixed at any distance from the axis of T within the limits of its length. By this mechanism it is evident that the pin will be carried circularly round a point which is itself maintained in circular motion. The polisher is fed from time to time with water, as it grows dry by evaporation, from the exposed edge of the speculum, through holes, as seen in the figure. The speculum can be made to revolve the same, or the opposite way, to the rotation of the polishing pin, by crossing or uncrossing the endless band G, and its relative angular velocity can be varied by shifting this band from groove to groove of the spindle-heads AH.

(109.) Such is Mr Lassell's mechanism in its original and simplest form. It needs little consideration to see the advantages it offers over the vibratory system. All the movements are continuous and perfectly smooth. The speculum and polisher are never allowed to come for a moment to relative rest, which, even with crank-movements, is unavoidable in the vibratory system, at the end of each stroke, by reason of the play of the parts, and thus not only shocks, but the unsettling of the particles of the polishing powder, and ruffling the surface of the pitch, are completely obviated. What may be the influence of these latter causes will be rendered apparent by a phenomenon which presented itself on one occasion to ourselves, in polishing by straight reciprocating strokes a speculum of 6 inches in diameter. On taking it off, the polish was brilliant, but however carefully wiped and cleaned, it seemed to have impressed upon it an image of all the grooves of the polisher, which, on minute microscopic inspection, was found to be owing to the existence of innumerable almost infinitesimally fine hair-lines, traceable to an abrupt termination in a little crook, at one end, but thinning off into nothing at the other. These evidently arose from polishing particles freshly brought into action, with a slight fluttering motion at the commencement of the stroke. But what was very singular, and not so easily accounted for, they seemed distributed over the surface quite casually, nor could the least tendency to a crossing linear arrangement of their terminations in any fixed situation be detected. In fact, the appearance of squares vanished on near inspection, and was only seen when the eye was withdrawn and the mirror inclined, when they appeared rather as an optical image in the air, at some undefined distance, than as if traced on the metal; and that this was really their character was

[1] From the *Transactions of the Royal Astron. Soc.*, 1849.

Telescope.

proved, on varying the inclination of the metal, when they dilated and contracted in apparent size, shifting at the same time their places on the surface, and undergoing to a certain extent a change from square to rhomboidal forms.[1]

(110.) The radii of the first and second excentric cranks (S and V), which have been found by Mr Lassell to give satisfactory results *under this arrangement*, for a speculum of 24 inches aperture and 20 feet focal length, are, for the first excentric, S, 1·7 in. (=S); for the second, VS, 1·4 in. (=Q)[2], in that of a 10-inch speculum of 80 in. focus, S=1·4 in., Q=0·9; and for the last-mentioned aperture, and 110 in. focus, S=0·8 in., Q=0·7 in. The diameter of the polisher to that of the metal may be taken as 92 to 100. The rapidity of movement may be such that the second excentric shall make about thirty-four revolutions per minute.

Mr Lassell's subsequent improvements.

(111.) The exact symmetry of the epicycloidal curves about the centre in this machinery was found by Mr Lassell to produce a tendency to bring on the polish, not uniformly over the whole surface, but in rings, gradually enlarging, till the polish became perfect in every part. This of course must be attended with some corresponding irregularity of figure, and to obviate it, he was led to deviate in some measure from the rigorous application of circular movement, so far as to displace the centre of the speculum under the polisher backwards and forwards, through a certain interval, and thus, by varying continually the incidence of this tendency, to destroy its effect on the polish and figure. The mechanism by which he succeeded in accomplishing this (and which in principle is the same as the introduction of a side-motion in the vibratory system) is as follows:—The speculum, instead of resting immediately on the upper surface of the vertical axle (D, fig. 25), reposes on an iron-plate *a* (fig. 26), as seen in section and in plan,

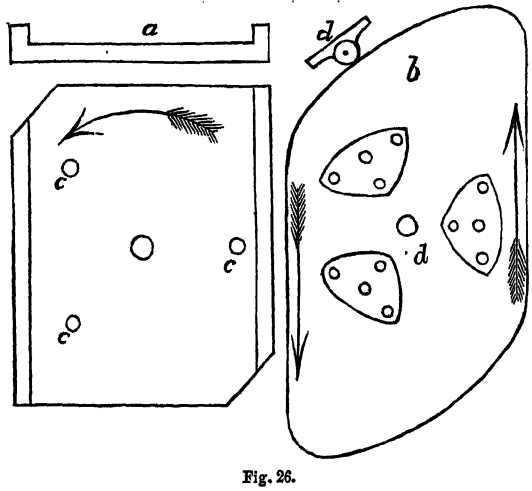


Fig. 26.

which, by three holes *c c c*, drops on three studs screwed into the upper surface of the wheel C. On this rests the plate *b*, fitting so as to slide easily between the raised sides of *a*, and carrying the triangular lever supports on which the speculum lies. *d* is a roller in a frame projecting from the wall plate W (fig. 25), which, as the axle D revolves, comes in contact with the obliquely-curved ends of the plate *b*, each once in a revolution, and forces it (the roller being itself immovable) to slide between the flanches smoothly and regularly, producing the effect of a correcting cross-stroke amid all the circular ones, and annihilating all ringlike tendency. An inch and a half, or two inches, of lateral thrust, so produced, suffices for a two-feet speculum. The improvement of figure, and the certainty of success in the operation, resulting from this contrivance, is described by Mr Lassell as very striking.

Telescope.

Mr Delarue's further improvements.

(112.) Mr Delarue, observing that in this arrangement the rectilinear motion given to the speculum takes place always along the same diameter of its area, with an effect injurious to distinctness, has recourse to a mode of obviating this inconvenience, which may be easily understood without an additional figure, by conceiving the mirror not to rest directly on the movable plate *b* (fig. 26), but on a circular iron-plate interposed, capable of revolving on the pivot *d* in its centre, and carrying on its upper surface the three triangular lever supports. The edge of this plate is grooved, to admit an endless catgut band, passing over two pulleys connected together, attached to a vertical jointed arm, so as to allow them to move to and fro in the direction of the central displacement, thus retaining always the same distance from the circumference of the wheel. The band is led over these pulleys, and two other fixed pulleys below them, to a small grooved wheel fixed on the spindle D below, and is kept tight by a heavy weight applied to pull outwards the arm carrying the pulleys. Thus, a very slow relative motion of rotation is given to the speculum round the pivot *d*, in the contrary direction to that in which the plate *b* itself is carried round, and the diameter, which is parallel to its sides, or in the direction of the arrow, is constantly shifted.

(113.) Another and final improvement introduced by Mr Delarue is destined to obviate the irregularity of rotation of the polisher on its centre-pin, which, it will be recollected (art. 107), is produced in Mr Lassell's apparatus by the mutual reaction of the speculum and polisher, and is therefore apt to vary much in speed, or even to go by starts. In Mr Delarue's mechanism, the pin which drives the polisher, though *loosely fitting* (not to constrain its even bearing), is not round but hexagonal, so that the polisher *quoad* rotation is commanded by the pin. But this, were the pin merely that marked V in fig. 25, would oblige the polisher to rotate in precise conformity with the angular velocity of V on its axis, which would be much too swift. Mr Delarue, therefore, substitutes for Mr Lassell's lowermost crank V, which carries the polishing pin, another crank of a more complex construction, carrying a train of wheels very similar in their arrangement, and set in motion on the same principle as the upper train OQRT. The axle of the pinion T is hollow, and is penetrated by an internal spindle, not partaking of its motion, but held firm by the clamp which fixes the place of the pinion in the sector S. To the lower end of this spindle is keyed fast a wheel of fifty-two teeth, which performs as a (relatively) fixed wheel the same office as the upper fixed wheel O. On this spindle *revolves* the crank which supplies the place of V, and which goes along with the pinion T. This crank consists of a triangular iron frame, composed of two parallel plates, kept asunder by pins, which serves to carry the axles of a train of wheels, whose action will be best understood by the diagram, fig. 27, *a*, where T is the pinion carrying round the framework and its wheels around the fixed wheel *a*, which gears into another *b* of an equal number of teeth,

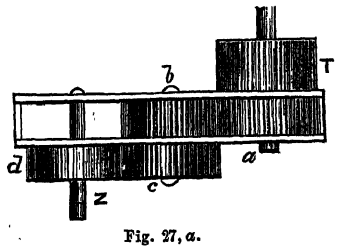


Fig. 27, *a*.

and which carries on the same axle another similar *c* gearing again into another similar *d*, which carries the polishing pin Z. By this mechanism the wheels *b c*, which

[1] This strange phenomenon has only once presented itself in the course of our experience. Mr Delarue informs us that a similar one has also occurred in his own.

[2] Q in Mr Lassell's notation.

Telescope. may be considered as one, being carried round the fixed wheel *a*, revolve in the *same* direction as that rotation (see fig. 27, *b*), while the third *d* revolves relatively in the opposite; the ultimate effect being that the wheel *d absolutely* does not revolve at all relatively to the wheel *a*, but keeps one of its diameters (as marked by the arrow) always parallel to the corresponding diameter of *a*. If the reader find this difficult to conceive, let him lay down three shillings on a table, working together by their milled edges, and holding one (*a*) tight down, carry the other (*d*) lightly round by the gentle pressure of the finger. If the heads on *a d* be placed parallel at first, they will always remain so, while that on *b* revolves twice round for each rotation of *b* round *a*.

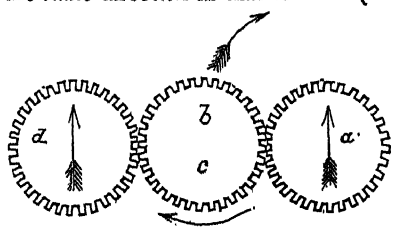


Fig. 27, b.

(114.) The polisher then carried by *d* will therefore, under this arrangement, rotate only so fast as the wheel *a* rotates by the motion of the crank-arm, PP. If the wheels *a* (*b c*) *d*, instead of having the same, have different numbers of teeth, thus (*a*, 52; *b*, 52; *c*, 54; *d*, 50), even this rotation will be modified and made to approximate to that which the polisher takes up *on an average* when left uncontrolled. And when the numbers are 52, 52, 51, 53 (which are the numbers found most advantageous by Mr Delarue), the result is a movement of the point in the periphery of the polisher, in an epicycloid of thirty-four loops for seven rotations.

(115.) There is only one particularity in this contrivance yet unnoticed. The situation of the centres of the wheels *a* (*bc*) *d* need not be in a right line. The axle of *d* is therefore made movable round *b* by fixing it in an arm (part of the crank frame), movable on the axis of *b c*, as its centre, so as to vary the interval between the centres of *a* and *d* from *nil* up to a certain maximum, and thus to make the *centre* of the polisher revolve in a circle of any size from *nil* up to that maximum. It is fixed in any desired position by a clamping-screw, pinning it in a *slot* or narrow circular guiding slit in the upper plate *e* (fig. 27, *a*) of the crank-frame.

(116.) Such is Mr Delarue's mechanism, which has afforded very admirable results in the production of specula 13 inches in aperture and 10 feet focal length, the perfection of which is enhanced by his practice of bestowing the same care and precision on every step of the figuring of the speculum, from the grinding, the smoothing on a bed of hones, or rather a slab of slate cut into squares, carefully brought to the same figure; and to the figuring of the polisher itself, which, being thus previously rendered almost perfect, the speculum is saved the rough work of having to figure the polisher for itself on every occasion of repolishing. For this part of his system of working he acknowledges his obligations to Mr Nasmyth, who has also engaged with much success in these delicate operations.

(117.) The combination of the epicycloidal movement of the polisher specified in art. 112, with the movements of the speculum itself, described in arts. 109, 110, gives rise to a relative epicycloidal movement of much complexity, and of which the general character is that of a near approach to rectilinearity in the circumferential regions of the speculum, over a considerable part of each stroke, with a short and highly curved loop at each extremity. Thus the general character of this system of polishing may be described as a blending of the rectilinear and circulating form of stroke, regulated to perfect smoothness and evenness of distribution, according to a regular law over the whole surface. Nor does there seem the slightest ground for doubting its applicability to specula of any size. Telescope.

(118.) These improvements, or their equivalents, have been adopted by Mr Lassell, who, however, limits the rotation of the polisher to a slow uniform movement round its axis, at the rate (for a 24-inch speculum of 20 feet focus) of one revolution to every thirty revolutions of the pinion T (fig. 25), corresponding to which he assigns for the excentricity of that pinion upon the sector S, S = 1·50 in.; for that of the polishing pin upon the crank V, Q = 1·00 in.; for the semi-thrust of the speculum itself, 1·52; for the diameter of the polisher, 23½ to 24 inches, and for its weight 16 or 18 lb.; the working speed being such that the pinion T makes seventeen revolutions per minute. With these adjustments he considers success in giving a true parabolic form certain, and the efficacy of a change in any of them so distinctly ascertained, and the whole process so entirely under control, that taking four nine-inch specula A, B, C, D, all sensibly perfect even in the opinion of a competent judge, he would engage to take A, B, and C successively to the machine, and communicate to A a sensibly elliptical figure (having the focus for central rays shorter than for marginal ones), to B a figure sensibly hyperbolic (affected with the opposite error), while C should come off apparently unaltered, as compared with the untouched one D, and all should give round images of stars when *in* focus, and the penumbra when *out* round and symmetrical.

(119.) Mr Grubb, of Dublin, has also devised a very ingenious mechanism for figuring and polishing reflectors, which equally secures the regular rotation of the polisher on its axis, and which the reader will find described and figured in Nichol's *Physical Sciences*, art. Speculum, from the learned pen of Dr Robinson. Mr Grubb's mechanism.

(120.) M. Foucault, in working the parabolic surfaces of his glass reflectors for silvering (art. 76), after attaining a good spherical figure in the first instance by grinding to a fine and considerably reflective surface, discards all further mechanical appliances for its conversion to a parabolic curve by a system of regulated movement, and works by hand-abrading; by gradually polishing off, with tools and polishing materials of fitting delicacy, the difference in substance between a spherical and parabolic segment of equal focus (which, as we have seen, art. 56, amounts in a 4-feet speculum of 48-feet focus, to less than a 21,000th part of an inch in thickness, even at the extreme edge). To enable him to execute such a manipulation with certainty, it is necessary to have at every instant a test of the state of the surface infinitely more delicate than can be afforded by any mechanical means of measurement; and this he finds in the following optical processes, by which every, even the smallest, irregularity of level in the surface, and every, the minutest, deviation from its proper inclination to the axis, is made glaringly conspicuous. [As to the process of hand-abrasion, it is analogous to that by which a truly plane form is given to extensive steel surfaces in engine work, where the prominences are reduced, not by grinding the whole of one plane surface against another, but by a series of local abrasions, tested from instant to instant by contact with a fiducial plane.] M. Foucault's processes.

(121.) M. Foucault's first procedure for the detection of irregularities of figure is to place very near to the centre of curvature a minute object, as the point of a pin. The image of this will be formed of the same size, and very near to the object itself—side by side, for instance, and can thus be compared microscopically with the object, and thus an approximate judgment of the figure can be formed. As a still nicer test, he places an object, having parallel sides (such as the edge of a thin piece of steel, about $\frac{1}{10}$th of an inch thick), near the centre of curvature, being enlightened from the side opposite the mirror. Its image then is seen dark on a bright ground, and if viewed with Detection of irregularities of figure.

Telescope. the naked eye at the distance of distinct vision, each of its parts is seen by rays converging only from a small portion of the surface of the mirror, the others passing beside the pupil. If, then, the curvature be not uniform, or offer irregular gradations, the edge will appear distorted: contractions and dilatations will appear—each indicative of a corresponding more or less abrupt change of curvature. Finally, and still more delicately, a thin piece of metal, pierced with a small hole of above $\frac{1}{300}$th of an inch in diameter, illuminated with artificial light, is placed within the centre of curvature, the rays diverging through which come back and form an image situated a little beyond that centre. By placing the eye in the cone of rays which, having formed this image, diverge anew, and bringing it gradually almost close to the image, the whole pencil is received, and the whole surface of the metal is seen illuminated. If, now, an opaque, rectilinear edge be brought near the image of the hole, and be made to infringe on it by degrees, the mirror will also by degrees lose its brilliancy, and when all the light is about disappearing, the whole of the irregularities of the surface of the metal will be plainly seen. Suppose, for instance, the surface a *perfect sphere*, then the very last indivisible point of the image will be formed by rays coming from the *whole* surface of the metal, and this, though feebly, will appear uniformly illuminated. Quite otherwise, if irregular. Some portions will send rays which ought to go to form this point aside of it. These will not enter the eye, and those portions of the surface will appear dark; *vice versâ*, other portions will appear unduly illuminated, as sending to the eye rays which do not properly belong to them, and which emanate from other parts of the hole. The missing rays will leave on their corresponding places on the speculum a deficiency of light, and the accumulated ones will produce an increased intensity in others, and the result is to produce the appearance of valleys and hills, by a kind of *chiaro-oscuro* effect, in which all the inequalities of surface become enormously exaggerated, and are seen as real elevations and depressions. Thus a surface can be judged of in a few seconds, and, when defective, the faults are known immediately with great precision.

Process of giving parabolic figure.

(122.) M. Foucault sets out from a good spherical surface, and, by polishing off the exterior zones in a ratio increasing from the centre, renders it elliptic. The *regularity* of this ellipce (if we rightly understand his process) is then tested, just as that of a spherical surface would be, the illuminated object or minute hole being placed in the farther focus of the ellipce, and its image being formed in the nearer, all the other steps in the process remaining the same. Thus the more distant focus is by degrees carried farther and farther away, till so near an approximation to the parabolic form is *certainly* attained, that a very slight continuation of a similar process in the same direction finishes the work.[1]

(123.) It is no small recommendation of this mode of optical examination of the surface, that by it the real defects of configuration can perfectly well be distinguished from those accidents which temporarily divert the rays from their strict geometrical paths, from flexure in the mirror itself, and even from undulations in the air above it, or in the tube of a telescope, which seem to pass like waves over the surface. Whoever has viewed the coloured fringes seen when a prism is pressed against a plane glass within the coloured arc, fixing the limit of total reflection, and seen them undulate under a trifling pressure, disfiguring the surface, will easily appretiate the delicacy thus attainable.

(124.) Our limits will allow us to say little as to the modes of mounting telescopes. For astronomical purposes of precision, where the object is to determine the places of celestial objects with exactness, or for geodesical uses, the tube of the telescope is part and parcel of the graduated apparatus, and strictly limited as to its connection with it. Portable stands for merely viewing objects, are either tripod stands, in which a vertical axis revolves within the upright shaft, and carries the telescope on an elbow-joint, allowing a movement in a vertical plane, thus constituting a movable "alt-azimuth" mounting; or frameworks of wood, on which one or both ends of the tube can be elevated or depressed, and a certain limited horizontal movement given by a screw. Such are usually provided with a "finder," or small telescope, with a large field of view, and low magnifying power, provided with a cross-wire in the focus of the eye-glass, by whose aid an object, first seen by the naked eye, or otherwise found by a "sweeping motion," and brought by the movements of the telescope (to which it is fixed) to coincidence with the cross, shall then be found (by previous adjustment to parallelism) in the centre of the field of view.

Telescope. Mountings of telescopes.

Alt-azimuth mounting.

(125.) Large reflectors are often (as in Sir William Herschel's constructions) mounted alt-azimuthally on wooden scaffoldings or frameworks, formed by an octagonal foundation frame, with strong beams in front and behind, braced together and connected with radii running up to a central pin, on which the whole revolves on rollers, on a ring or railway, firmly based on brickwork or timber. The front and back beams carry two pairs of ladders, one at each end, inclined to and resting against each other, and carrying between them, at their summits, a strong suspension-beam, from which, by a tackle of pulleys, the upper end of the tube is suspended. The lower rests on rollers, running to and fro on a rail, bedded on the radii of the foundation-frame, and can be advanced or driven back by appropriate mechanism. The rope which passes through the pulleys has one of its ends connected with a large barrel, by which (the other end remaining fixed) the tube can be elevated or depressed through great differences of altitude; the other, with a smaller barrel, worked by a finer and slower mechanism, to command lesser differences. [And we will here pause to notice the exceeding steadiness and absence of tremor (even in windy weather in the open air) which is secured by this mode of suspension, the several rope-lengths intermediate between the pulley-blocks (four, six, eight or more of each) being not all of equal length, and (from the effect of friction and stickage) far from having equal tensions, so that their vibrations, not being isochronous, contradict and annihilate each other.] The two ends of the upper suspension-beam are held firm in their places by stays springing from the lateral angles of the revolving foundation-frame,[2] and the whole structure is studiously so designed in the disposition of its parts as to avoid rectangular and rhombic frame-work, and constitute an assemblage of triangles,[3] so as to secure the maximum of stiffness by the avoidance of any play of parts, being, in fact, so far an anticipation of Seppings' principle of diagonal bracing; as the form given to the strengthening rings (of sheet-iron bent to an angle), applied within the sheet-iron tube of the largest of these structures, was of the principle of corrugated iron-plates, since adopted so largely in roofing.

Meridional mounting.

(126.) Reflectors of the very largest size, however, are chiefly used as meridian instruments, and this dispenses with the necessity of much of the above-described mechanism. Lord Rosse's 6-feet reflector is suspended between

[1] If, in this account, we have done injustice to any part of M. Foucault's mode of procedure, we can only urge in excuse that his account of it (*Not. Ast. Soc.*, xix. 284) is in some parts quite unintelligible, p. 286, lines 9, 10, 11, for instance.

[2] These are wanting in stands of Mr Ramage's construction, to the great detriment of stability.

[3] This refers chiefly to the mounting of Sir W. Herschel's telescopes of 20 and 25 feet focus. In the foundation-frame of the 40-feet reflector this could not be carried out in all the upper works.

Telescope. two lofty meridional walls of solid masonry, between which its upper end is allowed a considerable amount of lateral motion, so as to admit of taking up the view of a celestial object considerably before its arrival on the meridian, and following it considerably after without displacing the lower end. One of the most elegant of Lord Rosse's mechanical contrivances, is his mode of counter-balancing the weight of the tube of a telescope, which is seized by its centre of gravity and *all but* swung, so as to press lightly both on its lower end, where it rests on the supporting bed, and on its upper suspension, thus allowing the greatest freedom and facility of vertical movement, and that equally in whatever position it may happen to be placed.

Equatorial mounting. (127.) The equatorial form of mounting telescopes, however, for general astronomical purposes, is gradually superseding every other. Previous to the vast improvements which modern engineering has effected in every description of iron machinery on a great scale, this mode of mounting was considered applicable only to light telescopes, such as refractors, of what would now be considered trifling dimensions. The general principle of this mode of mounting is easily understood. An axis parallel to that of the earth, or pointing to the sidereal pole, and therefore, at any particular place, having a fixed situation, is traversed by another axis at right angles to it, which carries the telescope. In whatever position the telescope may be placed by its rotation on the latter axis, if this position be maintained while the *polar* axis is made to revolve, the direction of the telescope will sweep out on the sphere of the heavens a circle parallel to the equinoctial, or a "parallel of declination." On the other hand, if the polar axis be prevented from revolving, and the telescope be turned round on the axis perpendicular to it, it will sweep along a meridian circle, or a "declination circle," *i.e.*, one at right angles to the equinoctial. Therefore, if once set on a celestial object, which is carried round by the earth's diurnal motion, in order to follow it, it will suffice (if the small effect of refraction be left out of consideration) to turn the whole instrument round uniformly on the polar axis—that is to say, by a single movement; whereas, in every other construction two movements, in two planes, at right angles to each other, are requisite. This movement may be given either by hand, by means of a handle and Hook's joint moving a tangent screw, working into an oblique-toothed circle, fixed on the polar axis, or (according to a method first introduced by the German opticians, Fraunhofer and Utzschneider) by a clock-work movement, regulated so as exactly to keep pace with the apparent diurnal movement of the heavens. (Of this more presently.) The advantages of this construction, as adapted to finding, viewing, measuring, or photographing celestial objects, are immense. For, 1*st*, by means of two graduated circles fixed, the one on the lower end of the polar axis, the other on the "declination axis," perpendicular to and carried round with it, the telescope may be "set" (or adjusted in direction), by the aid of a clock showing sidereal time, upon any star or other object whose right ascension and declination are known, with the *certainty* of finding it in the middle of the field of view at any instant; and, 2*dly* (the clock movement being then thrown into gear), it may be kept there, without any personal aid on the observer's part, thus leaving both his hands and his whole attention at liberty to execute any micrometrical measurements he may have occasion to make, the object appearing all the while at rest relatively to the system of wires, &c., to which he may be referring it.

English and German systems. (128.) Two systems of equatorial mounting are in use, one, which may be called the English system, having been practised by the English opticians (while the optician's art might be considered almost exclusively an English one), in which the polar axis was supported at its two extreme ends, the telescope, with the whole weight of the declination circle, &c., being supported on it between them; the other, if not first introduced, at all events almost generally adopted by the German artists, and which may therefore not improperly be termed the German mounting, in which a short polar axis, revolving between two strong sustaining collars, but projecting at its upper extremity beyond them, carries, on the portion so projecting, and supported only by its stiffness, the telescope and its appendages. Both constructions have their advantages and disadvantages. Beautiful examples of the English construction, as adapted to large achromatic telescopes, are those of the 5-feet equatorial of Sir James South, constructed *of tin plate* by the late Captain Huddart, and which the reader will find fully described and figured in *Phil. Tran.*, 182; of the equatorial of the Liverpool Observatory; of the "Northumberland" equatorial of the Cambridge Observatory; and lastly (and the most perfect of all), of that recently erected at the Royal Observatory of Greenwich, carrying the 12-inch achromatic noticed in our list, art. 31,—all three constructed on principles combining the requisites of extreme stiffness to resist both *flexure* and *twist*, and lightness, devised by the present astronomer-royal, Mr Airy. Telescope.

(129.) Of the German system of equatorial mounting, so far as achromatic refractors are concerned, abundant examples are extant at the observatories enumerated in our list, as furnished with such instruments by the continental opticians, and the reader will find them minutely described in the annals of those observations, and (to specify one or two) in Prof. Struve's "Beschreiburg des Grossen Refractors in der K. K. Sternwärte zu Dorpat," and his "Description de l'obs. Imp. de Poulkova." But more recently it has been found that this system of mounting, by the aid of the immense strength and stability which can now be combined with the utmost delicacy and smoothness of movement in great machinery of cast-iron, is peculiarly well adapted for the support of large and ponderous reflecting telescopes on the Newtonian or Herschelian construction. Thus Mr Delarue has adopted this system for the mounting of his reflector of 13 inches aperture and 10 feet focal length; Mr Lassell for his equatorial reflector of 2 feet aperture and 20 feet focus, and ultimately for the magnificent reflector of 4 feet aperture, and 39 feet focus, noticed in art. 57, and of which we can only regret that our limits will not allow of our entering into any details of description, photographed as we have it before us by the kindness of its distinguished constructor.

Application of a clock movement to follow the diurnal rotation. (130.) The clock movement, by which the polar axis in these instruments is driven, has this peculiarity, that it cannot be regulated by the ordinary pendulum and scapement system of clock-work, which, of necessity, goes by jerks at each second. It is essential that the movement should be uniform, so as to keep even pace, under the highest magnifying power, with the diurnal rotation of the heavens. This Fraunhofer and his successors accomplish, or aim at accomplishing, by a movement not very unlike that of the governor of a steam-engine, only that the balls, instead of opening and closing a valve, rub against a brass hollow conoid, and so, in diverging, generate an increased friction, which destroys the excess of power, and keeps velocity from increasing beyond a definite limit. For this Mr Airy has substituted a far more elaborate and theoretically perfect system of equalization, by employing a regulated descent of water through a centrifugal wheel as the moving power, using a conical pendulum as the primary regulator of speed, and equalizing the amplitude of its circuit by the resistance of the fluid on vanes caused to dip deeper into it by an increased velocity, and at the same time to contract the supply through the intervention of a throttle-valve, and *vice versâ*, the effect being to produce the nearest approach to a mathematical uniformity of rotation which has yet been accomplished.

Telford. (131.) In addition to the works already cited in various parts of this article, the reader is referred for further or more detailed information to the following, viz.:—

Boscovich, *Opera pertinentia ad Opticam et Astronomicam*, 1785. Klügel, *Analytische Dioptrik*; Prechtl. *Praktische Dioptrik*, Wien, 1828. "Hopkins on the Equatorial Mounting of Telescopes," *Notices of Ast. Soc.*, xiv., 2, 41; Rothwell, ditto, ditto, xiv., 3, 85; Airy, ditto, ditto, xiii., 6, 186; Simms, ditto, ditto, xiii., 8, 260; Steinheil's ditto, ditto, xix., 2, 59. "Littrow on Barlow's Fluid Object-glasses," *Ast. Notices*, 1, 188. Bohnenberger *On Achromatic Object-glasses*. Encke, *De Formulis Dioptricis (Inaugural Lecture)*, Berlin, 1844. Santini, *Considerazione intorno al calcolo degli oculari (Mem. Imp. Inst. Sci. Venezia*, 1842). Moebius *On the use of continued Fractions in Optical Formulæ (Crelle's Journ.*, v., p. 213, and vi., p. 215). Gauss. Mem. R. S. Göttingen, i., 1838. Bessel, *Ueber die Gründformeln der Dioptrik, Astr. Nachr.*, xviii., p. 97. Brewster *On New Philosophical Instruments*. Robinson, article on SPECULA (and the numerous works therein cited). Nichol's *Physical Sciences*. (J. F. W. H.) Telford.

TELFORD, THOMAS, a very able and distinguished engineer, was born in the parish of Westerkirk and county of Dumfries, on the 9th of August 1757. His father, who followed the occupation of a shepherd, died before the close of that year; and the orphan boy was thus left to the sole care of his mother, whose maiden name was Janet Jackson. She survived till the year 1794, and had the high satisfaction of seeing him already entered upon a very prosperous career. In his correspondence with her, he is said to have written all his letters in printed characters, that she might be able to read them without assistance. His very limited education he received at Westerkirk school; and, during the summer season, was employed by his uncle as a shepherd boy. This occupation left him abundant leisure for reading; and his early and eager love of knowledge he was enabled to gratify by the kindness of some individuals, who accommodated him with the loan of books. At an early age he quitted Westerkirk school and the care of his uncle's flock, in order to learn the trade of a mason in the neighbouring town of Langholm. After the completion of his apprenticeship, he continued for some time to work as a journeyman. Langholm Bridge, over the River Esk, was partly reared by hands which were destined for more scientific occupations. At this early period of his life, he was remarkable for his elastic spirits and gay humour. In his native district of Eskdale, he was long remembered as "laughing Tom." His favourite pursuits were not yet scientific, but literary, and he even aspired at the reputation of a poet. He was a contributor to the *Weekly Magazine*; and one of his compositions, entitled *Eskdale, a Poem*, appeared with the name of the author in a provincial miscellany. It is in imitation of Pope's *Windsor Forest*, and at least displays some command of poetical language and imagery. He subsequently wrote many verses; and from a poetical epistle which he had addressed to Burns, some extracts were printed by Dr Currie. Telford at length quitted Eskdale, and sought for better employment in Edinburgh, where he is said to have continued, with unremitting application, to study architecture on scientific principles. In the meantime, however, he must have earned his daily bread by the labour of his hands. Here he remained till the year 1782, when he was emboldened to try his fortune in London. He had now reached the age of twenty-five, and seems to have acquired new confidence in the resources of his own talents.

John Pasley, a wealthy merchant, the brother of Sir Thomas Pasley, and the uncle of Sir John Malcolm, was remarkable, even in a proverbial degree, for his anxious attention to the welfare of the Eskdale youth who repaired to the metropolis. This ingenious young man, then a journeyman mason, he received with his habitual kindness, and not only treated him with hospitality, but, we have every reason to believe, rendered him very important services, and greatly contributed to his subsequent advancement. In his account of his own life, it is observable that Telford makes not the slightest allusion to his benefactor. As to his occupation, he states that he was fortunate in being employed at the quadrangle of Somerset Place, where he acquired much practical information, both in the useful and ornamental branches of architecture. After a residence of two years in London, he was engaged in superintending the building of a house in the dock-yard at Portsmouth, intended for the resident commissioner. "During the three years," he remarks, "that I attended the building of the commissioner's house, and of a new chapel for the dock-yard, I had an opportunity of observing the various operations necessary in the foundations and construction of graving-docks, wharf-walls, and similar works, which afterwards became my chief occupation."

Having terminated his engagement at Portsmouth in 1787, he was employed by Sir William Pulteney to superintend some alterations in Shrewsbury Castle, which he wished to fit up as a temporary residence. This baronet likewise belonged to Westerkirk, being a younger son of Sir James Johnstone of Westerhall. It is more than probable that Telford had been recommended to him by Mr Pasley; and to this new connection he was indebted for a very favourable opening of his career as a civil engineer. He was appointed surveyor of the public works in the rich and extensive county of Salop; and this office he retained till the time of his death. His chief attention was thus devoted to building and repairing bridges; but, as an architect, he was likewise employed in superintending the erection of churches and other edifices. His politics did not coincide with those of his patron. "Telford in his youth," says Mr Rickman, "is known to have been tinctured with the then fashionable doctrines of democracy, while the strong mind of his patron derided and detested the flimsy tissue, as might be expected from his penetration and experience. A dangerous rupture was once likely to ensue, when Telford rather improperly transmitted some of the political trash of the day under his patron's frank; but the latter pardoned him, after due animadversion." Telford's progress in his professional career, though not uncommonly rapid, was steady and certain; and every new opportunity of exerting his talents contributed to extend a reputation which at length became unrivalled. In 1790 he was employed by the British Fishery Society to inspect the harbours at their several stations, and to devise a plan for an extensive establishment in the county of Caithness; and after an interval of three years he was intrusted with the management of the Ellesmere Canal. In 1803 the parliamentary commissioners for making roads and building bridges in the Highlands, as well as the commissioners for the Caledonian Canal, appointed him their engineer. Under the former board, 1117 bridges were erected, and 920 miles of new roads were made; and under the latter board was completed the Caledonian Canal, a work of great labour and expense. Under the road commissioners on the Carlisle, Glasgow, and Lanarkshire roads, 30 bridges were erected; one of them having a span of 150 feet, and another being 122 feet high. In both parts of the kingdom, he afterwards conducted a great variety of public operations; and in 1808 he was employed by the Swedish government to execute a regular survey, and lay down correct plans and sections of the country between Lake Wener and the shore of the Baltic, near Soderkoping, and to make a detailed report on the subject, with the view of connecting the great fresh-water lakes, and forming a direct communication between the North Sea and the Baltic. Having completed this service, he em-

Telford.

barked at Gottenburg early in October. In August 1813 he again visited Sweden, and inspected all the works then commenced, which chiefly consisted of excavations. The king bestowed on him a Swedish order of knighthood, but his good sense prevented him from assuming the title. As a further mark of the royal approbation, he received the king's portrait set in valuable diamonds. He continued for many years to be engaged in a great variety of similar undertakings, indeed in all the most important undertakings that were then in progress; and a simple enumeration of his roads, bridges, canals, and harbours, would itself occupy a very considerable space. "It has been said, and no doubt truly, that Mr Telford was inclined to set a higher value on the success which attended his exertions for improving the great communication from London to Holyhead, the alterations of the line of road, its smoothness, and the excellence of the bridges, than on that of any other work he executed. The Menai Bridge will unquestionably be the most imperishable monument of Mr Telford's fame. This bridge over the Bangor Ferry, connecting the counties of Carnarvon and Anglesea, partly of stone and partly of iron, on the suspension principle, consists of seven stone arches, exceeding in magnitude every work of the kind in the world."[1]

Telford was possessed of a robust frame, and, till he reached the age of seventy, he had never been visited with any serious illness. While at Cambridge in the year 1827, he was afflicted with a severe and dangerous disorder; and although he gradually recovered a certain degree of health, he never recovered his former vigour. He became subject to bilious derangements in an alarming degree; and these recurring in the spring and autumn of 1832 and 1833, and again in the spring of the ensuing year, greatly impaired his strength. On the 23d of August 1834 he experienced an attack, which, after affording some delusive expectations of his recovery, reached its fatal termination on the 2d September of the same year, after he had completed the seventy-seventh year of his age. He died at his house in Abingdon Street, Westminster, and his remains were deposited in the Abbey.

He bequeathed legacies to the amount of L.16,600, but his own relations were entirely overlooked. "After his mother's death, Telford had few family connections to provide for; and although he was ready to help these, when occasionally in want of pecuniary assistance, yet he did not divide his property amongst them, having from experience formed a strong opinion against the removal of any man from his station in life." To Colonel Pasley, the nephew of his early benefactor, he bequeathed a legacy of L.500. We likewise mention to his credit that he bequeathed L.1000 to the subscription library of Westerkirk, and the same amount to that of Langholm. The defects of his early education he had endeavoured to remedy by his own unaided exertions in his mature years. We are informed that he had taught himself Latin, French, and German, and could read those languages with facility, and converse freely in French. He is likewise said to have been well acquainted with algebra, but to have placed more reliance on experiment than on mathematical investigation. A combination of science with experiment he doubtless understood and practised, as the best method of proceeding in his more difficult undertakings. He was a lover of literature, and was fond of miscellaneous reading. His relish for poetry never deserted him; and two poets, Campbell and Southey, were remembered in his will. To the *Edinburyh Encyclopædia* he contributed the articles "Architecture," "Bridge-building," and "Canal-making." His account of his own life is however the most lasting monument of his professional talents. Of his personal history, the details are very meagre and unsatisfactory; but the record of his proceedings, and the result of his experience, as an engineer who had been engaged in such important and multifarious operations, constitute it a work of great interest. (*Life of Thomas Telford*, civil engineer, written by himself. Edited by John Rickman, one of his executors; with a preface, supplement, annotations, and index, Lond. 1833, 4to. See also DISSERTATION SIXTH, prefixed to this work, § 351.) (D. I.)

Tell.

TELL, WILLIAM, a celebrated Swiss patriot, was born at the village of Bürglen, near Altorf, towards the end of the thirteenth century. All that is known regarding him is, that he was a simple countryman, whom the tyranny of Austria roused to madness, and whom foreign persecution galled into an heroic resistance, on which all Europe, and indeed all the world, has since not ceased to look and take courage. The common account of his story is, that Tell and his boy passing one day through the market-place of Altorf, in which was erected, by order of Hermann Gessler, one of the bailiffs of Albert I., the ducal hat of Austria, that every Swiss who passed by might show the tokens of his surrender, it was observed that Tell neglected to uncover his head as he passed beneath the imperial symbol of submission. He was seized and taken before Gessler. The German tyrant having learned that Tell was an excellent bowman, ordered him to shoot an apple from his own child's head, under penalty of immediate death. He performed the feat. Disappointed and chagrined at his success, Gessler demanded why a second arrow was still in his quiver. "Had the first hit my boy," replied Tell, boldly, "the second was designed for thy heart." The offender was at once seized, bound, and preparations made to convey him in a boat across the lake of Lucerne to the Castle of Küssnacht, where Gessler resided, and whither he was himself proceeding. One of those sudden squalls, which are so apt to vex inland lakes, overtook the boat, unmanned the rowers, and rendered the craft quite unmanageable. Tell, who was known to be an experienced boatman, was unfettered, the rudder put into his hand, and immediately, as by magic, the little ship wore round, and stood steadily for a flat shelf which jutted forth on the rocky margin of the lake. As she neared the shore Tell started to his feet, clutched his trusty bow, and by a nimble spring gained the rock, and pushed back the boat into the surf. The storm was steadily abating, and Gessler and his men got safely landed. Tell selected a narrow defile where he knew Gessler must pass, and, true to his resolution, shot the tyrant through the heart. This occurred in 1307, and the wars of the Swiss and the Austrians did not terminate till 1499. Tell sinks from view with this event, and nothing more is heard of him, save that he fought at the battle of Morgarten, and was drowned in 1350 while fording the swollen river Schächen.

Many modern historians, while admitting the unquestionable picturesqueness and beauty of Tell's story, feel bound to reject it as an authentic historical record. In proof of their position, they allege that a similar story is told in the *Wilkina Saga*, and by Saxo Grammaticus, of a Danish king Harold and one Toko. They affirm that substantially the same story occurs in Swiss history as early as the twelfth century. And to crown the pile of counter argument, it has recently been found, they aver, in 1835, that the name of Gessler does not occur as an Austrian bailiff in the records of that age. In the face of all this scepticism of Grimm, Ideler, and others, there are nevertheless a number of facts of undoubted genuineness regarding Tell still left, on which the poetical and patriotic, with Johann von Müller among their number, may erect as trustworthy a belief as almost any which is disclosed to

[1] *Annual Biography and Obituary*, vol. xix. p. 208.

Tellez ‖ Tellicherry

us by the stern historical muse. Foremost of those facts is this, that no later than 1388, when the celebrated Tell chapel was built, some hundred and fourteen persons visited the place who had known the hero himself. Add to this, that all the chroniclers of the time allude to Tell's adventure as something of quite notorious occurrence.

The story has no doubt received a few embellishments, and perhaps inconsiderable alterations, as it has floated down the stream of centuries. All the essentials of the Swiss hero's adventures are very likely to have transpired upon Swiss soil. In truth, the narrative is (like many other traditions found in the page of history) properly representative, and as such it may well take its place among the semi-fabulous, semi-historical traditions, of which early history is in a great measure composed.

Tell's adventures have frequently been the subject both of poems and of dramas. The only one of those poetical compositions that claims mention here is the celebrated drama of *Wilhelm Tell*, by the poet Schiller.

TELLEZ, GABRIEL, a Spanish ecclesiastic, and an eminent follower of Lope de Vega, in the Spanish drama, is better known to the world of letters by his *nome de plume* of TIRSO DE MOLINA, was born at Madrid late in the sixteenth century. All that is known of his life is, that after receiving his education at Alcalá, he entered the church in 1613, and died probably in February 1648. Some accounts represent him as sixty years of age at his death, while others make him eighty.

Tirso de Molina, as he chose to call himself when he doffed his priestly robes, was a man of a decidedly dramatic genius; but very immoral in the habitual manifestation of it. The prevailing tone of his plays is unquestionably bad; and although he was a churchman, he has not succeeded in keeping the products of his genius out of the way of the confessional and the inquisition. Yet many of his less offensive dramas have kept possession of the stage down to our day. Besides 5 volumes of his collected dramas, containing 59 plays, published in 1616–1635, there are some 21 additional plays that have been printed; and, according to a statement made by the author in the preface to his *Cigarrales de Toledo*, 1624, he wrote 300 in all. Of these the best known out of Spain is his *El Burlador de Sevilla* (The Deceiver of Seville), an original exhibition of a character that has, since the time of Lope de Vega, become celebrated on every stage, both in Europe and America. Don Juan Tenorio, in the hands of Tirso, is a fellow of undaunted courage, of unmingled depravity, and of a cold cynical humour, rendering him at once one of the most interesting, and at the same time one of the most repulsive personages in the whole range of the drama. Molière held him up to the combined admiration and disgust of the French people in 1665, in his *Festin de Pierre*. To Zamora in Spain, to Thomas Corneille in France, to Shadwell (*Libertine*, 1676), and Lord Byron in England, and to Mozart in Germany, Tirso's *Don Juan* has since afforded ample exercise for ingenuity and sometimes for theft. But the most famous of Tirso de Molina's efforts is his *Don Gil in the Green Pantaloons*, one of the very best specimens of an intriguing comedy in any language.

Among the merits of Tellez must be mentioned his unquestionable power of gay narration, an extraordinary command of the Castilian dialect, and a luxurious power of versifying, capable of pleasing every taste with the variety of his metres, and the more fastidious by the elegance and grace of his rhythms. Among his faults may be mentioned his palpable caprice. He now begins with much naturalness with the accidents of a bull-fight; again, he introduces a speech of 400 lines in the first act. His characters, besides, want variety and often delicacy. (See Ticknor's *Spanish Literature*, vol. ii.)

TELLICHERRY, a seaport-town of British India, in the presidency of Madras and district of Malabar, 95 miles S.W. of Seringapatam, and 340 S.W. of Madras. It is finely situated in a beautiful and fertile country, bounded towards the west by the sea, and towards the east by a range of wooded hills. The fort, which contains a jail and hospital, stands on an elevation close to the sea, and about 40 feet above its level. Most of the houses are built of unbaked bricks, and thatched, but there are some of a superior kind. There is good anchorage for small vessels, sheltered by a line of black rocks opposite the fort; but in stormy weather it is not very safe for large vessels anchoring here. The climate of Tellicherry is very salubrious; and it has been called the Montpellier of India. An active trade is carried on here, chiefly in pepper, ginger, arrowroot, sandalwood, &c. Pop. about 20,000, mostly Mussulmans, with some Hindoos, and a few Christians.

Temesvar ‖ Tempe.

TEMESVAR, a town of the Austrian empire, capital of a circle of the same name, and of the crownland of Banat, in a marshy plain on the Bega Canal, 75 miles N.N.E. of Belgrade. It is strongly fortified with walls, moats, and outworks; and is entered by three gates, beyond each of which there lies a suburb. The streets are broad and regular; the houses solid and handsome; and there are many fine public squares. The principal buildings are, the Roman Catholic cathedral, a fine Gothic edifice; a handsome Greek cathedral, with several other churches; a synagogue; the elegant episcopal palace; the old castle of John Hunyady; the large county hall; the theatre, and assembly rooms. There are also here numerous convents, a gymnasium, and several other schools; an arsenal, barracks, civil and military hospitals, &c. Manufactures are extensively carried on in Temesvar, especially in one of the suburbs, which is called from that circumstance the Factory Suburb. Iron wire, silk, cotton cloth, paper, and leather, are the chief articles prepared. A considerable transit trade is carried on, especially in corn. Temesvar has played an important part in modern history. It was in the hands of the Turks, from its capture in 1552 till 1718, when it was regained by Prince Eugene, and strongly fortified. In 1849, it was besieged for 107 days by the Hungarian insurgents, but it held out until it was relieved by General Haynau. Pop. (1854) 20,300, exclusive of the military.

TEMPE, a celebrated valley of Greece, in the north-east of Thessaly, through which the Peneus forces its way between the mountain-ranges of Olympus and Ossa into the sea. It forms the outlet for all the streams that water Thessaly, and is the principal pass by which entrance is obtained into that country from the north. The beauty of Tempe has been described by many authors, both in prose and verse; but it is in reality more remarkable for sublimity and wild grandeur, than for the soft and sylvan scenery generally associated with the name. It is about 5 miles in length, and in some places not more than 100 yards in breadth, leaving barely room for the road to pass along the side of the river. The cliffs on either side are lofty and almost perpendicular, broken in some places so as to afford glimpses of the wooded summits of Olympus or Ossa, and in many parts covered with wild vines and other creeping plants. The Peneus flows with a placid though deep and rapid stream; its banks are fringed with low shrubs, and frequently shaded with spreading plane-trees. A military road was made through the pass by the Romans, and the modern road follows the same course, on the right bank of the river. Four forts defended the pass, and some of the ruins are still visible. When Xerxes invaded Greece, it was intended at first to defend this pass against him, but on learning that there was another route by which he could cross Mount Olympus, the Greeks retired to Thermopylæ. It has been conjectured, both in ancient and modern times, that the pass of Tempe was formed by an earthquake,

Temperament.

which divided the mountains and opened a passage for the Peneus.

TEMPERAMENT OF THE MUSICAL SCALE. "In the modern system, called *tempered*," says a German writer on music, "all the intervals are not employed in their original perfection, as the nature of the harmonic scale presents them, but lose, sometimes in this interval, sometimes in that other, something of their acuteness or gravity. In fact, experience shows that, in tuning the major and minor thirds, the fifths, and the fourths, in their original perfection, when we reach a certain term, we meet with a fault of too great excess or too great deficiency; and from this faultiness arises the necessity of tempering this or that sound, in order to combine reciprocally the intervals of one mode with those of another, the result of which is called *temperament*." The nature and the principle of temperament, as applied to musical instruments of fixed sounds, may be understood by perusing the articles MUSIC and ORGAN in this work. We shall here content ourselves with giving a very few additional remarks, and with indicating some works whence further information may be derived, seeing that the subject of musical temperament is not of sufficient importance to occupy much room in a work like this. The various systems of temperament that have been proposed for such instruments as the organ, the harpsichord, the pianoforte, &c., offer only a choice in the distribution of the imperfections of false intonation. The unequal temperament is that usually adopted; but it must be observed, that tuners in general proceed more by rule of routine and an indifferent ear, than according to any scientific principle of temperament. Hence the great differences found among instruments tuned by different tuners. It is a common error to suppose that "a person who sings in tune, tempers without knowing it." Even Chladni, following the lead, has asserted this; while the truth is, that there is *no temperament* in the voice of a singer whose intonation is perfect, unless his voice and ear happen to be misguided by the accompaniment of a *tempered* instrument, that is, an instrument *out of tune*. When left to itself, the voice of such a singer, in executing the most intricate modulations, forms the sounds in their true ratios to the different tonics or key-notes that occur, and, in the wonderful subtlety of the intonations of that only perfect musical instrument, the human voice, possesses all the intonations that are necessary to form these sounds exactly. Nearly the same thing occurs in the case of such a violin-player as a Viotti or a Paganini when he plays alone, and undisturbed by the false intonations of any accompanying instrument. This was actually proved in Paris many years ago, by the experiments made by M. Charles and the celebrated violinist Viotti. We may here remark, that it is of great detriment to the just intonation of a singer to learn to sing by the guidance of an instrument such as the pianoforte, as is the common practice; for a habit of mal-intonation is then inevitably acquired. The same remark applies to singers taught with the accompaniment of those instruments with fretted finger-boards, such as the guitar, of which the intonation is also imperfect. As to the imperfections of the common guitar, the reader may consult the lively and ingenious work entitled *Instructions to my Daughter for playing on the Enharmonic Guitar*, London, 1829. The celebrated singer Madame Mara used to say that every singer ought to learn to play the violin, in order to acquire a knowledge of just intonation. Certainly that instrument, and others of the violin kind, are the only ones we have that are capable of the nearest approach to perfect intonation, making allowances for the mechanical imperfections of their strings, as we have already hinted in the article MUSIC. But still the human voice is the only perfect musical instrument. It has been a prevalent opinion among musicians and writers upon music, that the ancient Greeks were ignorant of many of our musical intervals, and possessed no instruments capable of executing our modern musical scales. But it is more than probable that the knowledge of our ratios of musical intervals, and of perfect intonation in a variety of scales, was much more exact among the ancient Indians, Arabians, and Greeks, than is generally supposed, or than the scanty, imperfect, and corrupted Greek relics of works on music, and the very limited examination of Indian and Arabian manuscripts, have hitherto been able to show. The reader may consult, on the subject of musical temperament, the following works. Among these, one of the best is Professor Robison's, for clearness, as well as useful suggestions:—Chapter 13, *et seq*, of the third book of *Salinas de Musica*, Salamanca, 1577. Dr Smith's *Harmonics*, second edition, 1759. Dr Thomas Young's Papers in the *Philosophical Transactions*, and in Nicholson's *Journal*; also vol. ii. of his *Lectures on Natural Philosophy*. Cavallo's Paper in the 78th vol. of *Philosoph. Trans.* Vol. iv. of Professor Robison's *System of Mechanical Philosophy*, edited by Sir David Brewster in 1822, pp. 376–451. *Instructions for Playing on the Enharmonic Guitar*, London, 1829. (G. F. G.)

Tempesta || Temple.

TEMPESTA. See MOLYN.

TEMPLARS, or KNIGHTS OF THE TEMPLE, a religious order, instituted at Jerusalem in the beginning of the twelfth century, for the defence of the holy sepulchre, and the protection of Christian pilgrims. They were first called *The Poor of the Holy City*, and afterwards assumed the appellation of *Templars*, because their house was near the temple. The order was founded by Baldwin II., then king of Jerusalem, with the concurrence of the pope; and the principal articles of their rule were, that they should hear the holy office every day, or that, when their military duties should prevent this, they should supply it by a certain number of paternosters; that they should abstain from flesh four days in the week, and on Fridays from eggs and milk-meats; that each knight might have three horses, and one esquire; and that they should neither hunt nor fowl. After the ruin of the kingdom of Jerusalem about 1186, they spread themselves through Germany and other countries of Europe, to which they were invited by the liberality of the Christians. In the year 1228, this order acquired stability by being confirmed in the council of Troyes, and subjected to a rule of discipline drawn up by St Bernard. In every nation they had a particular governor, called master of the Temple, or of the militia of the Temple.

The order of Templars flourished for some time, and, by the valour of its knights, acquired immense riches, and an eminent degree of military renown; but as their prosperity increased, their vices were multiplied, and their arrogance, luxury, and cruelty rose at last to such a monstrous height, that their privileges were revoked, and their order suppressed with the most terrible circumstances of infamy and severity. Their accusers were two of their own body, and their chief prosecutor Philip the Fair of France, who addressed his complaints to Clement V. The pope, though at first unwilling to proceed against them, was under the necessity of complying with the king's desire; so that, in the year 1307, upon an appointed day, and for some time afterwards, all the knights, who were dispersed throughout Europe, were seized and imprisoned, and many of them, after trials for capital crimes, were convicted and put to death. In 1312 the whole order was suppressed by the council of Vienne. (See Addison's *Knights Templars*, 1842.) They originally wore a white habit, with red crosses sewed on their cloaks as a mark of distinction. (See KNIGHTS and KNIGHTHOOD.)

TEMPLE, SIR WILLIAM, was born in London in the year 1628. The family from which he sprung was ancient, and is said to have assumed its surname from the manor of Temple, in the hundred of Sparken Hall, in Leicestershire.

Temple. He was first sent to school at Penshurst, in Kent, under the care of his uncle, the celebrated Dr Hammond, then minister of that parish; but at the age of ten he was removed to a school at Bishop-Stortford, in Hertfordshire. When he had acquired a sufficient knowledge of Greek and Latin, he returned home at the age of fifteen; and two years afterwards he went to Cambridge, where he was placed under the tuition of the learned Dr Cudworth, then fellow of Emmanuel College. His father, Sir John Temple, being a statesman, seems to have designed him for the same mode of life; and, on this account, after residing at Cambridge two years, which were principally spent in acquiring a knowledge of French and Spanish, he was sent abroad to finish his education.

He began his travels by visiting France in 1648. As he chose to pass through the Isle of Wight, where his majesty was detained a prisoner, he there accidentally met with the second daughter of Sir Peter Osborne of Chicksand, in Bedfordshire, then governor of Guernsey for the king; and his lady being on a journey with her brother to St Maloes, where their father then was, the young traveller joined their party. This gave rise to an honourable attachment, which, at the end of seven years, concluded in a happy marriage. Having resided two years in France, Temple made a tour through Holland, Flanders, and Germany. In 1654 he returned from the continent and married. As he rejected all offers of employment under Cromwell, the five years which he lived in Ireland were spent chiefly in improving himself in history and philosophy; but at the Restoration, in 1660, being there chosen a member of the convention, while others were trying to make their court to the king, Temple opposed the poll-bill with so much spirit that his conduct soon attracted the attention of the public, and brought him into notice. In the succeeding Parliament, 1661, he was elected with his father for the county of Carlow; and in the year following he was chosen one of the commissioners to be sent from that Parliament to the king, which gave him an opportunity of waiting on the Duke of Ormond, the new lord-lieutenant, then at London. He soon afterwards returned to Ireland, but with a resolution of quitting that kingdom, and of removing with his family to England.

On his return he met with a very favourable reception from the Duke of Ormond; and soon acquired such a share in his esteem, that the duke complained of him as the only man in Ireland that had never asked anything from him. When he mentioned his design of carrying his family to England, his grace said that he hoped he would at least give him leave to write in his favour to the two great ministers, Clarendon, then lord-chancellor, and the Earl of Arlington, who was secretary of state. This the duke did in such strong terms as procured him the friendship of these two noblemen, as well as the good opinion of the king. Temple, however, made no other use of this advantage than to tell Lord Arlington, that if his majesty had any employment abroad which he was fit for, he should be happy to undertake it; but, at the same time, he requested that he might not be sent into any of the northern climates, to which he had a very great aversion. The secretary replied, he was very sorry he had made such an objection, as there was no other employment then undisposed of except that of going envoy to Sweden. However, in 1665, about the beginning of the first Dutch war, Arlington sent a messenger to acquaint him that he must immediately come to his house. He found that his lordship's business was to tell him, that the king had occasion to send some person abroad upon an affair of the utmost importance, and that he had resolved to make him the first offer; but that he must know, without delay, and without telling him what it was, whether he would accept of it, and that he must be ready to set out in two or three days, without mentioning it to any of his friends. After a little consideration, Temple told his lordship, that as he took him to be his friend, and as he had advised him not to refuse, as it would be an entrance into his majesty's service, he should consult no further. This business was to carry a secret commission to the Bishop of Munster. He accordingly set out on the 2d of August, and executed it so much to the satisfaction of Charles II. that, on his return to Brussels, his majesty appointed him resident there, and created him a baronet. As Brussels was a place where he had long wished to reside, he sent for his family in April 1666; but before their arrival, he had again been obliged to depart upon business to the prelate's court. The bishop having listened to terms of accommodation with France, Sir William wrote two letters to dissuade him from that alliance; and these not having the desired effect, he went in disguise to Munster, where, though he arrived too late to secure the prince in his first engagement, yet he prevailed on him to permit five or six thousand of his best troops to enter into the Spanish service. Temple.

Two months after the conclusion of the peace with the Dutch at Breda, Sir William's sister, who resided with him at Brussels, being very desirous of seeing Holland, he went thither incognito, to gratify her desire; but while he was at the Hague, he paid a private visit to De Witt, in which he laid the foundation of that close intimacy which afterwards subsisted between them. In the spring of 1667, a new war breaking out between France and Spain, which exposed Brussels to the danger of falling into the hands of the former, Sir William sent his lady and family to England; but he himself remained there with his sister till the Christmas following, when he was ordered by the king to come over privately to London. Taking the Hague in his way, he paid another visit to De Witt, and, pursuant to his instructions, proposed those overtures to him which produced the triple alliance. Soon after his arrival at the British court, he returned, on the 16th of January 1668, with the character of envoy-extraordinary and plenipotentiary to Holland; where a conference being opened, he brought that treaty to a perfect conclusion in the short space of five days. The ratifications of this alliance being exchanged on the 15th of February, he repaired to Brussels; and a treaty being set on foot between France and Spain at Aix-la-Chapelle, he proceeded for that place on the 24th of April, in quality of his majesty's ambassador-extraordinary and mediator. Here he arrived on the 27th; and it was chiefly owing to his assistance that the Spaniards were brought to sign the articles of that peace on the 2d of May. This service being completed, he returned to Brussels, with a view of remaining there in his former station of resident; but he received letters from the Earl of Arlington, with the king's order to continue as ambassador, and to serve his country in that quality in Holland, as, on account of the late alliances, his majesty was resolved to renew a character which the crown of England had discontinued there since the time of King James. Sir William being now left at liberty to return to England, embraced the opportunity; and upon his arrival at London he was received with every possible demonstration of favour, both by the king and the court.

Setting out again for Holland, with his new character of the king's ambassador, he arrived at the Hague in the end of August 1668. Here he enjoyed the confidence of that great minister De Witt, and lived in great intimacy with the Prince of Orange, who was then only eighteen years of age; but, in September 1669, he was hurried back to England by Lord Arlington. When Sir William waited on the earl, he found that he had not one word to say to him; for, after making him attend a long time, he only asked a few indifferent questions respecting his journey. Next day he was received as coolly by the king; but the secret soon came out, and he was urged to return to the Hague, and

Temple. pave the way for a war with Holland. In this, however, he excused himself from having any concern, which so much provoked the Lord-Treasurer Clifford that he refused to him an arrear of L.2000 due from his embassy. Disgusted with Arlington's behaviour, which was so unlike the friendship he had formerly professed, Sir William now retired to his house at Sheen, near Richmond, in Surrey; and in his retreat, when free from the hurry of business, he wrote his *Observations on the United Provinces*, 1673, and one part of his *Miscellanea*, in the time of the second Dutch war. About the end of summer 1673, the king wishing to put an end to the war, sent for Sir William, and desired him to go to Holland to negotiate a peace; but powers having been sent from thence at this time to the Marquis de Fresno, the Spanish ambassador at London, Sir William was ordered to confer with him; and a treaty was accordingly concluded in three days, and the point carried respecting the superiority of the British flag, which had been so long contested. In June 1674 he was again sent ambassador to Holland to offer the king's mediation between France and the confederates, then at war, and it was accepted not long after; Lord Berkeley, Sir William Temple, and Sir Leoline Jenkins, being declared ambassadors and mediators. Nimeguen, which Sir William had proposed, was at length agreed upon by all parties to be the place of treaty. During his stay at the Hague, the Prince of Orange constantly dined and supped once or twice a week at his house; and by this familiarity he so much gained the prince's confidence and esteem, that he had a considerable hand in his marriage with the Princess Mary, daughter of James II.

In July 1676 he removed his family to Nimeguen, where he spent the remainder of that year without making any progress in the treaty: and the year following his son was sent over with letters from the lord-treasurer, ordering him to return, and succeed Coventry as secretary of state. In consequence of this order, Sir William came over to England in the spring of 1677; and though the affair of the secretary's place was dropped at his desire, he did not return to Nimeguen that year. About this time the prince having the king's leave to come over, he soon after married the Princess Mary; and this gave occasion for a new coolness between Lord Arlington and Sir William, as he and the Lord-Treasurer Osborne, who was related to Sir William's lady, were only privy to that affair. After the prince and princess were gone to Holland, as the court always seemed inclined to favour France, the king wished to engage Sir William in some negotiations with that crown; but he was so ill satisfied with this proposal, that he offered to give up all pretensions to the office of secretary; and desiring the lord-treasurer to acquaint his majesty with his intentions, retired to Sheen, in hopes of being taken at his word. Upon a discovery, however, of the French designs not to evacuate the Spanish towns agreed by the treaty to be delivered up, the king commanded him to undertake a third embassy to the states. With them he concluded a treaty, by which England engaged, in case France refused to evacuate the towns in forty days, to declare war immediately against that nation; but before half that time was elapsed, one De Cros was sent from the English court to Holland upon a business which there damped all the good humour excited by the treaty, and which produced such sudden and astonishing changes in this country as gave Sir William a distaste for all public employments.

In 1679 he returned to Nimeguen, where the French delayed to sign the treaty till the last hour; but having concluded it, he returned to the Hague, whence he was soon after sent for to enter upon the secretary's office, which Coventry at length resolved to resign. He accordingly came over, and went to court, as all his friends hoped, with a full intention of assuming his office; but he started some difficulty, because he had not a seat in the House of Commons, thinking that, by his not being a member, the public business would suffer at such a critical time, when the contests between the two parties ran so high that the king thought fit to send the Duke of York into Flanders, and the parliament to commit the Lord-Treasurer Danby to the Tower. After this his majesty still pressed Sir William to be secretary of state; using as an argument for his compliance, that he had nobody to consult with at a time when he had the greatest need of the best advice. Notwithstanding all this, Sir William declined the king's offer, advising him to choose a council in whom he could confide, and upon whose abilities he could depend. This advice the king followed; and the choice of the persons being concerted between his majesty and Sir William, the old council was dissolved four days after, and the new one established, of which the latter was a member. Temple.

In 1680 the councils began again to be changed, on the king's illness, at the end of summer, and the Duke of York's return to court. At this juncture Sir William, endeavouring to bring to the king's favour and business some persons to whom his majesty had taken a dislike, if not an aversion, he met with such treatment from them as gave him a fresh distaste to the court, at which he seldom made his appearance; so that he resided principally at Sheen. Soon after this the king sent for him again; and having proposed that he should go as ambassador into Spain, Sir William consented; but when his equipage was almost ready, and part of the money paid down for it, the king changed his mind, and told him that he would have him defer his journey till the end of the session of parliament, in which he was chosen a member for the University of Cambridge. In this session the spirit of party ran so high that it was impossible to bring the house to any kind of temper. The duke was sent into Scotland; but this would not satisfy them, nor anything but a bill of exclusion, which Sir William strenuously opposed, saying that "his endeavour ever should be to unite the royal family, and that he would never enter into any councils to divide them." Not long after this period, the parliament being dissolved by his majesty, without the advice of his privy council, and contrary to what he had promised, Sir William made a bold speech against that measure; for which he was very ill used by some of those friends who had been most earnest in promoting the last change in the ministry. Upon this he grew quite tired of public business, declined the offer he had of again serving for the university in the next parliament, which was soon after called, and met at Oxford; and seeing his majesty resolved to govern without his parliament, and to supply his treasury through another channel, he retired to Sheen a few days after, whence he sent word by his son, that "he would pass the rest of his days like a good subject, but would never more meddle with public affairs." From that time Sir William lived at this place till the end of that reign and for some time in the next; when, having purchased a small seat called Moor Park, near Farnham in Surrey, for which he conceived a great fondness, on account of its solitude and retirement, and its healthy and pleasant situation, and being much afflicted with the gout, and broken with age and infirmities, he resolved to spend the remainder of his life in this agreeable retreat. In his way thither he waited on King James, who was then at Windsor, and begged his favour and protection to one "that would always live as a good subject, but, whatever might happen, never again enter upon any public employment;" desiring his majesty to give no credit to anything he might hear to the contrary. The king, who used to say that Sir William Temple's character was always to be believed, promised him whatever he desired, gently reproached him for not entering into his service, which, he said, was his own fault; and kept his word as faithfully to Sir William as Sir William did to his majesty,

Temple ‖ Tenasserim

during the surprising turn of affairs that soon after followed by the arrival of the Prince of Orange. At the time of this happy revolution, in 1688, Moor Park becoming unsafe, as it lay in the way of both armies, he retired to the house at Sheen, which he had given up to his son; to whom he refused leave, though importunately begged, to go and meet the Prince of Orange at his landing; but after King James's abdication, when the prince reached Windsor, he went thither to wait upon his highness, and took his son along with him. The prince pressed him to enter into his service, and to be secretary of state; but his age and infirmities confirming him in the resolution which he made not to meddle any more with public affairs, he was satisfied that his son alone should enjoy his Majesty's favour. Mr John Temple was upon this appointed secretary at war; but he had hardly been a week in that office, when he terminated his existence by drowning on the 14th of April 1689.

In 1694 Sir William had the additional affliction to lose his lady, who was a very extraordinary woman, as well as an affectionate wife. He was then considerably turned sixty; at which age he practised what he had so often declared to be his opinion, that "an old man ought then to consider himself of no farther use in the world, except to himself and his friends." After this he lived four years very much afflicted with the gout; and his strength and spirits being worn out, he expired in the month of January 1698, in the seventieth year of his age. He died at Moor Park, where his heart was buried in a silver box under the sundial in his garden, opposite to a window from which he used to contemplate and admire the works of nature, with his sister, the ingenious Lady Giffard. This was according to his will, in pursuance of which his body was privately interred in Westminster Abbey. There a marble monument was erected in 1722, after the death of his sister, Lady Giffard. She resembled him in genius as well as in person, and left behind her the character of one of the best and most constant friends.

Sir William Temple's principal works are:—*Memoirs from* 1672 *to* 1691. They are very useful for those who wish to be acquainted with the affairs of that period. *Remarks upon the State of the United Provinces; An Introduction to the History of England; Letters written during his last Embassies; Miscellanea.* He is a pleasing and popular writer; and his style was long regarded as a model of grace and elegance.

TEMPLE. See ARCHITECTURE, JERUSALEM, and TABERNACLE.

TEMPLEMORE, a market-town of Ireland, in the county and 28 miles N.E. of Tipperary, and 9 miles N. of Thurles. It stands near the right bank of the Suir; and is a modern town, in general neat, clean, and well built. The parish church is a handsome building, with a tower and spire; and there are also places of worship for Methodists and Roman Catholics; a court-house, jail, barracks, hospital, dispensary, school, news-room, and ball-room. Several weekly markets and annual fairs are held here. Pop. 4375.

TENASSERIM, a long strip of country extending along the west coast of Further India, between N. Lat. 10. 48. and 18. 52.; E. Long. 96. 35. and 99. 30. Length from north to south 500 miles, greatest breadth about 80, area estimated at 30,000 square miles. It forms part of the British possessions, and is divided into the four provinces of Amherst, Tavoy, Ye, and Mergui. It is bounded on the E. and N. by Siam and its tributary states, from which it is separated by the Siamese range of mountains; on the W. it is separated from Pegu by the Salween, and bounded also by the Bay of Bengal; while on the S. it comes to a point at the mouth of the River Packshan. The coast of this country, which is extensive in comparison with the area, presents in its general character a great uniformity. It is, except at the deltas of the larger rivers, bold and rocky, indented with many creeks, and lined with clusters of small islands, the most important of which is the Mergui Archipelago, lying opposite the province of that name. The general character of the surface is mountainous; but there are also extensive plains and valleys, watered by rivers of considerable size. The mountains run in three parallel chains from N.N.W. to S.S.E., and vary in height from 3000 to nearly 5000 feet above the sea, those nearest the sea being inferior to the more inland ranges. From base to summit they are covered with dense forests and brushwood, which extend in some places to the very edge of the sea. The largest river entirely within the limits of the country is the Tenasserim, which flows for about 200 miles southwards, parallel to the mountains, then turns westwards, and falls by several mouths into the sea. The Salween is a much larger river, but belongs more properly to the Burman empire than to Tenasserim, as the greater part of its course is in the former country, and it only separates for a short distance Tenasserim from Pegu. It flows southwards, and enters the sea near Moulmain. The Sitang and the Attaran, which both flow from east to west, fall into the Salween; a short distance above its mouth are the chief other rivers of the country. The Packshan forms the S.E. boundary of Tenasserim, and flows S.W. into the sea. The tide flows for some distance up all these rivers; and they can all be navigated, though the channels are sometimes intricate and interrupted. And not only do they thus facilitate internal communications and commerce, but by annually overflowing the surrounding country they also greatly fertilize the soil. The climate is remarkably uniform, both in the different parts of the country and in the different seasons of the year. The heat is in general very great, especially in the month of April, when it rises above 100°. From June till October the rainy season lasts; but in some parts of the country there are showers more or less frequent through all the year. It is remarkable that, notwithstanding its heat and moisture, Tenasserim is a very healthy country; the mortality both among Europeans and Hindoos being less here than in any other part of British India. Agriculture is only carried on to a limited extent, as but a small proportion of the area has been cleared and brought into cultivation. Rice is one of the chief crops raised, especially in the north, where the alluvial regions are more extensive than in the other parts. Cotton is not indigenous to the country, but has been introduced from Western India; it is grown to a small extent, chiefly along the rivers' banks. The sugar-cane thrives well, but is not extensively cultivated. Tobacco is raised for home consumption, as also are the betel-nut, the areca-nut, and other plants. The vast forests afford supplies of valuable timber. Teak grows in abundance on the upper course of the Attaran; jack-trees, sapan-trees, sandalwood-trees, and many trees yielding caoutchouc are also found here. Spices of all kinds are abundant. The wild animals which roam over the uncleared country are numerous; elephants, rhinoceroses, and tigers being the chief. Of the mineral resources of the country one of the most important is coal, which is found in considerable quantities and of good quality near Tavoy, and also on the River Packshan. Iron exists throughout the country, and tin in the southern portion. Gold has been found in the sands of some rivers, and copper in some of the islands of the Mergui Archipelago. In some places sulphureous springs exist. The tin seems to have been worked at a remote period; but the other minerals have not yet been turned to much account. Tenasserim is inhabited by several different races of people, and it is not certainly known which of them formed the original population. The Talians, who speak a different language from the Burmese, are at present the most numerous; but with them are intermingled Karens, Siamese, Burmese, Peguans,

Tenbury || Tenedos.

and Toungthoos, and the language of Burmah is used in all public transactions. The prevailing religion is Buddhism, except among the Karens, who have no religion except what is embodied in vague popular traditions. Churches and mission stations have been erected throughout the province by the American Baptist Missionary Society; and much has been done by these means to improve the moral character and condition of the people. The early history of Tenasserim is involved in obscurity and confusion. The country seems to have been now in the hands of the Siamese, now in those of Pegu, and now in those of the Burmese, who finally gained a lasting hold over it about 1760, and retained it under their oppressive government till it was ceded to the English by the treaty of Yandaboo in 1826. It was then in a miserable state, with a scanty population, and yielding no revenue; but under the British government it has rapidly risen to a very prosperous condition. Pop. 191,476.

TENBURY, a market-town of England, Worcestershire, on the Teme, 22 miles N.W. by W. of Worcester, and 133 W.N.W. of London. It contains some good houses; but has on the whole a mean appearance. Here are a parish church, built in 1777, a Baptist chapel, national schools, a savings bank, and mineral-springs of some repute. An extensive trade is carried on in hops, cider, and perry. Pop. 1786.

TENBY, a municipal and parliamentary borough and fashionable watering-place in Pembrokeshire, South Wales, on the western side of Carmarthen Bay, near the mouth of the Bristol Channel, 244 miles W. of London. Tenbigh (otherwise "Denbygh y pyscod," or "Fishing Denbigh," so called to distinguish it from the other Denbygh in "Gwynedh," or North Wales) is picturesquely seated on a lofty ridge or promontory of limestone, projecting into the sea, by which it is surrounded at high-water on three sides. On the east of the town is a small harbour, formed by a stone pier, which affords anchorage for a few vessels, but with the disadvantage of being dry at low-water. The borough is governed by 4 aldermen and 12 councillors, one of whom is mayor. The principal buildings are the parish church of St Mary, the town-hall and market-place, and the baths and assembly-rooms. The remains of Tenby Castle are interesting, and sufficiently preserved to convey an idea of the character of the fortifications, formerly of great strength and importance. The town-walls are more perfect, and still show marks of the injury inflicted upon them in the civil wars, when Tenby, garrisoned for the king, sustained two sieges, in 1643, and again in 1648. The woollen manufacture, introduced by the Flemings more than 700 years ago, and once very flourishing, has entirely disappeared. A considerable trade in fish is carried on here. Norris, in his *Etchings of Tenby*, 1812, mentions as a tradition the existence of a fish-bank off the town, called "Will's Mark, on which the greatest abundance and every variety of fish was formerly taken;" adding that "this spot was no longer to be found." The situation of this bank would appear to have been accidentally re-discovered in 1858. Tenby contributes, jointly with Pembroke, Wiston, and Milford, to send 1 member to Parliament. A market is held on Wednesday and Saturday. There is a small island immediately off the town, on which was formerly a chapel dedicated to St Catherine. The island of Caldy, of more importance, and on which are a lighthouse and the remains of a monastic establishment, is distant about 2 miles. Pop. (1851) 2982.

TENEDOS, a small island off the coast of the Troad, from which it is about 5 miles distant, 12 miles S.W. of Cape Sigeum. It is only 10 miles in circuit, but contained in ancient times a city with two harbours, and is celebrated both by poets and philosophers for the wisdom of its laws and institutions. It was also at one time an important naval station, on account of its position near the mouth of the Hellespont. But Tenedos will always be most closely associated with the Homeric poems, in which it is frequently mentioned, and in which Apollo is invoked as the god who rules Tenedos with might. Virgil, again, describes its once famous port as "Nunc tantum sinus et statio male fida carinis."

Teniers || Tennant.

TENIERS, DAVID, the elder, a Flemish painter, born at Antwerp in 1582, received the first rudiments of his art from the famous Rubens, who highly esteemed him for his promising genius, and with great satisfaction examined and commended his designs. From the school of that celebrated painter Teniers went to finish his studies at Rome. He attached himself to Adam Elsheimer for six years; and from the instructions of two such incomparable masters, he formed to himself a peculiar style, which his son afterwards cultivated so happily as to bring it to the utmost perfection. His pictures were small; and his subjects usually shops, laboratories, humorous conversations, and rural festivities. The demand for his pieces was universal; and even his master Rubens thought them an ornament to his cabinet. He died at Antwerp in 1640. (See ARTS, *Fine*, and PAINTING.)

TENIERS, *David*, the younger, also an admirable painter, was the son of the former, and was born at Antwerp in 1610. He greatly improved under his father, and obtained such reputation as introduced him to the favour of the great. The Archduke Leopold William made him gentleman of his bed-chamber; and all the pictures of his gallery were copied by Teniers, and engraved by his direction. The king of Spain and Don Juan of Austria set so high a value on his pictures, that they built a gallery to receive them. William Prince of Orange honoured him with his friendship; and Rubens not only esteemed his works, but assisted him with his advice. His principal talent lay in landscapes adorned with small figures. He also painted men drinking and smoking, chemists' laboratories, country fairs, and the like. His small figures are superior to his large ones. He died in 1694. (See ARTS, *Fine*, and PAINTING.)

TENISON, THOMAS, archbishop of Canterbury, was born at Cottenham, in Cambridgeshire, on the 29th of September 1636; and studied at Corpus Christi College in Cambridge. In his youth he applied himself to physic; but afterward went into orders, and was some time minister of St Andrew's Church, Cambridge, where he showed great attention to the sick during the plague in 1665. He showed himself very active against the growth of popery, by his writings both in the reign of King Charles and in that of King James. In 1680 he was presented to the vicarage of St Martin's-in-the-Fields, London, to which parish he made several donations. He endowed a free school, and built a handsome library, which he furnished with useful books. William and Mary, in 1689, presented him to the archdeaconry of London; in 1691 he was nominated to the see of Lincoln; and in 1694 he succeeded Dr Tillotson as archbishop of Canterbury. He performed all the duties of a good primate for twenty years, and died on the 14th of December 1715.

TENNANT, SMITHSON, a distinguished chemist, born at Selby in Yorkshire, on the 30th November 1761, was the only child of the Rev. Calvert Tennant, younger son of a respectable family in Wensleydale, near Richmond, and vicar of Selby. His mother was Mary Daunt, daughter of a surgeon of that town. His father had been a fellow of St John's College, Cambridge, and began to teach his son Greek when he was only five years old. He had the misfortune to lose him four years after; and before he grew up, his mother also, while he was riding with her, was thrown from her horse and killed on the spot. He was sent, after his father's death, to different schools, at Scerton, Tadcaster, and Beverley. In these he was remembered as a boy retired in his manners, and somewhat melancholy,

Tennant. and indolent with respect to puerile amusements. He learned but little at school, and may be considered as in a great measure self-educated, having been fond, almost as a child, of reading books of science, and of amusing himself with little experiments which he found described in them; and while he was at school at Tadcaster, he took great delight in attending a course of Walker's lectures on experimental philosophy which were given there. At Beverley he was under the care of Dr G. Croft, who had made himself known to the public by some controversial writings. Here he never entered much into the pursuits of his contemporaries, but profited by a good library belonging to the school; and among other books which he read with avidity was Sir Isaac Newton's *Treatise on Optics*.

He had entertained a great desire to complete his chemical studies under the immediate instruction of Dr Priestley, who was then enjoying deserved reputation for his recent experimental discoveries; but Dr Priestley's occupations did not permit him to undertake the task of directing his education, however agreeable it might have been to him to have assisted such a pupil. In the meantime he had not neglected his classics, but had acquired a sufficient knowledge of the learned languages to appreciate with correct taste the beauties of the great writers of antiquity. Notwithstanding his admiration for Dr Priestley, he was an early convert to the antiphlogistic theory of chemistry; which, with all its errors, was still a material step in the advancement of science.

In 1781 he went to Edinburgh, with the view of qualifying himself for the profession of physic, and he had the advantage of attending Dr Black's lectures, which were then in great reputation. In October 1782 he entered as a pensioner of Christ's College, Cambridge, where he became intimately acquainted with the late Professor Harwood, who had been first a surgeon in India, but having lost, by the misconduct of an agent, the fortune which he had there acquired, submitted cheerfully to the toil of recommencing his career as a physician, though already past the middle age. His talents for conversation were such as were extremely likely to captivate a young man of superior discernment; and he formed a friendship with Tennant which continued uninterrupted throughout their lives. At Cambridge he studied a little of the mathematics in the works of Newton, but much more of chemistry and botany: he already began to exercise his inventive powers in an attempt to economise the consumption of fuel in distillation, which he did not make public until twenty years after, though he mentioned it at the time to some of his friends. He also occupied himself incessantly in general, and especially in political reading, though he was far from having the air of a student; but his rooms were always in confusion, from the mixture of heterogeneous materials that were accumulated in them. His residence at Cambridge was perhaps the happiest time of his life; his spirits unwearied, his health unbroken, his feelings acute, and his conversation brilliant, though simple and unaffected.

In the summer of 1784 he paid a visit to Denmark, to Sweden, and to Scheele, whose acquaintance extremely delighted him, and most of all from the simplicity of the apparatus that he employed in his researches. A year or two afterwards he went to France, and being taken ill at Paris, he was joined there by his friend Harwood, with whom he returned through Holland and the Netherlands, at the time when the bigoted people of the Low Countries were in insurrection against a philosophical despot, while Holland remained free and prosperous.

He was particularly intimate with Dr Milner, the master of Queen's College, and was recommended by his signature, together with those of Waring, Maskelyne, Jebb, and Watson, as a fellow of the Royal Society, into which he was admitted in January 1785. He removed, together with his friend Harwood, in December 1786, from Christ's College to Emmanuel, and in 1788 he took the degree of bachelor of physic. In 1791 he communicated to the Royal Society his very interesting discovery of a mode of obtaining carbon from the carbonic acid. Having observed that charcoal did not decompose the phosphate of lime, he concluded that phosphorus ought to decompose the carbonate of lime; and the result fully justified his manner of reasoning. Tennant.

He paid a third visit to the Continent in 1792, intending to pass through France into Italy, and arrived at Paris not long before the 10th of August; but he saw some indications of an impending convulsion, and was fortunate enough to quit Paris on the 9th. He visited Gibbon at Lausanne, and was much interested in the sagacity which this eminent writer displayed in his conversation. He proceeded to Rome and Florence, where he was fully impressed with all the admiration that he had been taught to anticipate for the treasures of ancient and modern art possessed by those cities; and in his return through Germany, he was greatly amused by the mixture of knowledge and credulity which he observed among the studious of that country. At Paris, in 1793, he found everything enveloped in gloom and overwhelmed with terror. His friend Lametherie was alarmed by the visit which he paid him; but he had the integrity to preserve for him entire some property of considerable value with which he had intrusted him.

Upon his arrival in London, Tennant took chambers in the Temple, and was in the habit of living much with some of his early acquaintance, who had adopted the law as their profession; to his own he was in great measure indifferent, neither seeking to practise it, nor being well calculated to succeed greatly in it with the public, though he studied it with attention, and took pains to make himself master of its history and philosophy, being a particular admirer of Sydenham, when considered in relation to the age in which he lived. He took his degree of doctor of physic in 1796; and in the same year he gave the Royal Society a paper on the quantity of carbonic acid afforded by the diamond, which he measured by heating it with nitre, and obtaining a precipitate by the addition of muriate of lime; and he found that the diamond afforded no more carbonic acid than an equal weight of charcoal. A subsequent communication contained the result of his observations on the action of heated nitre on gold and platina.

The love of travelling appeared to be his predominant passion. In his travels, he studied not only the natural and political history of the countries which he saw, but also their languages, and the philosophy of their etymologies. He likewise observed the peculiarities of their agriculture; and, in 1797, he determined, after visiting an agricultural friend in Lincolnshire, to devote his attention to practical farming as a serious pursuit. He purchased some allotments of unenclosed land in that neighbourhood, but he left the management of them chiefly to his friend, and afterwards made considerable additions to the property by further purchases. In 1798 or 1799, he bought a tract of newly enclosed land on the Mendip Hills, near Chedder, where he built a house, and resided for some months every summer through the remainder of his life. These speculations, though their results were at first doubtful, yet succeeded remarkably well on the whole; more especially considering the benefit which his health derived from the travelling and the exercise that they rendered necessary; but they occupied too much of his attention, and of that time which might have been employed so much more to the advantage of the public, and to his own ultimate satisfaction.

In 1799, he gave the Royal Society a paper on the magnesian limestone, or dolomite, which he considers as rather

Tennant. a combination than an accidental mixture; and the forms of the crystals, as they have been determined by later observers, together with the laws of definite proportions, have tended to confirm this conjecture. He found that grain will scarcely germinate, and soon perishes when sown in the neutral carbonate of magnesia. In 1802 he published his paper on emery, which he showed to be a substance similar to the corundum or adamantine spar of China, and not an ore of iron, as had been commonly supposed. In the month of July he was making some experiments on crude platina, when he discovered in it a singular dark powder, which was left undissolved by the nitro-muriatic acid, and which was also observed the next year by Messrs Descotils and Vauquelin. In 1804, Dr Tennant showed that the powder contained two new metals, which he named *iridium* and *osmium;* and he received the Copleian medal from the Royal Society in November, as an acknowledgment of the merit of his various chemical discoveries. In 1805 and 1806 he paid two successive visits to Ireland, by way of Scotland, one of them in company with Browne the traveller, for whom he had a high esteem, and to whom he suggested the observation of the temperature of boiling water as a mode of determining the heights of mountains; a method, however, which had been long before recommended by Achard and others.

He became latterly more fond of general society than he had been in his earlier years, and he used to receive miscellaneous parties at his chambers, and to show them prints, and minerals, and novelties of various kinds. In 1812 he was persuaded to convert these mixed exhibitions into a more regular course of lectures, principally upon mineralogy, calculated especially for the ladies of his acquaintance, and which highly delighted all his audience. He subsequently accepted a professorship at Cambridge, and would thus, if he had survived longer, have greatly extended the sphere of his utility.

In 1813 he delivered a lecture on mineralogy to the Geological Society, and gave them also an account of his analysis of a volcanic substance from the Lipari Islands, containing the boracic acid, which has since been examined on the spot by Dr Holland. In the month of May he was elected professor of chemistry in the University of Cambridge, all opposition having been withdrawn before the election. The following spring he gave his first and last course of lectures there. His introductory lecture still exists in manuscript, and is said to contain a masterly sketch of the history of the science. He communicated to the Royal Society, in 1814, a paper on the easiest mode of procuring potassium, and another on the economy of heat in distillation, proposing to heat a second boiler by the condensation of the steam of the first. In the spring and summer of this year he was occupied in searching for the origin of iodine, and he succeeded in detecting this substance in sea-water, by the test of its tarnishing the surface of leaf silver. One of the last services that he rendered the Royal Society was in the capacity of a member of a committee which was formed in order to investigate, at the request of the government, the degree of danger that might attend the general introduction of gas-lights into the metropolis. He undertook, together with his friend Dr Wollaston, to make some experiments upon the inflammation of the gas, and they discovered conjointly the very important fact, that the gas contained in a small tube will not communicate the flame; a fact, which, in the hands of Sir Humphrey Davy, has been rendered productive of consequences so important to the public safety; although Sir Humphrey having been abroad at the time of this investigation, and the report of the committee not having been then published, he had to re-discover this truth, and many more, in his most ingenious and successful researches.

It was early in the month of September that Dr Tennant went for the last time to France, being impatient to Tennant. observe the changes which an eventful interval of twenty years had produced in that highly interesting country. He was greatly delighted with Lyon and Marseille; and, returning to Paris in November, he lingered there till February 1815. On the 15th of that month he arrived at Calais; on the 20th he went to Bologna with Baron Bulow, in order to embark there. They did embark on the 22d, but were forced back by the wind, and meant to try again in the evening. In the meantime they took horses and went to see Bonaparte's Pillar, about a league off; and going off the road on their return, to look at a small fort, of which the drawbridge wanted a bolt, they were both thrown, with their horses, into the ditch. Bulow was only stunned, but Tennant's skull was so severely fractured that he died an hour after.

Dr Tennant was tall and slight in his person; his face was thin and his complexion light; he resembled a little the portraits of Locke; he was generally negligent in his dress, but, on the whole, agreeable in his appearance. He was distinguished for good sense, for quickness of perception, and for penetration; but, as his friend and biographer Mr Whishaw observes, in the admirably energetic sketch which he has given of his character, he was one of those who, to use the words of Dr Johnson, "without much labour have obtained a high reputation, and are mentioned with reverence rather for the possession than the exertion of uncommon abilities."

The effect of his peculiar cast of humour was heightened by a perfect gravity of countenance, a quiet familiar manner, and a characteristic simplicity of language. He was firmly attached to the general principles of freedom, being fully convinced "of their influence in promoting the wealth and happiness of nations; a due regard to these principles he considered as the only solid foundation of the most important blessings of social life, and as the peculiar cause of that distinguished superiority which our own country so happily enjoys among the nations of Europe." He possessed a strong sense of high honour, as well as of duty; and his liberality and humanity were evinced by some practical occurrences in which he had occasion to exercise them: his steward had defrauded him, and when the day of reckoning came, had destroyed himself: he not only forgave the debt, but provided also for the widow and her family.

His papers published in the *Philosophical Transactions* were eight in number. *On the Decomposition of Fixed Air*, 1791, p. 182; *On the Nature of the Diamond*, 1797, p. 123; *On the Action of Nitre upon Gold and Platina*, p. 219; *On the different sorts of Lime used in Agriculture*, 1799, p. 305; *On the Composition of Emery*, 1802, p. 398; *On two Metals found in the Black Powder remaining after the Solution of Platina*, 1804, p. 411; *On an easier Mode of procuring Potassium than that which is now adopted*, 1814, p. 578; *On the Means of Producing a double Distillation by the same Heat*, p. 587. *The Analysis of a Volcanic Substance containing the Boracic Acid* appeared in the *Transactions of the Geological Society*, vol. i., 1811. (T. Y.)

TENNANT, *William*, a poet and oriental scholar of Scotland, was born in Easter Anstruther, a small fishing village in the county of Fife, in 1785. He was educated at a school in his native place, where he had Thomas Chalmers for his play-fellow. Early disabled for active life, by being deprived of the use of his limbs in early youth, he took kindly to books, and entered the University of St Andrews in 1799. After remaining here two sessions, he afterwards became a clerk to his brother, who was a corn-factor in Glasgow. Whilst in this situation he applied himself assiduously to the study of the great European poets, and succeeded in mastering the difficulties of Ariosto, Camoëns, and Wieland in their own original tongues. Tennant, after transporting himself back to his native place, published his humorous poem of *Anster Fair* in 1812. It was written in the *ottava rima* of the Italians, which was then but little known in English poetry, but which has since been popularised by the pen of

Tennemann || Tennessee.

Lord Byron. The poem was lively, picturesque, and agreeable; frequently landing in burlesque where mere drollery was aimed at, and descending more than once from high tragical situations to the merest farcical jokes. The fun of the poem, although often strained, has nevertheless many of the essentials of true humour, and it abounds in instances of the most apt and sometimes even striking language. The scene is laid in the reign of James V., and the heroine of the entertainment is Maggie Lauder. Jeffrey did what he could to give it a name in the *Edinburgh Review* in 1814, and it has since gone through many editions. Tennant was successively teacher of the parish schools of Denino, to which he was advanced in 1813, and of Lasswade in 1816. In 1819 he went to Dollar Academy, where he taught the classical and oriental languages until 1835, when he was appointed professor of oriental languages in St Mary's College, St Andrews. Here he employed his leisure in compiling grammars of the Syriac and Chaldee tongues, which were published in 1840. He likewise wrote various poems, dramas, and translations of very considerable merit, but except his *Anster Fair*, his poetical productions are now well-nigh forgotten. He died near Dollar on the 15th of February 1848.

TENNEMANN, Wilhelm Gottlieb, a learned philosopher of the school of Kant in Germany, was the son of a clergyman, and was born at Brembach near Erfurt on the 7th December 1761. After passing through the public school and the university of his native town, he removed to the university of Jena in 1781, where he gave himself wholly up to philosophy. At the outset of his career he was a decided opponent of the philosophy which he afterwards saw reason to embrace. In 1791 he published a work on the *Doctrines and Opinions of the Socratics on the Immortality of the Soul* (Lehren und Meinungen der Sokratiker über die Unsterblichkeit der Seele); in 1792–95 he published in 4 vols. his *System der Platonischen Philosophie.* Tennemann's *Geschichte der Philosophie*, of which 11 volumes were completed at the time of his death (1798–1819), will afterwards remain as his surest passport to fame. The abridgment of this work (1812) has been translated into French by V. Cousin (1839), and into English by Johnstone, revised by J. R. Morrell in 1852. He likewise translated Hume's *Treatise of Human Nature*, and Locke's *Essay* into German. In 1798 he was made extraordinary professor at Jena, and in 1804 he was removed to be professor of philosophy at Marburg. In 1816 he was made librarian to the university, and he died on the 30th September 1819.

TENNESSEE, one of the western states of the North American Union, lying between N. Lat. 35. and 36. 36.; W. Long. 81. 40. and 90. 15.; bounded on the N. by Kentucky and Virginia; E. by North Carolina; S. by Georgia, Alabama, and Mississippi; and W. by Arkansas and Missouri. Length from E. to W. about 430 miles; breadth 110; area about 45,600 square miles. It is generally divided into three parts—Eastern, Middle, and Western Tennessee; the Cumberland Mountains separating the eastern from the middle, and the River Tennessee, the latter from the western portion. The surface of the country varies much in its different parts; as it extends over so great an area, from the summit of the Alleghany range to the east bank of the Mississippi. The eastern part of the country is entirely occupied by the various chains of the Alleghany Mountains, the chief of which are three; the Kittatinny chain, known also under several local names, forming the boundary between Tennessee and North Carolina; the Chestnut ridge nearly parallel to this, further west; and the Cumberland Mountains or Laurel ridge, still further west. None of the summits exceed 2000 feet in height; but the chains are continuous, broken only by a few gaps or passes at long intervals. In some places the mountains are rugged and precipitous, in others they rise gently from the surrounding country, and enclose fertile and beautiful valleys. The country between the mountain-ridges is occupied by valleys, broad but somewhat uneven in their surface; and there are but few tracts unfit for cultivation. Forests of pines and other trees cover the mountains to their summits. The central portion of Tennessee is a hilly country, gradually declining in elevation towards the west. The hills generally form ridges or undulations in a direction parallel to the mountain-chains in the east. The extreme west of the state forms an almost unbroken level. Tennessee.

Many fine rivers, some of which are navigable, traverse the state of Tennessee. The Mississippi, which washes for a distance of 160 miles its western border, receives either directly or through its affluent the Ohio, all the rivers of the state. Western Tennessee is entirely watered by direct tributaries of the Mississippi, the chief of which are the Forked Deer, navigable for 150 miles; the Hatchee, for upwards of 100, and the Obion for 60 miles. The central and eastern regions are watered by the Tennessee and Cumberland, with their affluents. The Tennessee river is formed by the confluence near Kingston of the Clinch and the Holston, the former of which rises in the Alleghanies in the S.W. of Virginia, while the latter flows from the same mountains on the borders of Tennessee, and receives from the left the French Broad River and the Little Tennessee. The united stream flows in a very irregular course generally towards the south-west, until it crosses the frontiers of Tennessee and enters Alabama. It then turns westward, and after a long curve, re-enters Tennessee and crosses that state again from south to north, enters Kentucky, and falls into the Ohio. The Elk and the Duck rivers are its principal affluents in the lower part of its course, they both rise in the Cumberland Mountains and flow westwards into the Tennessee. The whole length of the Tennessee is nearly 900 miles, of which 400 are within this state; and it is navigable for 700 miles by steam-boats. The Cumberland rises in Kentucky, and makes a bend for about 150 miles in the north of the state, then re-enters Kentucky, and falls into the Ohio a short distance above the Tennessee. Its largest affluents in Tennessee are the Caney Fork and Stone River. Its navigable length is 400 miles.

The geological structure of the country varies considerably in its different parts. A narrow strip of land along the eastern boundary of the state is occupied by Upper Silurian strata, here known by the name of gray limestone. The Lower Silurian formations, under the names of the Stone River and Nashielle groups, cover a large portion of Central Tennessee; and strata of the Devonian formation traverse the west of the state from north to south. Still further west lies a broad strip of chalk rocks; while immediately on the bank of the Mississippi there are more recent alluvial deposits. There are also extensive coal measures, which traverse the state from north-east to south-west, forming part of a chain that connects the great coal regions of Ohio and Pennsylvania in the north with those of Alabama in the south. Many valuable minerals exist in the country in great abundance. Besides coal, iron is found chiefly along the Cumberland river. Copper, lead, zinc, silver, and manganese exist in the central and eastern divisions, and gold in small quantities in the north-east of the state. Marble, slate, gypsum, and alum are also among the minerals of Tennessee. In the Cumberland Mountains, as in most limestone regions, there are many caves, some of which are more than 100 feet below the ground and upwards of a mile in extent. The country has also many salt and mineral-springs.

The climate of Tennessee is temperate, being free alike from the excessive heat of the south and the cold winds of

Tennessee. the north. A considerable amount of snow falls during the winters; but these are generally of short duration. With the exception of some of the alluvial regions near the great rivers, the whole of the country is of undoubted salubrity. The soil is in general fertile and fit for the plough, especially in the western parts, where a rich black mould prevails; in some parts in the east of the state the soil is poorer and more adapted for pasturage; but even here the valleys are very fertile. Forests of pine, juniper, red cedar, oak, beech, walnut, poplar, and many other trees cover the mountains of Tennessee. Maize, tobacco, and cotton are the most important crops raised; but besides these, wheat, rye, oats, buckwheat, barley, potatoes, flax, hemp, and fruits of various kinds are cultivated. In 1850 the extent of cultivated land in the state was 5,175,173 acres, and the produce consisted of 52,276,223 bushels of maize, 7,703,086 of oats, 1,619,381 of wheat, 89,163 of rye, 3,845,560 of potatoes, 369,321 of pulse, 14,214 of grass seed, and 18,906 of flax seed; 20,148,932 lb. of tobacco, 77,812,800 of cotton, 8,139,585 of butter, 1,364,378 of wool, 1,036,571 of honey and wax, 177,681 of cheese, 368,131 of flax, 248,000 of sugar-cane, 258,854 of rice, 158,577 of maple sugar, and 74,092 tons of hay. The live stock in the same year comprised 270,636 horses, 75,303 mules and asses, 750,762 horned cattle, 811,595 sheep, and 3,114,111 swine, valued in all at L.6,247,418. The wild animals of the country are similar to those found in the adjacent states, including deer, squirrels, racoons, foxes, and in some places bears. There are also pheasants, partridges, wild turkey, ducks, and geese; and fish are found in the rivers, but not in very great abundance.

The state of Tennessee, especially its eastern portion, njoys many facilities for manufactures in having abundance of water-power from its great rivers, a plentiful supply of coals and other fuel, and many of the most important raw materials produced in the immediate neighbourhood. According to the census of 1850, the state contained 2789 manufactories, producing annually above L.100 worth of goods. Among these were 33 cotton factories, employing 310 men and 581 women, and producing 363,250 yards of cloth, and 2,326,250 lb. of yarn, valued in all at L.106,378; 4 woollen establishments, employing 15 men and 2 women, and producing goods valued at L.1314; 81 furnaces, forges, &c., employing 2705 men, and producing 44,152 tons of wrought, cast, and pig iron, valued at L.335,732; numerous breweries and distilleries, employing 159 hands, and producing 657,000 gallons; and 364 tanneries, producing leather valued at L.155,415. The total value of home-made manufactures in Tennessee was L.648,709, being higher than the amount in any other state of the Union. The chief centres of manufacturing industry are Nashville, Knoxville, and Memphis; but the great bulk of the manufactures are carried on in the villages of the state; and there are no great manufacturing towns such as have risen up in the eastern states. Internal communication is facilitated in Tennessee by numerous railways, which intersect the country in all directions, connecting all the principal towns with the Atlantic coast on the one side, and the Mississippi and the western states on the other. In January 1859, the total length of the railways in Tennessee was 830 miles. There are no canals in the state, the numerous navigable rivers affording abundant means of communication by water. The principal exports from the country are live stock, pork, bacon, lard, butter, flour, maize, fruits, tabacco, cotton, hemp, and saltpetre, which are conveyed either to New Orleans, and thence to American or foreign ports, or by railway to Virginia, Georgia, or South Carolina. Tennessee has thus an important internal and transit trade, but no direct intercourse with foreign countries.

Education is well provided for in Tennessee; there were in January 1859, 7 colleges, besides a separate theological seminary; 278 academies; and 2713 schools, attended by 288,538 children. The government has a school fund, which amounted in 1853 to L.121,677; and the amount laid out on education in 1857 was L.41,525. Among the public institutions are a state penitentiary, an institution for teaching the blind, a lunatic asylum, all at or near Nashville, and a school for the deaf and dumb at Knoxville. In 1850, Tennessee contained in all 1939 places of worship, with 606,695 sittings. Of the former, 831 belonged to the Methodists; 611 to Baptists of various sects; 357 to the Presbyterians, and the rest to other sects of much less size and importance in the state. There is, on an average, 1 place of worship to every 517 inhabitants, and the aggregate value of church property is L.251,846.

Tense || Tenterden.

The government of Tennessee is, like that of all the other states of the Union, democratical. The executive power is in the hands of a governor, elected by popular suffrage for a period of two years, and receiving a salary of L.625 a year. The legislature consists of a senate of 25, and a house of representatives of 75 members, likewise elected by the people every two years. The judicial establishments consist of a supreme court of 3 judges; a court of chancery of 6; 15 circuit courts; a special criminal court for Davidson county, in which the capital stands; a common law and chancery court; and a criminal court for the city of Memphis. All the judges are popularly elected for a term of eight years, and have salaries varying from L.312 to L.520. Slavery exists in Tennessee; and by a provision in the constitution, the legislature has no power to abolish it without the consent of the owners. The total amount of the state income for the two years ending October 1, 1859, was, L.385,016; that of the expenditure for the same period, L.355,057. The total amount of the state debt, October 1, 1859, was L.3,467,417. There were in January 1859, 39 banks in Tennessee, with an aggregate capital of L.1,741,947, and a circulation of L.1,348,502. The largest town and capital of the state is Nashville, on the River Cumberland. There are 79 counties, of which 28 are in Eastern, 32 in Central, and 19 in Western Tennessee.

Tennessee was the first settled of all the states west of the Alleghanies, for as early as 1757 a settlement was formed at Fort London, in the east of the state, by emigrants from North Carolina, to which this country originally belonged. The Cherokees, who then inhabited the country, destroyed this fort in 1760, and murdered or drove away all the settlers; but colonization was soon after resumed, and in 1780 the Cherokees were expelled from the north and centre of Tennessee. In 1784, North Carolina ceded it to the Federal Government, but afterwards revoked the grant when an attempt was made to form an independent state. Finally, however, in 1790, it came under the direct sway of the United States government, by whom it was formed, in 1794, into a territory, and admitted in 1796 as a state (the sixteenth) into the Union. In the war with Britain in 1812 Tennessee took an active part; General Jackson, a citizen of this state, greatly distinguishing himself by his defeat of the British at New Orleans. In 1834, a new constitution was adopted in Tennessee, which still continues in force. The population of the state in 1850 was 1,006,213, of whom 237,026 were slaves.

TENSE. See GRAMMAR.

TENTERDEN, a market-town and municipal borough of England, in the county of Kent, 19 miles S.S.E. of Maidstone and 55 S.E. of London. It stands on a hill in the midst of a rich country, occupied chiefly by hop plantations. The church is large and handsome, chiefly in the perpendicular style. At the west end is a lofty tower, to which a beacon was formerly attached. The old saying that "Tenterden steeple was the cause of the Goodwin Sands," according to a story related by Bishop Latimer in one of his sermons, originated on an occasion when Sir Thomas

Tenterden ‖ Tenure.

More was sent with a commission to investigate the cause of the formation of the Goodwin Sands, and obstruction of Sandwich harbour, when this sage opinion was propounded by one of the oldest inhabitants. But a different explanation of the saying is also given. There are in Tenderden places of worship for Wesleyan Methodists, Baptists, and Unitarians; national, British, and commercial schools, and an athenæum. Weekly markets for corn, and an annual fair for cattle, wool, &c., are held here. Pop. 3901.

TENTERDEN, CHARLES ABBOTT, *Lord*, was the son of a barber, and was born at Canterbury on the 7th of October 1762. A writer in the *Gentleman's Magazine* describes his father as a "tall, erect, primitive-looking man with a large pigtail," who was often to be seen "going about with the instruments of his business under his arms, and attended frequently by his son Charles, a youth as decent, grave, and primitive-looking as himself." The turning point in the boy's fate was the year 1769, when he was entered a pupil at Canterbury school, then taught by the excellent Dr Osmund Beauvoir. Here, as ever afterwards during his life, he displayed the same talents and industry which gradually led to his being made a baron. He was calm, accurate, and steady; narrow-minded perhaps, but safe, sure, and exceedingly industrious. In 1779 he was captain of the school, and by the bounty of a few individuals he was enabled to enter Corpus Christi College, Oxford, in 1781. Here he distinguished himself much, and gained the prize in 1786 for a neat, lucid, elegant essay "On the Use and Abuse of Satire." He was admitted a fellow of his college, and took pupils. Abbott entered himself at the Inner Temple in 1788, and was called to the bar in 1795. Having chosen the Oxford circuit, he rapidly rose into great business. His income in a few years amounted to upwards of L.8000. In 1802, he published his excellent *Treatise on the Law relative to Merchant-Ships and Seamen*, which has since gone through numerous editions. In 1816 he was made puisne judge in the court of Common Pleas. He was knighted shortly after, and succeeded Lord Ellenborough as chief-justice of the Court of King's Bench. In all his decisions on the bench he showed an anxiety to make his judgments agree with common sense. He was a man of facts, in short, of the true Oxford type as it figured in those days in the society of England, and was excessively fond of supporting the executive. Sir Charles Abbott was made a peer in 1827, by the title of Baron Tenterden. He took an active part in the business of Legislation, and had a principal share in a number of acts passed for the alteration and the improvement of the law. During the long vacation he amused himself by reading the classics, studying botany, and inditing Latin verses on flowers and plants. In these refined and elegant pastimes his taste must have attained to an exquisite degree of culture. When Sir James Scarlett on one occasion referred to the poetry of Byron, Southey, and Wordsworth, Lord Tenterden begged to observe that "for himself he was bred in too severe a school of taste to admire such effusions." He died on the 4th November 1832, leaving two sons and two daughters. (See Lord Campbell's *Lives of the Chief-Justices*, vol. iii.)

TENTYRA, now DENDERA. See EGYPT.

TENURE, in *Law*, signifies the manner in which lands or tenements are held, or the service which the tenant owes to his lord. Of this kingdom almost all the real property is by the policy of our laws supposed to be granted by, dependent upon, and held of, some superior lord, by and in consideration of certain services to be rendered to the lord by the tenant or possessor of this property. The thing held is therefore styled a *tenement*, the possessors of it *tenants*, and the manner of their possession a *tenure*. Thus all the lands in the kingdom are supposed to be held mediately or immediately, of the king, who is styled the lord paramount, or above all. Such tenants as held immediately under the king, when they granted out portions of the lands to inferior persons, became also lords with respect to those inferior persons, as they were still tenants with respect to the king; and thus partaking of a middle nature, were called mesne or middle lords.

Teramo ‖ Terentius Afer.

TERAMO (anc. *Interamna Prætutiana*), a town of Naples, capital of the province of Abruzzo Ultra I., 27 miles N.E. of Aquila. The walls, which at one time enclosed the town, have now entirely disappeared. Some of the streets are broad, and lined with handsome houses; but the greater part of the town consists of narrow dirty streets and ruinous houses. The cathedral is a modernised Gothic building; and there are here also several convents, a royal college, diocesan seminary, several hospitals, public offices, and courts of law. Hats, watches, and cream of tartar are made here; and some trade is carried on in corn, wine, and oil. Numerous remains of temples, baths, aqueducts, &c., indicate the site of the ancient city. Pop. 10,000.

TERCEIRA. See AZORES.

TERENTIUS AFER, PUBLIUS, a comic poet of great celebrity, was born at Carthage about 195 B.C. Hardly anything is known with certainty regarding him. At an early age he became a captive, and was sold as a slave to Terentius Lucanus, a Roman senator, to whom he appears to have been indebted for a learned education. His manners and accomplishments recommended him not only to his master, but likewise to other men of rank, whose names have been recorded. Having been manumitted, he attained to great eminence as a writer of Latin comedies. He was honoured with the friendship of Lælius, and of Scipio the son of Paulus Æmilius; and his dramas are even supposed to have derived some of their chief beauties from their patrician pens. Such insinuations have not been uncommon in various eras of literary history; but some doubt may reasonably be entertained whether Scipio or Lælius could have produced even the second-rate scenes of Terence's comedies. They exhibit a uniform vein of elegant simplicity, in which we discover no reason to suspect a divided property. His plots are derived from Greek sources, chiefly from Menander; but the terse Latinity and graceful diction are peculiarly his own. Cæsar considered the want of pungent humour, the *vis comica*, the chief defect of his dramas.

The comedies of Terence appear to have been very successful on the stage, but he did not long continue his prosperous career. According to Eusebius, he died in Arcadia; and Suetonius refers his death to the consulship of Cn. Corn. Dolabella and M. Fulvius Nobilior—that is, to the year 159 B.C. According to this chronology, he must only have attained the age of thirty-three; but the latter writer states that he had not completed his thirty-fifth year. The circumstances of his death are variously related, but the prevailing report was, that when on his voyage home from Greece, his translations of Menander were lost by shipwreck, and the poet himself died of grief at their disappearance. He left an only daughter, who became the wife of a Roman knight, and inherited a garden of 20 acres in the Via Appia. He had a tawny complexion, with a slender frame, and a moderate stature.

Six comedies, all of the class *Fabula Palliata*, or those in which the characters introduced were Greeks in Grecian costume, are all that have survived the ravages of time of Terence's writings. The following are the titles of his plays, with the order in which they appeared:—The *Andria, or Woman of Andros*, was first represented at the Megalesian games, on the 4th of April 166 B.C.; the *Hecyra, or the Stepmother*, was exhibited at the Megalesian games in 165 B.C.; the *Heautontimoroumenos, or the Self-Tormentor*, was performed at the Megalesian games, B.C. 163; the *Eunuchus* was received with great acceptance at the Megalesian games, B.C. 162; the *Phormio* was played at the

Termini ‖ Terpander.

Roman games for the first time on the 1st October B.C. 162; and finally, the *Adelphi, or the Brothers*, the most delightful to a modern reader of all Terence's comedies, was acted at the funeral games of L. Æmilius Paulus, B.C. 160. Of these six comedies, the editions are very numerous, and not a few appeared before the termination of the first half-century of printing. The *editio princeps*, a folio without date, is supposed to have been printed at Strasburg by Mentelin. Seventeen editions, the first in 1517, proceeded from the Aldine press. Of the earlier editions, the most important is that of Gabriel Faërnus, Florent. 1565, 8vo. Faërnus was a man of taste as well as learning, and, being himself a very skilful versifier, possessed some eminent qualifications as an editor of Terence. To his text many succeeding editors have chiefly adhered. Another valuable edition was published by Lindenbrog, Paris, 1602, 4to, Francof. 1623, 4to; one by Bishop Hare, Lond. 1724–25, 4to; another by Bentley, Cantab. 1726, 4to, Amst. 1727, 4to; another by Westerhov, Hag. Com. 1726, 2 tom. 4to.; another by Stallbaum has been published in 1830, and the last by Volbehr in 1846. One édition was professedly published for men of taste ("in usum elegantiorum hominum edidit, F. H. Bothe"), Berolini, 1806, 8vo. Terence has been frequently translated into and imitated in nearly every European language. A good version of him into blank verse was executed by the elder George Colman, Lond., 1765, 4to; and a recent prose version has been executed by Riley, 1853.

TERMINI, a town on the north coast of Sicily, at the mouth of a river of the same name, in the province and 23 miles E.S.E. of Palermo. It stands on a hill, in the midst of a rich and well cultivated region; and is defended by walls and a strong castle. There are here several churches, convents, hospitals, and a college. The harbour is good; and corn, oil, and other agricultural productions are exported. The warm saline baths, from which the place derived its ancient name, Thermæ Himerenses, are still in high repute. Pop. 9000.

TERNATE, a small island in the East Indian Archipelago, off the W. coast of Gilolo, in the Moluccas. It is nearly circular in form, and about 10 miles in diameter, consisting almost entirely of a conical volcano, 5480 feet high, densely wooded up to a considerable height. Frequent and destructive eruptions have taken place. Cocoanuts, sago, tobacco, cotton, sulphur, and saltpetre are the chief productions of the island. The town of Ternate is the residence of a native sultan and a Dutch regent, and its harbour is commanded by a fort.

TERNI. See INTERAMNA.

TERODANT, or TARUDANT, a town of Morocco, capital of the province of Sus, in the midst of a rich and beautiful plain, 46 miles from the coast, and 110 S.W. of Morocco. It is well built of stone, and surrounded with lofty and thick walls. Dyeing, tanning, and the making of saltpetre are carried on here, and there is some trade in copper and cloth. Pop. 22,000.

TERPANDER, the father of Greek music and of lyric poetry, flourished at the town of Antissa, in Lesbos, somewhere between 700 B.C. and 650 B.C. It has been set down hitherto with confidence by historians (see particularly K. O. Muller in his *Literature of Anc. Greece*, and Grote, *History of Greece*, vol. iv.), as a well ascertained fact, that the victor at the Spartan festival of Carneia, was Terpander, and that this occurred in 676 B.C. (Ath., xiv.) But it has been acutely argued, by a writer in Smith's *Dictionary of Greek and Roman Biog. and Mythology*, that too much certainty has been attached to this point of time in the midst of the surrounding chronological obscurity. Born of a musical race, and born in a musical city, for here was the grave of the mythical and musical Orpheus, Terpander was, besides, possessed of a true genius for simple lyrics, and for the harmony of their utterance by the human voice in the form of song. His was the first orderly brain of sufficient power that undertook to bind down, under the rigour of rules, the floating airs of the different provinces of Greece and of Asia Minor. His musical success seems to have been nearly as great as the success which attended the Homeric poems. Curious circumstance this, that the first poet and the first musician of whom any record remains, should have been the best poet and the best musician in all history. Terpander removed from Lesbos to Sparta, where he set up the first musical school hitherto known in Greece. The compass of the lyre was enlarged by him from a tetrachord to an octave. Almost all we know of his musical labours is, that he exercised himself for the most part with citharoedic nomes (*νόμοι*). He set his own verses and those of Homer to fixed tunes, which he chanted on the harp at the musical contests of Greece. Whether or not he employed the flute as a means of harmonical expression is doubtful. Neither is it certain whether he invented any kind of musical notation in which to preserve his tunes after he was gone. The music of Terpander remained long famous throughout Greece; and as he was the first to gain the prize at the musical festival of Carneia, his descendants seem to have resolved that so high an honour should not pass lightly out of their school. The musicians of Terpander were, accordingly, famous for many centuries after his death. Only a few fragments now remain to attest the simple elegance of the religious songs of Terpander. These will be found in the second volume of Bode's *Geschichte der Lyrische Dichtkunst der Hellenen*.

Terracina ‖ Terra di Lavoro.

TERRACINA (anc. *Anxur*, or *Tarracina*), a town of the Papal States, at the S.E. extremity of the Pontine marshes, near the border of the kingdom of Naples, about 56 miles S.E. of Rome. The ancient Anxur, whose site is occupied by the present old town, stood, as ancient writers inform us, on calcareous rocks, widely conspicuous for their white colour, forming the termination of the Monti Lepini, the ancient Volscian Mountains. At the foot of these rocks, and close upon the sea-shore, ran the Via Appia, still the high-road between Rome and Naples. Along it has been built the more modern portion of the town, consisting chiefly of inns, custom-houses, and other public offices. The most conspicuous building in Terracina is the cathedral, with its lofty spire; there is also an elegant episcopal palace, and above the town, on the summit of the overhanging cliff, are the remains of the palace of Theodoric. The ancient harbour, constructed by Antoninus Pius, has long been completely silted up; but there is still some fishery here and a little trade. Anxur was the name of the town while it was subject to the Volscians; but after the Romans conquered it, about 400 B.C., they gave it the name of Tarracina. It was a place of importance in the later times of the republic and under the empire. Pop. 4145.

TERRA DEL FUEGO. See TIERRA DEL FUEGO.

TERRA DI LAVORO, a province of the kingdom of Naples, nearly corresponding to the ancient Campania, bounded on the N. by Abruzzo Ultra, E. by Molise and Principato Ultra, S. by Principato Citra and Naples, W. by the Mediterranean and the Papal States. Length from N.W. to S.E. 86 miles, greatest breadth, 70; area, 2505 square miles. It occupies the country between the Apennines on the north-east and the sea on the south-west, which here forms the wide gulf of Gaeta; and it consists generally of an extensive plain, broken in a few places with ridges of hills; but it may be considered as comprising five separate plains and valleys, three of which lie along the coast, and two at the foot of the mountains. The three plains along the coast are, that of Nola in the extreme S.E., almost entirely covered with elms and poplars, festooned

Terranova || Tertullianus.

with vines, and watered by the Lagni (anc. *Clanius*); the plain of Capua and Caserta in the centre, watered by the Volturno and Savone; and that of Gaeta, traversed by the Garigliano (anc. *Liris*.) The two valleys near the mountains are those through which the upper waters of the Volturno and Garigliano flow. The hills which separate the last two, and also the plains of Gaeta and Capua, are the Massic Hills, so celebrated in ancient times for their wine. Indeed, the whole district was anciently most favoured in this respect, producing, besides the Massic, the Falernian, Cæcuban, Formian, and other wines. It is still one of the most fertile and well cultivated regions in Europe—producing, besides excellent wines, of which the most celebrated now is that called *Lachryma Christi*, corn, oil, fruits, flax, hemp, &c. Cattle of good breed are also reared on the pastures. The province has for its capital Caserta; and is subdivided into 5 districts, 50 arrondissements, and 236 communes. Pop. (1856) 774,525.

TERRANOVA, a seaport of Sicily, in the province and 30 miles S.S.E. of Caltamsetta, at the mouth of a river of the same name, on the south coast of the island. It contains a castle, several handsome churches and convents, a fine palace of the Duke de Monteleone, a public hospital, &c. The harbour is not very good, but there is a considerable trade in corn, wine, sulphur, and soda. Terranova occupies the site of the ancient Gela. Pop. 10,000.

TERRASSON, JEAN, born at Lyon in 1670, and educated at the Oratoire, distinguished himself in the dispute concerning Homer between La Motte and Madame Dacier, by writing a *Dissertation Critique sur l'Iliade d'Homère*, Paris, 1715, 2 tom. 12mo. Among other works, he likewise wrote a political and moral romance called *Sethos*. It is a publication of considerable learning and ability. He published a French translation of Diodorus Siculus, Paris, 1737–44, 7 tom. 12mo. Terrasson is commonly described as *Abbé*, but he only appears to have been in subdeacon's orders. In 1721 he became professor of Greek and Latin in the College of France. Having outlived his memory, he died at Paris on the 15th of September 1750. Four years after his death there appeared a small work by him on the Cartesian philosophy, entitled *La Philosophie applicable à tous les objets de l'Esprit et de la Raison*, 1754. Terrasson, who was a member of the French Academy and of the Academy of Sciences, had his éloge written by d'Alembert.

TERRE HAUTE, a town of the United States of N. America, Indiana, on the E. bank of the Wabash, 73 miles W.S.W. of Indianapolis. It is regularly and well built, partly of brick and partly of wood; and it has a court-house, town-hall, numerous churches, an academy, and other handsome buildings. The trade of the town is rapidly increasing, grain, flour, and pork being the chief articles. Pop. 4900.

TERTULLIANUS, QUINTUS SEPTIMIUS FLORENS, one of the Latin Fathers, was born at Carthage about the middle of the second century. Dr Allix, in his *Dissertatio de Tertulliani Vita et Scriptis*, 1680, has remarked that those who suppose him to have flourished about the year A.D. 160, have referred his birth to too early a period. His father was a centurion in the legion of the proconsul. The son was well instructed in elegant as well as useful learning, and in particular acquired much skill in the civil law. Having renounced the errors of paganism, he distinguished himself by his able apology for the Christians. It appears from his works that he was married. He became a presbyter of the church of Carthage, and afterwards paid a visit to Rome, where he was a spectator of the games celebrated by the Emperor Severus in the year A.D. 204. On his return he embraced the errors of Montanus. (See MONTANUS.) He assumed the *pallium*, or robe of the ancient philosophers, and defended his conduct in a learned and singular tract *De Pallio*. He at length relinquished his connection with the Montanists, but still retained some peculiar opinions. Tertullian reached an advanced age, and we may perhaps place his death about the year A.D. 240. Nearly all we know of him is obtained from a very short account by St Jerome. He was a man of much fervour and ingenuity, conjoined with various learning; but his works contain many erroneous, and some pernicious opinions, among which we may class his notion as to the benefit of prayers for the dead. He writes in an impassioned style of eloquence, and his meaning is not unfrequently obscure. Lactantius, no mean judge, has censured him as deficient in ease and perspicuity. His whole works number in all thirty-one. The earliest edition of his works was published by Beatus Rhenanus, Basil. 1521, fol. Many editions followed, but we shall only refer the reader to that of Rigault, or Rigaltius, Paris, 1634, fol. A separate volume, containing the commentaries of former editors, was added in 1635. Some of his treatises have received much learned illustration in a separate form, particularly the *Apologeticus* from Heraldus, Lutet. Paris, 1613, 4to; and from Havercamp, Lugd. Bat. 1718, 8vo; and the tract *De Pallio*, from Salmasius, Lugd. Bat. 1656, 8vo. Dr Kaye, late bishop of Lincoln, published a work of considerable value, under the title of *The Ecclesiastical History of the Second and Third Centuries, illustrated from the Writings of Tertullian*, Cambridge, 1826, 8vo.

Teruel || Testudo.

TERUEL, a province of Spain, Aragon, bounded on the N. by those of Saragossa and Huesca; E. and S. by Tarragona, Castellon-de-la-Plana, and Valencia; W. by Cuenca and Guadalajara. Area, 2363 square miles. It is intersected from east to west by the mountain-chain of Albarracin, from which several offsets diverge on either side. One of the loftiest summits of this range is that called Muela de San Juan, which is covered with snow for a great part of the year, and gives rise to several large rivers. Between the several mountain-chains, lie some broad and fertile plains. The principal rivers are the Guadalupe, flowing north-eastwards into the Ebro; the Jiloca, which joins the same river by means of the Jalon; and the Guadalaviar, which flows southwards, and falls into the Mediterranean, besides several smaller streams. The chief productions of the country are corn, wine, oil, fruits, timber, flax, hemp, silk, wool, and saffron; as well as cattle, sheep, and swine. Manufactures are in a very backward state here; coarse cloth, paper, leather, soap, and pottery being almost the only articles produced. Pop. (1857) 250,616.

TERUEL, the capital of the above province, stands on the left bank of the Guadalaviar, 142 miles N.E. of Madrid. It has ancient walls, gates, and towers, which give it an imposing aspect; and is in general well built, but has very narrow and gloomy streets. There are here a cathedral, episcopal palace, numerous churches and convents, a theatre, hospital, and other buildings. The inhabitants are chiefly employed in agriculture. Pop. 6752.

TERZETTO (*Ital.*), a musical composition for three *obligati* parts, vocal or instrumental. An instrumental terzetto is also called a *trio*.

TESCHEN, a town of the Austrian empire, Moravia, on the right bank of the Olsa, 63 miles E.N.E. of Olmütz. It is walled, and entered by three gates; but outside there are as many suburbs. The chief buildings are several fine churches, two ducal castles, an hospital, and a gymnasium, with a library and museum. Woollen cloth, linen, leather, fire-arms, and *liqueurs*, are made here; and there is some trade in these articles, as well as in wool, wine, honey, &c. Pop. 6400.

TESTAMENT. See WILLS.

TESTUDO, in the military art of the ancients, was a kind of cover or screen which the soldiers formed with their bucklers, by holding them up over their heads, and standing close to each other. This expedient served to shelter

Tetbury || Tewkesbury.

them from darts and other missiles, especially those thrown from above, when they went to the assault. The same name was also applied to a large wooden tower which moved on several wheels, and was covered with bullock-hides, serving to shelter the soldiers when they approached the walls to mine them, or to batter them with rams. It was called *testudo*, from the strength of its roof, which covered the workmen as the shell does the tortoise.

TETBURY, a market-town of England, in the county and 17 miles S.S.E. of Gloucester, on a hill near the source of the Lower Avon. It contains two market-houses, a handsome parish church with a spire, places of worship for Baptists and Independents, a grammar-school, and alms-houses. Woollen cloth is made here; and there is some trade in butter, cheese, and yarn. Pop. of the parish, 3325; of the town, 2615.

TETUAN, a seaport of Morocco, in the province of Fez, on a ragged hill, near the shore of the Mediterranean, 33 miles S.E. of Tangier, N. Lat. 35. 37., W. Long. 50. 18. It is surrounded by walls flanked with towers, and has on the summit of the hill a castle containing the governor's residence. The houses are wretched, and the streets narrow, unpaved, and dirty. The only noticeable buildings are the mosques, some of which are handsome. The principal manufactures of the town are gun-barrels, coarse woollen cloth, woollen and silk sashes. Of these, woollen sashes are the only articles exported in any large quantities, and they are chiefly sent to Spain. In the vicinity there are rich veins of copper, but they have not as yet been successfully worked. The harbour of Tetuan is at some distance from the town, at the mouth of the small river Martil. Here are store-houses, a custom-house, and the residence of a British vice-consul. The roadstead is exposed; and the bar of the river can only be passed by vessels under thirty tons burden. There is some trade with the interior of Morocco through Fez. Tetuan has been taken by the Spaniards in the recent war with Morocco. Pop. estimated at 16,000, of whom about 4000 are Jews, and 2000 negroes.

TETZEL. See LUTHER.

TEUTONES, or TEUTONI, a powerful tribe of the ancient Germans, who, according to Pliny, originally dwelt to the N.E. of the Elbe. About the year 113 B.C. a large body of them, along with the Cimbri from Jutland, left their native seats and moved southwards. They invaded Gaul, and ravaged it from end to end, defeating several Roman armies that attempted to check their progress. When the Cimbri entered Spain, the Teutones remained in Gaul; but they also extended their incursions eastwards as far as Pannonia. At length, after carrying on their destructive ravages for about ten years, they were totally defeated by the Roman consul Marius, near Agnæ Sextiæ, in 102 B.C., losing, according to the lowest estimate of Roman writers, 100,000 slain, and 80,000 or 90,000 taken prisoners. A body of 6000 who escaped settled between the mouths of the Meuse and Schelde, and were the ancestors of the Adnatici. The Teutones are not mentioned in history for a long time afterwards; but Strabo and Pliny describe them as, in their day, still occupying their ancient seats in the north-west of Germany.

TEWKESBURY, a market-town, municipal, and parliamentary borough of England, in the county and 10 miles N.N.E. of Gloucester, 103 W.N.W. of London. It stands on the Avon, near its confluence with the Severn. The former river is here crossed by an ancient bridge of several arches, and the latter by an iron one of one arch 179 feet in span. The principal streets are three in number; and they, as well as the smaller thoroughfares, are clean and neat. Most of the houses are built of brick; but some, of great antiquity, are partly of timber. The parish church, formerly the collegiate church of a monastery, is a fine old Norman edifice, with a nave, choir, transepts, and a richly ornamented tower. Trinity Church is of more recent date. The town has also places of worship for Methodists, Independents, Baptists, and Quakers, a free grammar-school, national, British, and infant schools, alms-houses, a town-hall and court-room, market-house, jail, theatre, and other buildings. There is here a silk factory; but the chief manufacture of the town is that of hosiery. Lace, nails, and leather are also made. Markets are held twice a week, and fairs eight times a year. The borough is governed by four aldermen and twelve councillors, one of whom is mayor; and is represented in Parliament by two members. Tewkesbury seems to have been a Saxon town; and a monastery was founded here as early as the eighth century. The chief historical event connected with it is the defeat of the Lancastrian party by Edward IV., in 1471, at the Bloody Meadow, about half a mile off. Pop. of the borough and parish, 5878.

Texas.

TEXAS, one of the United States of North America, lying between N. Lat. 26. and 36. 30; W. Lon. 93. 30. and 107.; bounded on the N. by New Mexico and the Indian territories; E. by Arkansas and Louisiana; S.E. by the Gulf of Mexico; S.W. and W. by Mexico and New Mexico. The Red River separates it from the Indian territories, the Sabine from Louisiana, and the Rio Grande from Mexico. Its form is exceedingly irregular; its length from S.E. to N.W. is upwards of 800 miles; breadth from E. to W. about 750; area, 237,321 square miles. This vast extent of country is very various in its character, containing almost all kinds of surface, mountains and table-lands, hills and valleys, fertile plains and undulating prairies. It may be divided into three parts—the level region along the coast, the undulating and hilly country in the centre of the state, and the mountainous region in the north-west. The first of these extends along the whole coast of the State; it is from 30 to 60 miles in breadth; and consists of a fertile region, watered by numerous rivers flowing from the north-west into the Gulf of Mexico. The rivers generally flow through alluvial tracts, varying from 3 to 20 miles in breadth, and in general densely wooded. Beyond this region lies the hilly and undulating country, which extends in a belt from 150 to 200 miles broad across the country from N.E. to S.W. This region consists of elevated undulating prairies and narrow valleys, watered by numerous streams, and in some places studded with clumps of trees. The tablelands and mountains in the N.W. of Texas have as yet hardly been explored at all, but they are said to rival the plateaus of Mexico in the fertility of their soil and the salubrity of their climate. The extreme north of Texas is even less known than these tablelands; it is partly occupied by the Great American Desert, which extends about 60 miles into this State. The chief mountain-chains in the country are the Colorado Hills, running from N. to S.E. of the River Colorado, and several other ranges between that river and the Rio Grande, probably branches of the great chain of the Rocky Mountains. None of these ranges are of any great height.

Most of the rivers of Texas flow through the country from N.W. to S.E., and fall into the Gulf of Mexico. The largest of these is the Rio Grande, which rises in New Mexico, and forms the boundary between Texas and Mexico. Its whole length is 1800 miles, for 400 of which it is navigable. Next to it, proceeding towards the N.E., is the Nueces, 300 miles long and navigable for 100; the San Antonio, 250 miles long; the Guadalupe, 275 miles in length; the Colorado, which is 550 miles long, and would be navigable for several hundred were it not obstructed by a *raft* 10 miles from its mouth; the Brazos, 500 miles long, and navigable for 150; the Trinity, 400 miles long, and navigable for 300; the Neches, 300 miles long; and the Sabine, which forms a boundary of Louisiana, and has a

Texas. total length of 350 miles, for 150 of which it is navigable. Besides these, Texas is watered by the Red River, an affluent of the Mississippi, which rises in the N.W. of the State, and flows eastwards, forming for a long distance its northern boundary. It is obstructed by a *raft* in the N.E. of Louisiana, which State it enters after leaving Texas; but it is navigable above that for about 500 miles. The *rafts*, as they are called, which interrupt the navigation of several of the rivers here, consist of immense masses of driftwood and trees, which, as they float down the river, have become fixed at some point, and choke up the channel sometimes for many miles. That on the Red River was cleared away at the expense of L.62,500; but another has since been formed near the same place. The coast of Texas along the Gulf of Mexico is indented with many bays, lagoons, and excellent harbours. Indeed no other part of the coasts of this gulf possesses so many such facilities for navigation and commerce. Of these, the most important are Sabine Lake, at the mouth of the river of the same name in the east; Galveston Bay, the largest in the State; West Bay, Matagorda Bay, Espiritu Santo Bay, Corpus Christi Bay, and the Laguna del Madre. But Matagorda Bay and the Laguna del Madre are not so much bays as long sounds, extending between islands of these names and the mainland. There are also other islands, such as Galveston, St Joseph's, and Mustang Islands along the coast. There are no lakes of any size in the State.

The geological structure of Texas has been but imperfectly explored. It seems to be very various in different parts. The mountains belong to the igneous and metamorphic formations; but towards the east of this region there is a considerable tract of Lower Silurian strata. The centre and north of the country are chiefly occupied with carboniferous and chalky strata; and the region along the coast entirely with tertiary deposits. Minerals are very abundant, as might have been expected from the proximity of this country to the gold and silver regions of Mexico. On the San Saba, an affluent of the Colorado, there are silver mines, among the most productive in the world; and the same metal has also been discovered near the River Bidais, which falls into the Trinity. In 1853, considerable excitement was created by the reported discovery of gold west of the Colorado, but it has not been ascertained to exist here in any large quantities. Iron is obtained in several places; also lead, copper, coal, salt, alum, chalcedony, jasper, white and red sandstone, &c.; and there is said to be in the north-west of the State a vast bed of gypsum, stretching from the River Arkansas in the territory of Kansas to the Rio Grande. There are numerous mineral-springs; and some of them are highly esteemed for their medicinal qualities.

The climate of Texas is very fine. Though varying in temperature in different parts of the country, it is uniformly pleasant and healthy, and is free from the extremes both of heat and cold. The heat of summer is mitigated by the sea-breezes from the Gulf, and in the autumn and winter north winds sweep down upon the plains and drive away the exhalations from the low country, which might otherwise have a deleterious effect. The soil is very various, but in general it is remarkable for its fertility. Cotton and maize, which are the chief crops raised in Texas, grow well in almost every part of the country; of the latter, two crops are annually raised, and the cotton grown near the shores of the Gulf is reckoned equal to the best grown anywhere. Besides these crops, Texas produces wheat, rye, oats, buckwheat, rice, sugar, tobacco, indigo, flax, and hemp. The extent of cultivated land in 1850 was 639,107 acres; and the principal productions were 5,926,611 bushels of maize, 178,883 of oats, 41,689 of wheat, 179,332 of pulse, 1,416,718 of potatoes, 4776 of barley; 87,916 lb. of rice, 66,897 of tobacco, 131,374 of wool, 23,038,400 of cotton, 2,326,556 of butter, 94,619 of cheese, 7,351,000 of cane-sugar, 380,532 of honey and wax; 8279 tons of hay; 441,638 gallons of molasses; and live stock valued at L.2,138,900. The grape, the mulberry, and the vanilla are indigenous to Texas, and very abundant. Cayenne pepper is also grown in large quantities. The fruits and flowers of the country are exceedingly many and various, and of great beauty. The forests are extensive, especially in the east and along the rivers' banks. There is also a wooded region, extending from the sources of the Trinity northwards across the Red River, called the Cross Timbers, about 200 miles in length and from 5 to 10 in breadth. Oak, cedar, pine, ash, walnut, hickory, cypress, elm, and sycamore are among the forest-trees. Wild animals abound in the prairies and wilds of the north-west, especially the buffalo, the mustang or wild-horse, deer, wolves, foxes, bears, racoons, &c. Eagles, vultures, hawks, owls, and many smaller kinds of wild fowl are also abundant. Of domestic animals, Texas contained in 1850, 75,419 horses; 12,364 asses and mules; 901,545 horned cattle; 99,098 sheep; and 683,914 swine. Texas.

There are as yet few manufactures in Texas, since, on account of its rich soil and genial climate, the country affords much greater inducements to agriculture. Besides two furnaces employing 35 hands, and producing L.11,460 worth of pig-iron, cast-iron, &c., there was in 1850 a woollen factory employing 8 hands and producing L.33,000 worth of cloth and yarn. The total number of factories producing goods upwards of L.100 in value was 307, and the value of home-made manufactures was estimated at L.55,316. As the country has been but recently settled, the means of internal communication have not yet been brought into a very perfect condition. There are, however, roads throughout a large portion of the State; and in January 1859, there were 129 miles of railway completed. The commerce of the country is very considerable. Most of the articles for exportation are conveyed in coasting vessels to New Orleans or New York, and shipped from these ports to foreign countries. In the year ending June 30, 1858, there were 7 vessels built in the State, with a tonnage of 324. In the same year the total value of the exports of the State was L.505,927; and that of the imports, L.23,559.

Education is provided for by schools and academies. Of the former there were in 1850, 356, and of the latter 82. In 1856 the total number of scholars between the ages of 6 and 18 was 72,826. There is a school fund amounting to L.456,600; besides 2,054,592 acres of land which have been reserved for the same purpose. For founding a university, 221,400 acres have been set apart. The public institutions comprise a State penitentiary, a lunatic asylum, and hospitals for the deaf and dumb, the blind, and orphans. The number of places of worship in Texas in 1850 was 164, with 54,495 sittings; of the former, 88 belonged to the Methodists, 30 to the Baptists, 15 to the Presbyterians, and 13 to the Roman Catholics. There is on an average 1 church to every 1296 inhabitants.

The executive power in Texas is in the hands of a governor and lieutenant-governor, elected by the people for a period of two years. The legislative body consists of a senate of 21, and a house of representatives of 75 members, elected by the people, the former for four and the latter for two years. The judicial establishment consists of a supreme court of 3 judges, and 19 district courts. All the judges are elected for six years. Slavery is established in the State, and no law can be passed for emancipation without the owners' consent. The public receipts for the year ending October 31, 1857, amounted to L.321,808; the expenditure for the same year to L.65,556. There is no State debt. The capital of the State is Austin, on the Colorado.

Texas was first settled by the French at Matagorda;

Texel ‖ Thales.

but these colonists were soon expelled by the Spaniards, who in 1690 conquered the whole country from the Indians, who had previously possessed it. When the Mexicans threw off the yoke of the mother country, Texas formed one of the provinces of the new republic, and many settlers from the United States established themselves in the east of the country. In 1836, Texas declared itself independent of Mexico, and this led to a war in which, after several skirmishes with varying fortune, the defeat of the Mexican forces at San Jacinto secured the independence of Texas. For ten years Texas continued to exist as a separate republic; and in 1846 was admitted as a State into the North American Union. A dispute about the boundary led to a war between the United States and Mexico, in which the successes of the former obtained from Mexico not only the disputed portion of Texas, but the whole of New Mexico and Upper California. Pop. (1850) 212,592; of whom 58,161 were slaves.

TEXEL, an island in the German Ocean, belonging to Holland, separated from the mainland by the Mars Diep, 2½ miles broad. It is about 14 miles long by 6 broad, and its surface is low, chiefly occupied by pasture ground, on which cattle and sheep of excellent breeds are reared. The people are chiefly employed in farming, fishing, boat-building, and acting as pilots. Off this island, in 1653, the English fleet, under Monk, defeated the Dutch, under Van Tromp, who lost his life in the action. Pop. 4924.

TEZA, or TAZA, a town of Morocco, on a river of the same name, in the province and 65 miles E. of Fez. It is said to be one of the finest towns in the country, and contains a handsome mosque. It has some trade with the interior and with Algiers. Pop. 11,000.

TEZCUCO, a town of the Mexican Confederation, in the department and 20 miles E.N.E. of Mexico, on the east shore of the Lake of Tezcuco. It is in general well built; has manufactures of woollen and cotton cloth; and carries on an active trade. There are here many interesting remains of antiquity. Pop. 5000.

THALES, the founder of Grecian philosophy, and one of the seven wise men of Greece, is said to have been born at Miletus in Ionia, about the thirty-fifth Olympiad, or in 640 B.C. (Diog. Laërt. "Thales"). According to Hieronymus, he never had any teacher. He travelled early into Egypt, and associated with the priests whom he met in that country. He is reported likewise to have measured the pyramids of Egypt by the shadow which the sun traced upon the ground (Diogenes Laërt.) He was distinguished for his practical wisdom as well as for his scientific skill; for he is said to have diverted the course of the River Halys, which allowed Crœsus and his army to pass; and he united and strengthened the Ionians into a federal council, to resist the threatening insolence of Persia. In science, again, he is reported to have predicted the first eclipse on record, and to have divided the year into 365 days, to have proposed and proved various geometrical problems, and he is admitted on all hands to be the originator of philosophy. The first cause of all things was water, according to Thales. (Aristotle, *Metaph.* i. c. 3.) Aristotle conjectures the probable reason which induced the Ionian philosopher to adopt, to all appearance, so eccentric an explanation of the origin of the universe. He remarks in his *Metaphysics* (*l. c.*), that this view likely had its origin in the observation, that all things that grow appear to have their nourishment in moisture, and that the actual heat which arises with the process of germination seems to owe its existence to the presence of water. Thus, animal life, alike with vegetable life, owes its origin to the presence of moisture. Aristotle adds further respecting Thales' philosophy, that he maintained the world to be full of gods, and that all motion is due to the presence of a soul. Thales died in his seventy-eighth year, according to Apollodorus, or in his ninetieth, according to Sosicrates. Diogenes Laërtius recounts a number of maxims respecting Thales, but many of them are obviously spurious. Let one suffice as a specimen. Thales leaving his lodging under the care of an old woman, to contemplate the stars, accidentally fell into a ditch on his way, when the garrulous domestic administered a rebuke, by asking, "How canst thou know what is doing in the heavens, when thou canst not perceive what is at thy feet?"

Thalia ‖ Thames.

THALIA, one of the nine Muses. See MUSES.

THAME, or TAME, a market-town of England, in the county and 12 miles E.S.E. of Oxford, on the south bank of the Thame, which is here crossed by a bridge. It has a spacious market-place, from which the three main streets diverge. The parish church is a large and handsome cruciform building, with a fine embattled tower. Thame has also a market-house, above which is the town-hall, two free schools, alms-houses, &c. The people are mostly employed in farming; and lace is made by the women and children; but with this exception there is no manufacture here. Thame was the birth-place of the celebrated lawyer, Sir John Holt. Pop. of the parish, 3259.

THAMES, or ISIS, though not the longest, has been justly called the king of all the British rivers, superior to most in beauty, and to all in importance. It rises on the S.E. slope of the Cotswold Hills, and flows in general eastwards through the southern counties of the kingdom. Its source is in Gloucestershire, lower down it traverses a part of Wiltshire, then it separates Berkshire on the right from Oxfordshire and Buckinghamshire on the left, then Surrey from Middlesex, and, finally, Kent from Essex. Thames Head, the reputed source of the river, lies near the Thames and Severn Canal, about 3 miles S.W. of Cirencester; but the river may more truly be said to be formed by the confluence near Lechlade of the Churn, which is joined by the Isis or Thames, the Colne, the Leach, and the Cole. From Lechlade it flows towards Oxford, through a level country not very remarkable for its beauty, but containing some interesting spots,—such as Farringdon Hill, which rises with a gentle slope between the Thames and the Vale of White Horse, to the south, the picturesque spire of Bampton rising above the low ground on the north, and the stately trees and rich grounds which environ the modern seat of Buckland, on the south. As the river rolls on, the country on either side of its banks becomes ever more rich and beautiful; while the volume of the stream is increased by affluents from the north. After receiving the Windrush, the first of these, it turns northwards, and flows in that direction as far as Handborough, near Woodstock. Near this it receives the Evenlode, and then, turning to the south, round the foot of Witham Hill, it passes Godston Nunnery, the burial-place of the Fair Rosamond, and approaches the venerable towers and domes of Oxford, which it washes first on the west and then on the south side. Here the Cherwell unites its gentle stream with that of the Thames; and the noble river flows on through a tract of rich and verdant country, in some places hardly raised above the level of its waters. The next town it approaches is Abingdon, where may be seen beyond the meadows, on the river's banks, the Vale of White Horse, bounded on the south by a waving range of hills, partly wooded, partly bare. Below Wallingford, the Thames flows in a narrow valley between these hills and the celebrated Chiltern Hundreds in Buckinghamshire. A short distance above this point the Thames has received the Thame from the north-east. Further down, the river passes Reading, finely situated in a rich plain opposite the range of chalky cliffs that for a long distance lines the north side of the Thames. Through an exceedingly beautiful and diversified region, the river winds on past Henley Marlow and Maidenhead, until it flows

Thane ‖ Thann.

between Windsor's abode of royalty on the right, and on the left those

> "Distant spires and antique towers,
> That crown the watery glade;
> Where grateful science still adores
> Her Henry's holy shade."

Close at hand we come to Cooper's Hill, remarkable for its poetic, and Runnymede, still more so for its historical associations. Past Staines and Chertsey the river reaches Hampton Court, the favourite residence of William III., and Twickenham, equally celebrated for its connection with Alexander Pope. The beautiful town of Richmond, once the residence of royalty, and afterwards of the poet Thomson, and the village and gardens of Kew, Chelsea Hospital, and the primate's palace at Lambeth, bring us into the vicinity of the great metropolis. Westminster, St Paul's, and the Tower of London, are the well-known objects most conspicuous on the river's banks here. Then, leaving the city, it passes Greenwich, with its palatial hospital, Woolwich, Gravesend, and Tilbury Fort, gradually expanding its stream, until at the Nore Light, 45½ miles below London Bridge, it ceases to be known as a river, and mingles its waters with the ocean. The chief affluents of the Thames, besides those already mentioned, are from the north—the Colne, New River, Lea, and Roding; and from the south, the Kennet, Loddon, Wey, and Mole. The whole length of the river is 215 miles, and the area of the country it waters 6160 square miles, nearly one-eighth of the whole area of England. Its height at Thames Head Bridge is 376 feet, at Lechlade, 343 feet, giving an average fall in this part of its course of 6 feet per mile; but below this point the average fall is nowhere more than 2 feet 3 inches. At London Bridge, where it is only 4 feet 3 inches above the sea, the fall is only 9 inches; and between London Bridge and the Nore it is but 1 inch per mile. The breadth at London is 290 yards; at Woolwich, 490; at Gravesend, 800; and 3 miles below, 1290. Its depth between London Bridge and Greenwich is from 12 to 13 feet; the mean rise of the tide is 17 feet, and the extreme, 22 feet. Up to Blackwall it is navigable for ships of 1400 tons; to St Catherine's for those of 800; and for barges as far up as Lechlade. The Thames is of vast importance as a means of communication; for though, with the exception of the metropolis, it passes no manufacturing or commercial cities, it traverses some of the richest agricultural districts in the country. It is connected by means of numerous canals with all the great rivers of the kingdom.

THANE, or THANUS, a name given to the nobility in Britain before the time of William the Conqueror. It signifies a minister or honourable retainer, from the verb *thenian*, to minister. There were several degrees of nobility among the Anglo-Saxons; but those most commonly mentioned are the king's thanes and the alderman's thanes. The king's thanes seem to have been of three different degrees, according to their different degrees of wealth or favour at court. This title of thane was abolished in England at the Conquest. (See Turner's *Anglo-Saxons;* and Palgrave's *Rise, &c., of the English Commonwealth.*)

THANET, ISLE OF, the north-eastern extremity of the county of Kent in England, separated from the mainland by the Stour and its branch the Nethergong. It is about 10 miles long by 5 broad, and has an area of 26,500 acres. The surface is level and lofty, chiefly arable land well cultivated. Its N.E. point is North Foreland, with a lighthouse visible for 22 miles. Ramsgate, Margate, Broadstairs, and Richborough are the chief towns. Pop. 31,798.

THANN, a town of France, in the department of Haut-Rhin, on the Thur, 22 miles S.S.W. of Colmar. It lies at the foot of a hill on which stand the ruins of an ancient castle, and it has a fine Gothic church with a richly ornamented and lofty spire. Cotton handkerchiefs, hosiery, starch, and salt, are made here. Pop. 5864.

Thapsacus ‖ Theatines.

THAPSACUS, an ancient city on the right bank of the Euphrates, about 24 miles W. of its confluence with the Chaboras. There can be no doubt that it was identical with the place mentioned as Tiphsah in the Old Testament (1 Kings, iv. 24); and the Hebrew name derived from a word meaning to pass over, was given to it probably as being the lowest ford of the Euphrates. It was a place of much trade, occupying a position nearly midway between Babylon and Tyre; and it was also a military position of great importance. It was here that the younger Cyrus, and afterwards Alexander the Great, crossed the Euphrates. Tiphsah was subject to the Hebrews in the time of Solomon, and was the most easterly part of that monarch's dominions. The Arabian village of Deir probably occupies the site of Thapsacus.

THASOS, an island in the Grecian Archipelago, belonging to Turkey, off the coast of Rumelia, 30 miles N.N.E. of Mount Athos. Its shape is nearly circular, and its area is about 85 square miles. The surface is partly mountainous, especially in the north, where there are three peaks, the highest of which is 3428 feet above the sea. These hills are for the most part covered with forests, which afford abundance of good timber; and the island also produces corn, fruit, oil, and wine. Cattle and sheep are reared in large numbers. Another valuable production is marble of a fine quality. There is a small town called Volgaro in the interior, and a village Thasos on the N.E. coast. Thasos is said to have been originally peopled by Phœnicians, and afterwards by a Greek colony from Paros; and it rose at an early period to great wealth by means of the gold-mines on the island and neighbouring coast. For a long time the Thasians were the only people who worked those mines, but at length Histiæus of Miletus founded a city on the Strymon, and attempted, in 492 B.C., but without success, to conquer Thasos. The Thasians were, however, soon after compelled by the Persians to demolish their walls and surrender their men of war; and when Xerxes invaded Greece in 480 B.C., they had to supply provisions for his army as it marched through their territory. After the Persian war, Thasos became subject to Athens, but revolted in 465 B.C. A strong force was dispatched under Cimon to reduce them to allegiance, and after a siege of two years compelled them to surrender. The fortifications were destroyed, the men of war seized, and a heavy contribution demanded in addition to the annual tribute. When the oligarchical faction under Pisander gained the upper hand at Athens in 411 B.C., an aristocracy was established in Thasos; but this only led to a revolt of the island to Sparta. After much civil war, Thrasybulus, in 407, succeeded in restoring it to Athens, but soon after, in consequence of the battle of Ægospotamos, it passed into the hands of Sparta. At a later period Thasos recovered some of its former possessions on the continent, but at length it fell first under the sway of Macedon, and finally under that of Rome.

THAXTED, a market-town of England, Essex, on the left bank of the Chelmer, 17 miles N.N.W. of Chelmsford and 41 N.N.E. of London. It is an ancient town, and has a fine church, chiefly in the perpendicular style, places of worship for Quakers, Independents, and Baptists, a free grammar-school, national and British schools, alms-houses, &c. Rope-making and brewing are carried on. Pop. 2556.

THEATINES, a religious order in the Romish Church, so called from their principal founder John Peter Caraffa, then bishop of Theate, or Chieti, in the kingdom of Naples, and afterwards pope, under the name of Paul IV. in 1524. This order was the first who vainly endeavoured, by their example, to revive among the clergy the poverty of the apostles and first disciples of our Saviour.

THEATRES.

Theatres. THERE was something very appropriate in the author of *Sylvester Daggerwood* locating that strolling actor, for a time, at the little town of Dunstable. The place so named is the Mecca of the players. It was there that one of the earliest English stages was erected. In a house engaged for the occasion, the pious Geoffrey, monk and stage-manager, in the year 1119, superintended the performance of a drama which had St Katherine for a heroine, and her whole life for a subject. Unluckily the house, in one room of which this play was acted, was one day destroyed by fire. Ultra-pietists discerned in this calamity an indication of divine anger against the drama; prophets declared, with a vaticinatory spirit, warranted by results, that a tongue of flame would lap up all such edifices; and Geoffrey, warned by the event, abandoned the pleasures and perils of management, and withdrew to a cell at St Albans. Too many of his successors have been ill-fated enough to fail, as he did, without possessing so tranquil and pleasant a haven as his, wherein to safely moor for life their shattered bark and shipwrecked fortunes.

That show-room at Dunstable, however, marked not the foundation, but the progress of the drama in England. For the former, the inquirer must go back to times very remote, but certainly not so uncivilized as elementary books pronounce, or rather mispronounce, them to have been. The druidical rites contained the elements of dramatic spectacle; the Pagan-Saxon era had its dialogue actors, or buffoons, for the multitude; and when the period of Christianity succeeded, its professors and teachers, whether moved by joyousness or seriousness of spirit, took of the evil epoch what best suited their purposes. In narrative, dialogue, or song, they dramatised the incidents of the lives of saints, and of the history of One greater than saints; and they thus rendered intelligible to listeners what would have been incomprehensible had it been presented to them as readers.

In castle-hall, before farm-house fires, on the bridges, and in the markets, the men who best performed the united parts of missionary and actor were at once the most popular preachers and players of the day. It is told of perhaps the greatest of them all (St Adhelm), that when he found his audience growing a little weary of too much serious exposition, he would take his small harp from under his robes, and strike up a narrative song, that rendered his hearers hilarious. It would, perhaps, be difficult to determine whether these resorted more to the actor or to the preacher—a difficulty which certainly does not authorise any of *us* to look upon those early gatherings with contemptuous pity. The difficulty has not altogether vanished in these more enlightened days, when there are preachers better skilled in winning hearts to themselves than gaining souls to Christ.

The mixture of the sacred and profane in the early dialogues and drama prevailed for a lengthened period. It would seem that the profane sometimes superabounded, and the higher church authorities had to look to it. The monotony of monastic life had caused the wandering gleemen to be too warmly welcomed within the monastery walls, where there were men who cheerfully employed their energies in furnishing new songs and lively "patter" to the strollers. It was, doubtless, all well meant; but more serious men thought it wise and well to prohibit the indulgence of this peculiar literary pursuit; and, accordingly, the council of Clovershoe, and decrees bearing the king's mark, severally ordained that *histriones*, or actors, and other vagabonds therein named, should no longer have access to monasteries, and that no priest should henceforth either play the gleeman himself, encourage the members of that disreputable profession, or help them by writing songs, and turning "ale-poets." Theatres.

Such was the first development of the English Theatre, between which and the phase it has assumed in later days there is no less difference than there was between the cart of Thespis and the stage on which the Athenians expended a hundred thousand pounds, in order to worthily represent one single tragedy of Sophocles.

The further development of the English theatre has been described as a progress through mysteries, or miracle plays, generally illustrating Scripture history or holy legend; moralities, or moral allegories, in which the virtues and vices appeared in person; and, finally, the chronicle plays, which were followed by legitimate tragedy and comedy. The comic "interlude," played between the feast and the banquet, is commonly said to have been the invention of John Heywood, the well-known writer of the Tudor period; but the Canterbury monk, Fitzstephen, who wrote his *Description of the most noble City of London during the Norman era*, states, that in the theatres of his day, whatever the localities may have been where plays were represented, "common interludes" shared the stage with pieces illustrative of the performance of miracles and the sufferings of martyrs. The latter pieces kept the favour of the public till towards the close of the fifteenth century; in Cornwall they were popular a century later; and it is worthy of notice, that as, under the Normans, some of these pieces were in French and a few in Latin, from the time of the Plantagenet, Edward III., they were written and represented in the English tongue only.

Of the literary value of the miracle and moral plays, of their fitness as a means of instruction, it is not our office to speak. It is ours rather to seek, if there be yet any miracle *theatre* surviving the wreck of the early period, and if one be found, to direct towards it the notice of our readers. There *is* one still existing in England; it is known as "Piran Round," and has been visited by many a wayfarer through Cornwall. On a wild, flat, heath, a circular embankment (about 10 feet high, sloping backwards, and cut into steps for seats or standing-places) encloses an ample level area of grassy ground. An audience of 2000 people could sit or stand on this embankment, and look down on the actors in the circus, which formed a stage of above 100 feet in diameter. Previous to the dramatic era at all, Piran Round was a theatre where sports were enjoyed, single combats fought, and rustic councils assembled. The miracle play-actors then took possession of it, performing the rude but well-meant and useful drama in the ancient Cornish language. They were still playing there—those strollers who then were such worthy helps to the clergy—as late as Shakspeare's period, and a specimen of the pieces produced—a five-act piece, entitled, *The Creation of the World, with Noah's Flood*—was published in 1827 by the learned Davies Gilbert, the Cornish and English versions being on opposite pages. In this historical piece, originally played in the sixteenth century, for edification in Scripture history, the stage directions induce us to believe that varied costumes, variety of scenery, and very complicated machinery, must have been employed,—and all on an open-air stage! How the flood was actually represented it would be hard to say; but it is to be observed that, at the conclusion of this serio-comic history in action, the minstrels "piped," the audience set to at dancing, and then, having had their full of amusement,

Theatres. they who had converged from so many starting points upon the ancient theatre of Piran Round, scattered again on their several ways homeward, and as the sun went down, thinned away over the heath, the fishermen going seaward, the miners inland, and the agricultural labourers to the cottages and farm-houses dotting here and there the otherwise dreary moor.

With the meekest of our kings, Henry VI., came into fashion the moralities or symbolical dramas which people flocked to see, as amusing and instructive narrative sermons put into action. To this king, however, the English stage owes less than it does to his successor, Richard III., whose tastes and pleasures so ill accorded with most of his principles and actions. In the former he was a thorough Englishman, and his especial love for athletic sports rendered him as popular in the north, among the robust, as his charitable foundations, in and about his house in Wensleydale, won for him the gratitude of the sick and the needy. He was, moreover, the first of our princes who retained near his person a company of players. These plied their vocation, for his pastime; and the young "Duke of Gloucester's servants," as they were called, went from county to county (when their master gave them permission), from mansion to mansion, from one corporation-hall, or from one inn-yard to another, playing securely under the sanction of his name, winning favour for themselves, and a great measure of public regard, probably for their then generous and princely master.

The "poor players" did not, however, yet enjoy a legal recognition, but this enrolment of a company of them by the Duke of Gloucester led to that result in 1572, when Shakspeare was eight years old. The recognition even then was but partial, in this far, that these "servants" of noblemen, with whom it had become the mode to enrol such pleasant retainers in their household, were licensed to play wherever it seemed good to them, without let or hindrance from the law.

Meanwhile, it was not the professional player alone who assumed the sock and buskin. The gentlemen of the inns of court were wont to do this for the edification of kings, and, lacking these, we find the children of the chapel-royal, and the pupils in public schools, often summoned, as a matter of course, to appear in palaces as actors, having kings, queens, and a goodly house of royal and noble "cousins" for their audience. Thus, in 1527, when Henry VIII. was yet one of the true sheep of the Roman fold, the boys of St Paul's went (accompanied by their master) by water to Greenwich, where, in presence of the royal family and illustrious ambassadors from France, they represented a Latin play, descriptive of the then captivity of the Pope, and suggestive of the urgent necessity for his liberation. It was a play in which the old miracle and moral element largely abounded, with a mixture of the chronicle drama, out of which sprung the more legitimately elaborated pieces of a period near at hand. Therein Luther and his wife came in for much abuse—their very dresses, as described in the *dramatis personæ*, indicating that they were intended to excite the scorn and the ridicule of the great personages, some, at least, of whom were subsequently the champions of the man who was here pelted as "heretic," and attired "like a party-friar, in russet damask and black taffety."

From this period it may be said that the church, Montague or Capulet, fought for possession of the stage, as an eminence whereupon each party, which happened for the moment to be in power, might deliver its threats, its warnings, its monitions, or its entreaties. "Bilious Bale," as he was styled by his enemies, was the most industrious and the least pleasant-tempered of these party-dramatists. Under Edward VI. he enjoyed the bishopric of Ossory, if this Suffolk man can be said to have enjoyed that which was rendered intolerable to him by the persecutions of the Romanists, who hated him for his desertion of their church and for the (to them) scandal of his marrying,—a sanction for which he found in the well-known injunction of St Paul. Bishop Bale, who had seen the world, encountered as much adventure as a hero of romance, and in his breathing time had adapted the most abstruse doctrinal subjects to the purposes of comedy, repaid the abuse of his former colleagues with virulent interest. Of decorum of expression he knew nothing, and in his *John King of England*, he illustrated the wicked policy of Rome towards this country, with such effect that, while one party hotly denounced, the other applauded his coarse and vigorous audacity. So powerful was the influence of the stage when thus applied, that the government of Queen Mary made similar application of them in support of their own views, and a play, by an anonymous author, styled *Respublica*, exhibited to the people the alleged iniquity of the Reformation, the dread excellence of the sovereign herself, personified as Queen Nemesis, and her inestimable qualities —exemplified by the presence of all the virtues, who followed in her train, as maids of honour. Theatres.

The stage had thus been employed as a controversial pulpit, less to edification than exasperation; and possibly some persons recognised a retributive character in the fact that the first building actually and *legally* set apart for the exclusive performance of theatrical pieces in England was within the precincts of the dissolved monastery of Blackfriars. This occurred when Elizabeth was queen, in the year 1576. The "company" was the Earl of Leicester's, and at the head of it was James Burbage, father of Richard Burbage, the original Richard III. in the play by William Shakspeare, who, when Burbage and his followers opened the Blackfriars' Theatre, was a little lad of twelve years of age, surmounting the elementary difficulties of Latin and Greek, in the Free School at Stratford-on-Avon.

The assertion of Dryden, that Shakspeare created the English stage, and the remark of Johnson, that before the era of that supreme poet, dramatic literature was in a state of barbarity, have been repeatedly denied. The assertion and remark, however, are well founded. During many years which preceded the appearance of Shakspeare as a writer, the drama may be said to have been in the condition of the mass of marble which is preparing for the hands of a great sculptor. Rude men hue it roughly from the quarry; their successors, scarcely less ignorant, reduce the block to the dimensions required by the artist; workmen, more skilful, chisel it into shape; and a trustier hand cunningly fashions the whole into the appearance of everything but life. *That* is the peculiar work of the mind guiding the ever-ready hand. What none of the preparers could accomplish is achieved by the inspired craft of the perfect artist. Under *his* arm the block becomes instinct with beauty, breathes or seems to breathe, and an imperishable work, one that can never be excelled, is at once *created*. In this sense Shakspeare was the creator of the English drama. Before his time there was many an honest workman, but *he* was the artist, lacking whom the English theatre would have lacked vigour, beauty, life itself.

In this progress, players and authors had rendered good service; and it is to be remembered that in most cases the writers of plays, even when of the clergy, were actors as well as authors. It is the more singular, perhaps, that the members of the profession were often of a too roystering quality, and that, despite the connection of the church with the stage, the actors themselves were but ill regarded by the church. United, they had helped the drama towards maturity, through miracle-plays and moralities, interludes and chronicles, under the patronage of princes and nobles, till the period of the production of the first regularly-constructed English comedy—*Ralph Roister Doister*, in

Theatres. 1540, by Nicholas Udall, just one year before that harsh master of Eton lost his post, on suspicion of being concerned in a robbery of the college plate.

This comedy by the old Canon of Windsor, never acted we believe, marks the beginning of the new era of the Theatre in England. Twenty-two years later, that is, two years before the birth of Shakspeare, the first English tragedy, *Ferrex and Porrex*, was acted by the gentlemen of the Middle Temple before Queen Elizabeth, in Whitehall. This was the joint work of two lawyers, Norton, and Sackville who was afterwards Lord Buckhurst and Earl of Dorset. Calvinistic Norton was the colleague of Sternhold and Hopkins, in their dreary version of the Psalms; his lively colleague would probably have attained great reputation as an author, had not his country needed his services as a statesman.

We have already noticed one of the predecessors of Shakspeare, Bishop Bale. The Episcopal bench furnishes another, in the person of Bishop Still, whose coarse dialect comedy, *Gammer Gurton's Needle*, was acted at Cambridge in 1566. Then came Gasson, who, from the pulpit and the press, denounced the stage, whereon his own plays had met with but indifferent success. Succeeding to this wrathful city-rector, we have a goodly list:—Whetston, soldier, sailor, farmer, adventurer, and playwright, with more heart to enjoy money than resolution to laboriously gain it, but whose *Promos and Cassandra* led to Shakspeare's *Measure for Measure;* musical and poetical Edwards; martial and scholarly Gascoyne; the Templar Wilmot, an author with many colleagues in the finishing of a single piece; prolific Chettle; too sprightly Greene, dying at last of a surfeit of Rhenish wine and pickled herrings; and Lilly, of better reputation and more useful purposes, seeing that this worthy Kentish man, who, if he lost much time at court, compensated for it by his persevering study, his love of poetry, and the ends to which he turned his study and his love. He was the first who shook off the trammels of harsh and obsolete terms in writing, and of uncouth expressions in speaking. He was indeed the founder of Euphuism in this country, and, like all Euphuists, was addicted to refining over much, whereby affectation had like to become the poor compensation for strength, though that was but a rude vigour at the best. In his own day he was highly esteemed, but now there are only a few who know much, and care even a little, for the "only rare poet" of his time, "the witty, comical, facetiously quick, and unparalleled John Lilly." Blount says of him, that he sat at Apollo's table, and that the god gave him "a wreath of his own bays without snatching, and that the lyre he played on had no borrowed strings."

This harp, however, is too highly strung. Of all the dramatic poets who immediately preceded Shakspeare, Marlowe is undoubtedly the first in rank, and the most successful in innovation, for to him we owe the first tragedy that was ever written in blank verse. The jingle of rhyme, and the facilities afforded by it to composition, had allured more or less every preceding writer for the stage who employed the English language in giving utterance to his thoughts. Marlowe was a fair actor and an eminent author. In the first respect he at least equalled, if he did not excel Shakspeare. In the latter, he achieved a success which was only surpassed by that of the poet, whose triumphs are at once the pride and the despair of all aspirants to distinction in dramatic poetry. The love of Marlowe for the theatre was manifested by his abandoning the university for the stage, for which he furnished half a dozen pieces,—all of which were probably familiar to, and influential over, Shakspeare himself. Heywood styled him "the best of poets," and as a theatrical writer he was not undeserving of the name, till the Stratford boy had grown into beauty and strength of intellect. Drayton says that he

> "Had in him those brave translunary things
> That your first poets had."

Theatres.

He describes the poet's raptures as being "all air and fire, which made his verses clear;" and he so esteemed some of the exaggerations of this pillar of the stage, as to praise him because

> "—— that fine madness still he did retain
> Which rightly should possess a poet's brain."

There are several poets, like Marlowe, who were the predecessors and the contemporaries of Shakspeare, and, unlike Marlowe, his survivors also. Marlowe, however, just brought to an end his chequered career as Shakspeare stepped forth to snatch a prize for which human intellect may now strive in vain. The former would have been a better actor, author, and man, had he lived a less riotous life, been influenced by love or even common respect for godly things, and possessed control, or cared to exercise it over his passions. His end was more dramatic than becoming; a wrathful stab, dealt in a love-quarrel with a worthless man, for a worthless woman, led to his death in the year 1693. It was then that the poet of all time had begun to challenge the public approval as a writer for the stage; and henceforth the fame of Marlowe almost pales into nothing before the glory of his immediate and immortal successor.

Between the year of Shakspeare's birth, 1564, and that in which he began to be appreciated as a writer, 1593, the theatre had been a subject which had much occupied the thoughts of statesmen and of the superior clergy. The year in which the great poet was born formed a portion of the period in which (because of the awful plague of 1563) Archbishop Grindall advised Cecil to suppress the vocation of the idle, infamous, youth-infecting players, as the prelate called them, for a whole year; and "if it were for ever," added he, "it were not amiss."

In spite of the archiepiscopal desire, Elizabeth attended dramatic representations at inns of court and in college-halls; and rehearsals went actively on before the Master of the Revels. Professional actors spread all over the kingdom. Unattached to palace or mansion, they strove to obtain an independent livelihood; but the famous statute of 1572 threatened to deem and deal with them as rogues and vagabonds if they dared to erect a stage unlicensed "by two Justices of the Peace, at the least." Soon after was issued that first *royal* patent conceded in England to actors, whereby Lord Leicester's servants were authorized to produce such plays as seemed good to them, "as well," says the queen, "for the recreation of our loving subjects, as *for our solace and pleasure*, when we shall think good to see them."

The common council of the metropolis strenuously opposed the carrying out of the full licence contained in this patent, authorizing players to exercise their craft within the city of London and its liberties. The justices of Middlesex supported the opposition in other parts of the county. The players were treated as the devil's missionaries, and such unsavoury terms were flung at them and at playwrights by the city authorities and the county justices, that thereon was founded that animosity which led dramatic authors to represent citizens and justices as the greatest of fools, the basest of knaves, and the unluckiest of husbands.

It was because the city would not tolerate players at all, save under such restrictions as tended to virtually suppress their calling, that Burbage and his gay brethren commenced establishing themselves as near to the city as they could, within the precincts of Blackfriars. Now, on that spot, resided many a quiet and devout noble and lady, who were horror-stricken at the audacity of the actors, declaring that divine worship and sermon would be grievously dis-

Theatres. turbed by the music, rant, and the scurvy companions resorting to witness those abominable plays and interludes.

The remonstrance was all in vain, the playhouse in Blackfriars became an established fact, rivalling the "sumptuous houses," called, the one the "Theatre," the other the "Curtain," which had opened their doors to the delighted suburbans of Shoreditch, and the profound disgust of the city authorities. Pulpit logicians, bewailing both plagues and plays, argued in this wise:—"The cause of plagues is sin, if you look to it well, and the cause of sin are plays; *therefore*, the cause of plagues are plays." "If these be not suppressed," exclaimed a Paul's Cross preacher, "it will make such a tragedy that all London may well mourn while it is London." Had it not been for the interest taken in the subject by the Earl of Leicester, it would have gone ill with public companies of players, not only in the metropolitan liberties, but throughout the country.

Fashion and the court prevailed over all opposition. Already, for two years at least, the queen had had, for the first time, a band of players of her own; recognised actors, in addition to the company of players of interludes, she had maintained from the beginning of her reign. Lesser authorities, adverse to the public theatres, could only relieve their conscience by grumbling, while sober-going people, with godly magistrates, remarked, that the only quiet days in the city were those in which the theatres in the liberties were temporarily closed.

The early actors there were not wise in their generation. They would have more exceedingly flourished had they been less indiscreet. They bearded authority, played in despite of legal prohibitions, and at last were so imprudent as to introduce matters of state and religion upon their stages. Thence ensued suspensions for definite periods, severe supervision when the actors were permitted to resume, with much alacrity, on the part of the latter, in disobeying all injunctions when they could do so without much risk, even to the playing on a Sunday, which they would unblushingly do in any privileged locality where they conjectured that a warrant could not follow them.

Such were some of the phases of the theatre while Shakspeare himself was yet an actor, and at the time when he added to that title the name of author also. The "theatre" in Shoreditch, of his day, though styled a "sumptuous house," was only a wooden structure, neglected altogether, before Shakspeare himself had been a dramatic writer five or six years. In Holywell Lane (now High Street), Shoreditch, is to be found the site of this the first theatre especially erected in England for the exhibition of plays, with scenery. This house, built at the cost of John Brayne, who laid out L.600 upon it, was let, in 1576, to "James Burbadge, joiner," for 21 years, at L.14 a year. "Burbadge" was Brayne's son-in-law, and he broke a covenant binding him to give half the theatre and the profits to Brayne, in return for the money advanced. After the death of the covenanting parties, the breach of agreement was made a matter of Star Chamber inquiry; but, although Cuthbert Burbage, the son of James, had, in 1598, also carried off the wood of the theatre to the Bankside, and therewith rebuilt or enlarged the *Globe* Playhouse, the aggrieved heirs obtained no redress. Thus, one of the first theatres in or near London, gave rise to unsuccessful litigation caused by the fraudulent conduct of the proprietors.

The approach to the site of the second theatre is to this day marked out in the name Curtain Road. It continued, with tolerable success, till the commencement of the reign of Charles I., when stage-plays seem to have given way there to the exhibitions of athletic exercises.

The Surrey side of the Thames was a favourite locality for plays, long before the most famous of the regular and royally sanctioned theatres. The Globe was erected there. The Rose, which was built about 1584, has its site marked in the present Rose Alley, Southwark. This "Little Rose," as it was popularly called, was, however, only the successor of a more ancient building. It had a rival in the Swan, situated, like the Rose, on Bankside; but the fortunes of both houses were of the same character. They fell into decay, as the better companies began to form, and to attract the town; and their own attractions failing, these Surrey theatres were converted into rooms for the exhibitions of fencing and other manly exercises, such as are still to be seen, near the same spot, by an eager public in the more proudly named tenement in Southwark, St George's Hall. Theatres.

There is no doubt that for a considerable period the Royal Theatre in Blackfriars, despite all opposition, was the house favoured by the highest patronage. Its troop of actors and boys, or apprentices, who were first taught to play female parts, was good. In that company Shakspeare was one of the performers. The "house" was a winter house, the actors crossing over into Surrey, and playing at the Globe in the summer months. After a course of only twenty years, this theatre needed such extensive repairs, that it may be said to have been rebuilt. At that time (1596), Shakspeare and Richard Burbage were sharers. In 1633, the then proprietors, Cuthbert and William Burbage, let the house to the players, at a yearly rent of L.50. Twenty-two years later it was pulled down, after a career of something more than three-quarters of a century. Since 1647, however, the year of the suppression of plays, this theatre had been closed. The site, speedily built over, is now occupied by Apothecaries' Hall and Playhouse Yard.

The first of the three theatres which stood between the Thames and Fleet Street was the *Whitefriars' Theatre*. The old hall of the monastery of the friars formerly located there was converted into a playhouse, about the year 1580. In 1616, the year of Shakspeare's death, it had fallen into complete decay, and was never afterwards used for the representation of dramatic pieces.

The career of the old Globe, the summer-house of Shakspeare and his fellows, lasted from 1594, when it was built, to 1613, when it was destroyed by fire, through some lighted wadding from a gun lodging in the *thatched roof*. Shakspeare may have seen the *new* Globe, which was built the following year (chiefly by a royal and noble subscription), and was roofed *with tile*—a marked advance in usefulness if not in architectural beauty. This also was a wooden tenement, and on its summit its flag, with the cross of St George, waved just ten years, during the hours of performance. In 1654, Sir Matthew Brand, the *land*-lord, pulled down the house, the name of which still survives in Globe Alley, Southwark.

The Fortune Theatre was next in age to the Globe. It was erected in 1600 for Henslowe (the pawnbroker and money-lender to actors) and Alleyn. Its locality in the parish of St Giles, Cripplegate, is indicated by Playhouse Yard, which connects Whitecross Street with Golding Lane. In 1621, the old square wooden building was burned, and a circular one of brick erected forthwith in its place. There Alleyn achieved that fortune which the old, childless actor devoted to the foundation of God's-Gift College, Dulwich, from whose ample modern revenues no poor player is ever furnished with relief! In 1649, although no performances were going on, "the sectaries of those yeasty times," a party of soldiers, broke into the house and destroyed it; and, a few years later, the site and adjacent ground began to be covered with dwelling-houses.

In addition to these theatres of Shakspeare's time must be mentioned the gardens, the amphitheatres of which sometimes served for the combats of animals, at others for the representation of plays; and the inns, in whose yards stages were erected, for seasons more or less brief. Chief of the latter were the Cross Keys in Gracechurch Street; and, still more renowned, the Bull in Bishopsgate Street. These

Theatres. were the best patronized places previous to the era of licensing. At the latter, strutted the elder Burbage; there grimaced Tarlton, the prince of clowns; and in a house near the locality resided Anthony Bacon (the brother of the great Francis), whose mother had a wholesome but rather exaggerated dread of her son living in a parish where there was a stupid clergyman and a troop of excellent actors. The Bull is sometimes confounded with the "Red Bull" in St John Street, Clerkenwell, which was an inn converted into a regular theatre, and which was open as late as the period of the "Great Fire," if not for the acting of plays, at least for exhibitions of wrestling and fencing.

The Hope, on Bank Side, Southwark, was the Hope Theatre on Mondays, Wednesdays, Fridays, and Saturdays; and the Hope Garden on the other two days of the week, for bear-baiting and similar sports. It existed, chiefly in its latter capacity, through nearly the whole of the 17th century. In 1614, Jonson's *Bartholomew Fair* was there played for the first time. When plays were suppressed, the Puritans horsewhipped the actors, and the soldiery shot the bears; but the place rallied after the Restoration. Paris Garden, famed for its cruel but well-patronized sports, was also situated on Bank Side, and, under Henslowe and Alleyn, its circus was turned into a theatre, the richest receipts of which were made on the Sunday, till the law interfered, and respecting propriety, disgusted alike the dramatic public and the impoverished actors.

At one or other of these houses, humble in dimensions rather than in pretensions, were represented the whole of Shakspeare's thirty-five plays, from *Pericles* down to *Twelfth Night;* the latter in 1613. Here, actor and author, like Shakspeare, and fostered by him, Ben Jonson saw the triumph of his first plays, reckoning from his *Every Man in his Humour*, in 1598, and went on writing pieces yearly, and *masques*, when called upon, till his fire left him, and his last dramatic piece, *The New Inn*, was hissed from the stage in 1629. On these boards, Beaumont and Fletcher —united, alone, or each with other colleagues—brought forward those five dozen plays—the glory of their genius, often the shame of their taste. Of ardent, graceful Massinger's long list, the early plays alone were acted at the Globe and Blackfriars. Indeed, when the names of our early dramatic authors and their plays are called to mind, it will be found that on the modest stages of these little more than wooden booths, were first represented dramas which later authors have striven in vain to surpass. The dawn of our theatrical day was the brightest; and to this hour it is the reflection of that dawn which alone gives life, warmth, beauty, and dignity to the British theatre.

The old, and partially uncovered playhouses, commenced their performances at one o'clock. Subsequently they began an hour later, and, later still, three o'clock became the fashionable hour; continuing so till towards the close of the seventeenth century. The readers of Pepys' *Diary* will thus understand how it was that an industrious rake was, after a long morning in his office, and a couple of hours at the theatre, riding abroad in the Park, or eating syllabubs in suburban gardens by daylight.

The prices of admission have considerably varied. In the rooms or boxes at the Blackfriars, the gentry

> "Might see away their *shilling*
> Richly in two short hours."

The admission to the scaffolds or galleries was sixpence; to the seatless pit the groundlings had access for a penny or twopence. The fast gentlemen of the day loved to sit and show their "bravery," their persons, and their quantum, great or infinitesimal, of wit, upon the stage itself, where an additional fee procured stools for them, and where hired pages served them with refreshments, and, when the weed was in vogue, stuffed their pipes with tobacco, and handed them for use. This bad example was followed by the apt spectators; and eating, imbibing, and smoking, during the performance of a play, formed for a lengthened period the enjoyment of many, and some annoyance to the few. Theatres.

In less than a century, the relative value of money had caused a rise in the charges for admittance. In the reign of Queen Anne, admission to boxes, pit, and gallery, at Lincoln's-Inn-Fields and Drury-Lane, was respectively five, three, and two shillings. That is a higher tariff than generally prevails in the metropolitan theatres, where indeed, only recently, at the patent houses the charges were—to the boxes, 7s.; to the pit, 3s. 6d.; and to the galleries, 2s. and 1s. The lower-priced gallery had formerly been free for the livery-servants waiting for their masters and mistresses. The occupants, however, became so riotous and offensively critical and exacting, that they were deprived of their privileges, and the upper gallery was opened to a paying public.

But the emoluments of actors have undergone greater change than the prices of admission. L.20 was considered a fair receipt at the Blackfriars, and that could not have left a magnificent distribution of share or salary to the company. It is conjectured that the most eminent actors at that house did not enjoy an income of so much as L.100 a year. When Shakspeare was part proprietor, as well as author and actor, his revenue is supposed to have reached about twice that sum. Subsequent to the Restoration, the tragedian Hart received L.3 a week during a season of thirty weeks, and 6s. 3d. every acting day, as his proprietary share. Half a century later still, the great Betterton was not considered ill paid at L.5 per week, which included L.1 for the salary of his wife.

It seems difficult to believe the assertion of Taylor, that of the "forty thousand watermen" who lived and laboured between Windsor Bridge and Gravesend, "the cause of the greater half of that multitude was the players playing on the Bankside; for," he adds, "I have known three companies, besides the bear-baiting, at once there—to wit, the *Globe*, the *Rose*, and the *Swan*." To transport the audiences from the Middlesex to the Southwark side called into active service a host of watermen, who thought the golden time would last for ever, and who fell into great distress when the actors began to confine themselves to the Middlesex side, and that remote from the banks of the then pleasant river.

If the audiences were joyous on their way, by land or water, to their favourite houses, they appear to have been not less so within the theatre. The denouncers of plays have probably much exaggerated their accounts of the unseemly conduct of many spectators. These certainly seem to have been less unrefined at the close of the sixteenth century than French audiences in polite Paris. We obtain satisfactory proof of this fact in a decree published by the magistrates of the French metropolis in February of the year above mentioned, and which is to this effect:—"Every person is prohibited from doing any violence in the Theatre de Bourgogne during the time any piece is performing, as likewise from *throwing stones*, dust, or anything which may put the audience into an uproar, or create any tumult." It is also worthy of remark, that the liberty of English audiences has never been so tyrannously treated as that of foreign audiences. In 1772, a theatrical riot in the Copenhagen theatre, arising out of a satirical exposure by an author of a critic who had written of him in ultra-severe terms, led to a prohibition of hissing and all equivalent marks of disapprobation! This prohibition was long in force, and it still prevails in continental theatres, out of courtesy, when crowned or royal heads are present. On those occasions the audience neither applaud nor hiss, but leave all demonstrations of approval or censure to the illustrious visitors,

Theatres. as if they alone were endowed, for the nonce, with critical acumen.

The noisy audiences of the early period are frequently alluded to by contemporary writers; but the former were soothed as Orpheus soothed the brutes. The value of music, and its efficacy in keeping an audience in good-humour, was very early understood and applied in our closed theatres, as well as in the open one at Piran Round; in proof of which we may cite the lines uttered by Diccon at the close of the second act of *Gammer Gurton's Needle*—

> "Into the town will I, my friends, to visit there,
> And hither straight again to see the end o' this gear:
> In the meantime, fellows, pipe up your fiddles; I say, take 'em,
> And let your friends here have such mirth as ye can make 'em."

This custom still continues. Another, which many of us may remember, has ceased altogether, but its antiquity was respectable. We allude to the stepping forward of an actor at the end of a play, to announce the next evening's performance. That this was an observance of early date, is shown in the introductory lines in the folio edition of Beaumont and Fletcher. They profess to come from the "Stationer," who says—

> "As after the epilogue there comes some one
> To tell spectators what shall next be shown,
> So here am I."

Other old customs have only partially disappeared; for instance, the sharing system, whereby the receipts of a theatre are divided among the actors according to their merits, is one now confined to strolling and "scratch" companies. It is, however, of very early origin. It was still the practice in Shakspeare's time, after the deduction of between L.2 or L.3 for expenses. The shares must have been modest enough; for in Davenant's days, when salaries are mentioned, Betterton and other superior performers at one time received only 5s. for each piece in which they acted, except on the occasions of benefits, when the actors "played for their own profit only."

The sharing system, however, was the *rule* for many a year. Under it the proprietor had, of course, the greatest portion, and Davenant is reported to have made by it, during his brief seasons, L.200 a week. No doubt that, from an early period, "bespeaks" were profitable to actors and proprietors, as bringing an increased audience, as well as a fee from the bespeaker. On one occasion, the latter individual, Sir Gilly Meyrick, involved himself in an action for treason by bespeaking an old tragedy, called, *The Deposing of King Richard the Second.* The actors objected to its being old and unattractive, but Sir Gilly laid down forty shillings, and the piece was played. The attempt of Essex against Elizabeth soon followed; and Bacon, in pleading against Gilly, adduced this very bespeak as a proof of his traitorous designs against the crown.

It is in provincial theatres that "sharings" and "bespeaks" are still common. These theatres are of much later date than the "exclusive houses" of the capital. Strolling companies only played at inns or in booths. "There are many nations in the world," says Prynne, "that never knew what stage-plays meant; yea, there are sundry shires and citys in our kingdom where players (who for the most part harbour about London, *where only they have constant standing playhouses*) never come to make them sport; and yet they never complain for want of pleasures or these unnecessary stage delights; the most, the best of men, live happily, live comfortably without them, yea far more pleasantly than those who most frequent them."

The circumstance which had most embittered the Puritans against the theatre, was the unseemly practice of acting on Sundays. This was encouraged by King James, whose chief theatrical "revels" were held on Sundays at Whitehall, Greenwich, or Hampton. Such encouragement helped forward the profanity, and the king's subsequent attempt to remedy the evil, of which he was one, if not the chief cause, was fruitless. Charles I. introduced better arrangements for the regulation of the five companies licensed to play in London, whenever the plague mortality was under a certain limit; but the character of the theatre had perished in the eyes of godly people, and the rising revolutionary spirit waxed as hot against the stage as against the crown. Theatres.

The Puritan majority in the Parliament of 1647 realised the most fanatic wishes expressed by Prynne, in his *Histriomastix*, by suppressing theatres, and forbidding actors to exercise their vocation, under penalty of whipping. Little wonder is it that the younger and stronger players sided with the cavaliers, fought for the king, and rose, by their bravery, to various ranks. Shatterel stopped short at quartermaster, but Burt was a cornet, and Hart a lieutenant in Rupert's horse; Allen and Mohun became majors; while one of the three Robinsons, more memorable for his alleged fate than his rank, overcome in fight, laid down his arms to energetic Harrison, and asked for quarter. "Cursed is he that doeth the work of the Lord negligently!" exclaimed the enthusiastic Puritan, as he shot the defenceless player through the head. Swanston (an actor, of Presbyterian principles) supported the revolutionary party, but rather passively than actively, as he seems, on the suppression of the stage, to have exercised the craft of a jeweller.

The Puritan antipathy was as virulent against the poet as against the player. When a writer, with such an antipathy, had to speak of an opponent, he would class him for godlessness, with Shakspeare, Jonson, Beaumont, Fletcher, Davenant, Shirley, and a similar supposed iniquitous fraternity. The editor of the *Mercurius Britannicus*, alluding to an account given by his adversary of the *Aulicus*, touching an outrage on a clergyman of Wantage by Haselrigge, thus characteristically stigmatizes dramatic poets and prelatical authors. Aulicus says,—"Haselrigge barbarously cut the clergyman's books into pieces. These were only some Lady Psalter's Cosins' *Devotions*, Pockington's *Altar*, Shelford's *Sermons*, Shakspeare's Works, and such prelatical trash as your clergymen spend their canonical hours on."

Out of the wreck of the companies dispersed by the Puritan act of 1647, one troop was made up whose members strove, in a private way, to make a livelihood, by playing at the Cockpit in Drury Lane. Pit Place is said to have been the site of this precursor of the great patent theatre now existing adjacent to that locality. The acting terminated in three or four days, with the capture of the actors and the destruction of the place by the soldiery. When the poor players were released, they strove again to live by practice of their profession. They played, here and there at inns, notice of performance being circulated by trusty individuals, or they were invited to perform at noblemen's houses—Holland House, Kensington, being the chief of these—where collections were made for them by the nobility and gentry who were present. A bribe to a particular officer at Whitehall, procured them occasional freedom to play in town, and sometimes, under promise of fencing and rope-dancing, a tragedy or comedy was played, and the law was eagerly broken.

In this wise the English theatre progressed or stood still for about a dozen years, till Monk marched up Gray's Inn Lane to Hyde Park, and there, among his first acts, procured from the governing powers a license to Rhodes, the old wardrobe-keeper at the Blackfriars, to form a company and open a playhouse in the capital. The play-loving public had been living on the memories of bygone actors —on Hemings and Condle, on Sly and Armin, on Will Shakspeare, and Burbage, the Garrick of his day. They

Theatres. had talked of Alleyn, Green, Hamerton, and Swanston, Pollard and Rowley, Hart and Burt, and Clun; they had pitied those who had starved, admired those who had fought, and they had been to the Three Pigeons at Brentford to patronize the landlord, once Prince Hamlet of Denmark, then honest John Lowin, who had heard Shakspeare read aloud, and who was himself as good a landlord as he had been graceful performer.

The theatres of the Restoration were the Cockpit in Drury Lane, otherwise called the Phœnix, and reconstructed out of the older edifice of 1616; the theatre in Salisbury Court, Whitefriars; that of Lincoln's-Inn-Fields; the Duke's Theatre in Dorset Gardens; and, finally, new Drury Lane Theatre. At the Cockpit, Rhodes commenced with such old actors as he could collect, and new ones, among whom Betterton was the most perfect player of his time, and Kynaston one of the most popular performers with the multitude; they had both been apprentices with Rhodes. Appearances soon indicating that managers were about to assume a licence of their own, Charles II., in 1663, granted two patents for two theatres only in London. Under these were formed the king's company and the duke's company. The first was presided over by Killigrew, the second by Davenant, who had been bold enough to produce his *Siege of Rhodes*, at the Red Bull, as early as 1656. In despite of the law then existing, Killigrew and his majesty's servants deposed the manager at the Cockpit, and the actors there uniting with him, the new theatre in Drury Lane was opened in August 1663, with Beaumont and Fletcher's *Humourous Lieutenant*.

Davenant and the duke's company took up temporary quarters in the small theatre in Salisbury Court, Fleet Street. This house was built in 1660, on the site of the old granary of Salisbury House, which, as early as 1629, had served as a theatre. Hawes reckons it the "seventeenth stage or common playhouse which hath been new made within the space of three score years within London and the suburbs." So this house, finally destroyed in the great fire, and never rebuilt, Davenant, after playing for a brief while at the Cockpit, took his company, till their new house in Lincoln's-Inn-Fields was ready to receive them. This latter house, the first of three which stood on the same spot, at the rear of the Royal College of Surgeons, had originally been a Tennis Court; there Davenant had "new scenes and decorations, being the first that e'er were introduced in England." This testimony of old Downes establishes the fact of Davenant's peculiar merit in this respect. His scenery and decorations far surpassed anything that had been produced in the earlier theatres.

On Davenant's death, in 1671, the Duke's company removed, under Lady Davenant's rule, to the Duke's theatre, in Dorset Gardens, nearly on the site of the old Salisbury Court Theatre. This house was designed by Wren, and it had not only spacious access for those who came by land, but public stairs to the Thames for visitors by water. In these respective houses, the two companies continued to act till 1682, when Killigrew being dead, the two troops formed into one; and, leaving "Lincolns-Inn" to tennis-players, "Dorset Gardens" to wrestlers, and both to decay, opened in the new theatre, built by Wren, in Drury Lane (the old one having been burned in 1672) on the 16th of November 1682.

Under this arrangement, the single company at the Theatre-Royal, Drury Lane, as it was called, continued to ask the patronage of the town about twenty years. Before we notice the progress of the English stage during a subsequent period, we will record one great innovation which marked the Killigrew and Davenant period, and which cannot be omitted. Kynaston was a favourite actor of female parts down to the year 1661. In the January of that year, Pepys for the first time saw an actress on the stage, in the *Beggars' Bush*. This was some months before Davenant opened *his* theatre with women forming a part of his company. As early as 1629, however, there were French actresses occasionally exhibiting in London; and in 1632, Lady Strangelove, in the *Court Beggars*, remarks, "If you have a short speech or two, the boy's a pretty actor; and *his mother can play a part; women-actors now grow in request.*" Theatres.

This may be accounted for. Actresses may point to an exalted example as warrant for the dignity of their profession. Queen Anne of Denmark, consort of James I., acted in the court masques and pastorals, which were the dear delight of both sovereigns, and indeed of the audiences invited to be present at the performance. Despite the fact that a queen and her noble ladies were the first women-players in England, Prynne roughly assailed, in the coarsest of terms, the sprightly women who resorted to the stage as the public field of their profession, whether they came from France (as some did who acted in Blackfriars') or were native English—welcome to all but a few haters of innovations, and to rigid Puritans, like ponderous Prynne.

The floundering author of the *Histriomastix* denounced all playing as damnable, but that by actresses as especially "unwomanish." The term is singularly inappropriate. It was *unseemly* for the actors' boys or apprentices to assume the character of girls, and it was an unmanly occupation even for soft Stephen Hamerton, or radiant Hart, for graceful Clun, the lowly-toned Burt, or shrill Goffe, to don, with the attire, the ways, the gait, and as far as in them lay, the allurements of women, according to the requirements of the piece. It may have raised a laugh in an audience, the being told to have patience with a delay in commencing, caused by the circumstance that the queen had yet to shave; but even when the male face had been mown close, if not clean, the counterfeit presentment must have been, at the best, repulsive. How early audiences bore with male Juliets, Imogens, and Violas, we cannot conjecture at all. A couple of centuries ago, when the empire of woman was publicly acknowledged, the absurdity, to say nothing worse, of such a course, was patent. Yet it was not remedied without an apology, and when one of our early actresses was to walk an English stage, a rhyming address was spoken, the object of which was to justify the innovation by ridiculing the grossness of the previous system. It might have sufficed, we should have imagined, had the fair Mrs Sanderson been allowed to walk on unintroduced, as the gentle Desdemona; but not so; the wits of Charles II.'s reign were first apologetically informed—

> "Our women are defective and so sized,
> You'd think they were some of the guard disguised;
> For, to speak truth, men act that are between
> Forty and fifty, wenches of fifteen;
> With brow so large, and nerve so uncompliant,
> When you call '*Desdemona*'—enter, GIANT."

The fact, that in early times female characters were sustained by youths or men, will partly account for the gross language assigned to them for utterance. And yet if we contrast those characters in our old dramatists with those introduced into plays immediately after the period when actresses appeared on our stage, it will be found that a still more dangerous grossness pervades the language of their respective parts. This is attributed to the immorality that pervaded all classes after the re-action, when the puritanical severity no longer existed. It was long before the refining influences of female performers were felt, not fully, perhaps, till this century had somewhat advanced, and not perfectly perhaps even then. What was said of the innovation may now, however, with certain exceptions, be said of the rule, namely, that on the stage "nature has taken possession of her rights, the finest feelings are consigned to the fairest forms; the very Muse herself appears in her own sex and

Theatres. person; beauty, that gives being to the poet's rapturous vision, a voice that guides his language to the heart, smiles that enchant, tears that dissolve, with looks that fascinate, and dying, plaintive tones that sink into the soul, are now the appropriate and exclusive attributes of the all-conquering sex."

Killigrew and Davenant rendered good service by the introduction of actresses, and by their improvements in scenery. The custom, too, of retaining places in the boxes or "best rooms," was continued under their regime. A prologue, spoken in 1638, and alluding to manners at least a score of years old, says of the public, that

> "—— they to theatres were pleased to come,
> *Ere they had dined, to take up the best room;*
> There sat on benches not adorned with mats,
> And graciously did veil their high-crown'd hats
> To ev'ry half-dress'd player as he still
> Through hangings peep'd, to see the galleries fill."

In 1672, we have reference to another custom; a prologue spoken in that year sneeringly alludes to a portion of the public who did not arrive at the theatre till the last moment, and that till they came

> "The stinking footman's sent to keep your places."

Down to a late period in the last century, the front rows of the boxes were occupied by livery servants retaining the places previously engaged by their masters or mistresses, who were sometimes impelled thereto by the small vanity of exhibiting stalwart and showily-dressed men-servants. Walpole has many a sarcastic allusion to this custom, now as obsolete as the fashion of the same box-visitors in Lent, who manifested the religious feeling evoked from them by the solemn season, by going to the play in "full mourning."

In addition to the theatres occupied by Killigrew, with the King's, and Davenant, with the Duke's company, there were two houses established for the training of young people for the stage. These were called Nurseries, and were small playhouses in which dramatic pieces were occasionally acted by the regular performers, as well as rehearsed by the pupils. One of the nurseries was in Hatton Garden, where students were trained for the Duke's company; the second, in Moorfields, was the school for future members of the King's company.

> "There queens were formed and future heroes bred;
> There unfledg'd actors learn'd to laugh and cry;
> There infant punks their tender voices tried,
> And little Maximins the gods defyed."

Thus, for the new career of the English theatre after the Restoration, there were a few veterans of the Tudor school, the younger actors enlisted by the patentees, and the aspiring pupils of the respective nurseries. Greatest of all these, during the last portion of the seventeenth century, was Betterton, the original *Jaffier*. Next in talent, but far removed from the great actor, were Hart and Major Mohun, the original performers of Alexander the Great and Clytus. Clun and Nokes, and sprightly Price, were also among the first favourites of the public; and great in comedy as Betterton in tragedy, Lacy was long the people's pet comedian, winning golden opinions as the original actor of Teague, of Bayes, and of the hero in the first English version of Tartuffe. Among the actresses, most conspicuous for talent or other sources of attractions, were the two Marshalls, daughters of an old Presbyterian; Eleanor Gwynn, and, worthy colleague of Betterton, Mrs Barry, the first of that stage-honoured name, and the original, and seldom surpassed, Belvidera.

The dramatic authors of this long period were, at the best, but inefficient followers of that tuneful brotherhood comprising Shakspeare, Marlowe, Jonson, Beaumont, Fletcher, Webster, Marston, and others. The masterpieces of these writers were ill-supplied by the swelling nothingness of Davenant, the bombast of Sir Robert Stapleton, the Gallicised manner of Lord Orrery, the affectations of the three Howards, the nonsense of Flecknoe, the grossness of Etherege, or even by the most resonant of the periods of Dryden. The Duke of Newcastle supplied the theatre with poor plays; the Duchess wrote even worse; Settle's heroes ranted; Lord Falkland and Sir Charles Sedley's gentlemen were sorry rascals; Aphra Behn's were something more rascally still, and her heroines yet more audacious than her heroes; Wycherley, with more wit, defiled the stage more than Killigrew had done; and many a fine gentleman who could *not* write with ease imitated his vices, though unable to emulate his excellencies; Otway and Lee, who commenced as actors, were hissed by the audiences who crowned them as authors, full as one is of anachronisms and the other of rant; Durfey's productions failed to uphold the credit of the stage; of Bankes' tragedies it is difficult to say whether he meant them for serious pieces or burlesque extravaganzas; while for Shirley's superior muse there lacked the admirers he merited.

Theatres.

In tragedy, fustian reigned supreme; in comedy, virtue, honour, religion, common morality, were laughed down. Buckingham scarcely exceeded the extravagance of the former by burlesqueing it in the *Rehearsal*, and King Charles gave the sanction of fashion to the latter, by his loudly-expressed preference of French plays and French principles. Thence Shakspeare became neglected, or what was worse, outraged. Davenant amended him, Shadwell corrected him, Dryden altered him, Durfey and Crown improved him, and Nahum Tate, most criminal of these offenders, complacently revised, corrected, and simplified him! Less guilty, perhaps, but not less conceited, were Caryl and Sedley, the first of whom wrote a new *Richard III.*, and the other a new *Antony and Cleopatra*; but at once the most wicked and most silly assailant of all was Rymer, the critic, who wrote a pamphlet in order to suppress Shakspeare altogether!

Moliere was not more tenderly treated. His comedies were travestied rather than adapted to our stage, and these, unlike the so-called original pieces, were remarkable for their coarseness and personality. In the latter respect, the tragedies sinned as fully; the old comedy of the Greeks was not more unmistakably personal in its allusions to living individuals than many of the serious dramas of the seventeenth century.

It was a prolific period for the stage, but profitless both for itself and for posterity. Of all the pieces produced from the Restoration down to the appearance of Cibber, towards the close of the seventeenth century, there is not one that "keeps" the stage, according to the professional signification of that term. Some are still read out of curiosity, but perhaps *Venice Preserved* is the only one that is ever now performed, and that but occasionally. It is not a stock-piece, as so many of those of Shakspeare are.

In the period last-named there was no attempt to improve the public mind by teaching it from the stage. "I can no more be serious than you godly," was a phrase put into the mouth of Haines (a clever actor from one of the Nurseries), and it well illustrates the moral tone both of actors and audience. Ravenscroft, who used to write pieces expressly for the young actors to represent for their own profit, on the Wednesdays and Fridays during Lent, did not improve the public morals by introducing the Italian comedy and the freely-speaking harlequin. The new authors misunderstood the object of the old, as Mountfort annihilated the instruction of Marlowe by turning his *Faustus* into a farce. But authors misconceived their own position too; the dedications of their dramas had nothing in them of the quaint and elegant flattery of those of the Tudor days. They were disgracefully fulsome, the aim

Theatres. being, not to render honour to a nobleman, but to extract from him a couple of guineas and an invitation to dine.

This leads us to a consideration of the profits accruing from a professional dramatic authorship. The rights of theatrical authors included a portion of the proceeds of certain nights' performances of their pieces, as well as what they procured by selling their productions to the managers, or their copyrights to the publishers. In very early times, according to Oldys, an author's benefit took place on the first night, or rather first day of the acting of his drama. Subsequently, this arrangement being too much in favour of dull authors, the day was changed, and, as Davenant has it—

> "In the time of mighty *Tamburlaine*,
> Of conjuring *Faustus* and the *Beauchamps* bold,
> Your poets used to have the SECOND day."

At the commencement of the last century, it was the actors who divided the profits of a first night, after all expenses were paid, in order, probably, to remunerate them for the toil and time devoted to learning and rehearsing a new piece. Very early in the same century a new arrangement, previously attempted but now established, was made with authors. Their benefit was deferred to the third representation, and that was sometimes mortgaged. Decker speaks of a playwright—

> "Not caring, so he gains
> A cramm'd third day, what filth drops from his brains."

And in the epilogue to *Caius Marcius*, authors are asked—

> "Now, which amongst you is there to be found
> Will take his third day's pawn for fifty pound?"

Southerne, certainly not for his best, yet no doubt his then most attractive piece, *Sir Anthony Love*, was allowed two benefits: he used to make such occasions doubly profitable by hawking about his own tickets; and he is said to have thus acquired L.700 by a single play. Farquhar, in acknowledgment of the advantages accruing to the treasury from the long run of his *Constant Couple*, had four nights allotted to him. This was a singular case, and for many years the author's nights were understood to be the third, sixth, and ninth. At present there is no such understanding; the author sells his drama with or without copyright to the purchaser, and in the latter case he has a small claim upon the receipts of any theatre in the capital or the provinces where his piece may have the good fortune to be played.

There was one curious but temporary system connected with authors and managers, which must not be omitted in an article illustrative of the theatre. Just after the Restoration, when the patronage of play-goers was solicited by the proprietors of two houses, the latter used to engage the services of popular dramatists by a retaining fee of from L.1 to L.2 per week. This worked so ill that it was soon superseded.

At what period authors were first required or permitted to read their new pieces to the players is uncertain. That it was an established custom in the last century we know, and that it was one as likely to mar the author's object as to farther it, is certain. All depended on the reader's power and skill. Lee displayed both in such perfection that the despairing actors accepted their parts with modest conviction of doing the author injustice, and yet, when Lee himself attempted the stage (in *Macbeth*), his enunciation was extremely defective. Colly Cibber was another of the fine, declamatory, and impressive readers. Rowe, again, possessed this accomplishment so fully, that even Mrs Oldfield acknowledged that all the merit she derived from the modulation of her voice was entirely owing to her hearing Rowe read his own tragedies. Some authors of less note were remarkable for their skill in this important element of success. Nevertheless, several of the greatest and most successful of our dramatic authors were the most incapable readers. Dryden was cold, flat, and unaffecting, although he harmonized the language which he himself pronounced so indifferently. Thompson, between his blundering and his broad Scottish accent, was so unintelligible, that he was compelled to abandon the task to an actor. Congreve put in peril the acceptance of his most lively comedies by his wretched reading of the dialogue; and had not Cibber taken the manuscript of *Cato* from the hands of the hesitating, unemphatic Addison, a tragedy which, in fame or fortune, enriched author, actors, and proprietors, it would have been summarily and unanimously rejected. Over Bickerstaff's reading of his farcical comedies the actors went to sleep; and stammering, blundering, Irish-tongued Goldsmith was so well aware of his defects, that he was wont to say, "I leave the reading of my pieces to the players, the punctuation of them to the printers; for in truth I know little of either." He was, however, most successful in other respects; receiving sums for his two comedies which had never before been awarded to dramatic authors—namely, L.500 for his *Good-Natured Man*, and L.800 for *She Stoops to Conquer*. In point of lack of excellence in reciting from his own manuscript, Reed, who wrote dull farces and duller tragic pieces, was on a par with Goldsmith. "Sir," said Johnson to Henderson the actor, "I never did the man an injury, yet he would read his tragedy to me." Garrick's almost supernatural ability in reading was so well known that, after his death, the publisher Rivington put forth a pamphlet, now known to have been an imposture, pointing out, for the use of young clergymen, "the manner in which the Common Prayer was read in private by the late Mr Garrick."

Theatres.

One of the greatest annoyances which actors have been compelled to undergo is in the waste of great labour, study, and anxiety in the production of pieces, which proved immediately unsuccessful. To this grievance Le Kain, the great French tragedian, proposed a remedy—to other theatres as well as those of his own nation. The proposition was made in a published letter, in which the author says—"A thousand instances prove that a dramatic piece is never properly judged of unless upon the stage. Many a tragedy has appeared extremely good on the reading that has proved very defective in representation. The best method in this case would be to act the piece upon the stage, the actors reading their parts from the book of the piece; for to require that the actors should get any new piece by heart, unless there is some chance of success upon the stage, is surely to impose upon them a very cruel, and very often a superfluous and unnecessary task." It is not extraordinary that such a remedy was never resorted to, but it *is* that it was ever proposed. We will only add to our allusion to this circumstance the record of a fact, that actors themselves have almost invariably proved the most incorrect judges of the probable effect of plays read to them by authors.

Touching the value of dramatic pieces in the eyes of publishers we have a few authentic indications. Dr Young received for the copyright of his *Busiris*, L.84; Smith for his *Phædra and Hippolytus*, L.50; Rowe obtained only 15s. more for his *Jane Shore*, which was hardly worth the additional compensation; while his *Lady Jane Gray* acquired for him a further increase in the sum of L.75, 5s. Cibber fared better than the tragic poets, his once popular comedy of the *Nonjuror* bringing him just one hundred guineas. It was rare for a comedy to be estimated at such a value. *Parolle and Izidora* was not undervalued at L.36, 10s.; but the *Lady's Last Stake* might have been priced higher than L.32, 5s. Exactly half that sum was paid for a twice better comedy, *The Double Gallant;* the *Comical Lovers* ran down to L.10, 15s.; and his absurd *Venus and Adonis*, in which the goddess of beauty sang a

Theatres. song commencing with "O pleasing horror! O melodious yell!" was considerably overpaid at L.5, 7s. Cibber's attempt at putting on the stiff classical sock of Corneille was not profitable to him, his *Cinna's Conspiracy* realizing only a poor L.13; but this piece was not one "of circumstance" like the *Nonjuror*, which was honoured by the attendance of the king, was published in costly and also "people's" editions, and was recommended by moral-essay writers as a work which should find place in every household with the *Book of Common Prayer* and the *Whole Duty of Man!* Compared with the sum given for the copyright of the *Nonjuror*, how unworthy was that handed over by Tonson to Otway for *Venice Preserved*—only L.15! In later days, publishers have been more liberal or more daring. Maturin received three hundred and fifty guineas from the late Mr Murray for his tragedy of *Bertram;* and the same price was given by Mr Warren to Barry Cornwall [Mr Proctor] for his *Mirandola*, prior to that tragedy being brought forward on the stage.

The consideration of the profits of the professional author has led us away from that of the condition of the English theatre in the eighteenth century, to which we now return. The concluding years of the seventeenth century were not favourable to the interests of the theatre. A taste for operatic performances had been founded by converting some of the master-pieces of the drama into musical plays. The temper of the times, too, was adverse, and the patentees began to treat agreements with their actors as matters that might be set aside whenever such a course might be profitable to them. The veteran Betterton was at the head of those rebellious and triumphant actors who overthrew the monopoly of the patentees, and obtained a *licence* from William III. to act in a separate theatre. This triumph was consummated when the seceding company opened at the new theatre in Lincoln's-Inn-Fields, in 1695, with the *Love for Love* of the brilliant but immoral, and then young writer, Congreve. The old patentees continued at Drury Lane, but occasionally played at the house in Dorset Gardens. At this time, however, the tendency of the "theatre" was so hostile to every virtue and principle of honour, that Collier launched against it his famous philippic, which was but ill answered by either Vanbrugh or Congreve, and with even less effect ridiculed by Durfey laughing in song at

> "Stubborn nonjurors,
> Who, wanting employment, now scourge the hard times;"

and groaning at the fact that

> "Dull, clod-pated ralliers,
> Smiths, cobblers, and *colliers*,
> Had damned all the rhymes."

There was little improvement, however, either in authors, actors, or audiences; but a statute of Queen Anne attempted to find a remedy, and the actors were forbidden, under pain of being silenced, acting anything contrary to religion and good manners; no persons not of the company were to be permitted to go behind the scenes, or be upon the stage during a performance; infamous vizard-masks were driven from every part of the house; and payment before admission was strictly enjoined. Thenceforth the Lord Chamberlain began to exercise an authority over the actors seldom before assumed. As immediately subsequent to this, very immoral plays were acted in presence of Queen Anne herself, the statute became a dead letter, except when it was occasionally appealed to by ignoble persons who resorted to the theatre, informed against the actors if they detected them in offending, and who, receiving a portion of the fine, were of course the better pleased the more blasphemy and indecency abounded.

In 1704, Betterton assigned his licence and company to Captain Vanbrugh, who took both to the Haymarket, and commenced a campaign there in the new house, on the site of which the present Opera-House stands. At Drury Lane, the elder Rich (Christopher) had attained the leadership in the management, made over to him by the representatives of the Davenant family. For four years there existed only a disastrous rivalry, and in 1708 the companies once more united under Rich's management at Drury Lane, the Haymarket house being left under the direction of Swiney, for the production of opera as well as of the regular drama, for the performances of which he raised an independent troop of players "at the Queen's Theatre in the Haymarket." This arrangement failed to be profitable. The managers then changed houses—they fared no better; then rechanged; and at length Collier, who had succeeded Christopher Rich, opened Drury Lane under a licence, including Wilks, Doggett, and Cibber, in 1711. From this period, by good management, prosperity began to smile upon the undertaking, and continued for twenty years, almost without intermission. During that period the names of Booth, whose acting, and Steele, whose writings in the *Tatler* had served the theatre, were added to the licence, Collier retiring; and ultimately the licence during pleasure was set aside for a patent, at the head of which was the name of Steele. The patentees met with formidable opposition, however, when, in 1715, the old patent, of which Rich had been deprived, was restored, and again a new theatre in Lincoln's-Inn-Fields was opened under the management of his son, John Rich. The Duke of Newcastle constantly interfered in the affairs of the theatres, by right of his authority as Lord Chamberlain, whereby he could order the closing or opening of a house, or procure any alteration in the patent, as when he expunged and afterwards restored the name of Steele. Theatres.

The close of the first quarter of the last century was made memorable by the introduction of pantomimes, the attraction of which was far greater than any exercised by the finished actors who then graced the stage. In this sort of entertainment, still tolerated even by intellectual and educated audiences, Rich excelled, eclipsing all the efforts of the Drury Lane management. A new rival to both houses also arose in 1720, in the "Little Theatre in the Haymarket;" but it was not a dangerous one till some years had elapsed. In 1730, a new theatre in remote Goodman's Fields quietly established itself; but it was not considered by the patentees menacing to their interests. In 1732, Rich removed to the new theatre in Covent Garden, the house that was subsequently burned down in 1808. The old house in Lincoln's-Inn-Fields had a short subsequent career as a theatre. In 1756 it was converted into a barracks, and finally it was the well-known Copeland's China repository, till 1848, when the old theatre, with its playhouse-look to the last, was taken down to afford space for the enlarging of the Royal College of Surgeons. Meanwhile, in 1733, certain discontented actors suddenly left their respective houses, in Drury Lane and Covent Garden, and appeared at the Haymarket. Their alleged grievance consisted in their being transferred, after the death of the old patentees, to new proprietors, without their consent. This division was not mended till Fleetwood, a man of fortune, purchased the whole patent of Drury Lane, and effected a reconciliation. From this time it became a rule that actors and managers should be bound by signed articles.

In a brief space of time, the political allusions which began to abound on the stage, and especially in Fielding's *Pasquin*, led in 1737 to that licensing act, which was so eloquently resisted by Lord Chesterfield, and whereby the number of theatres was limited, and no piece, not even a prologue or epilogue, could be produced without the approval of a licencer. The first who exercised his office was William Chetwynd, with a salary of L.400 per annum. His trifling labours were relieved by a deputy, at half his

Theatres. superior's amount of salary. These respective offices still exist, and probably no others have been so abused as these have been by most of the individuals who have hitherto enjoyed them.

The appearance of Garrick at Goodman's Fields, in 1741, marks the commencement of a new era in the history of the English theatre. Fleetwood allured him to Drury Lane, by offering him the highest salary that had ever yet been given to an English actor—600 guineas a year. Fleetwood's management, however, threatened to ruin the theatre, and he was obliged to dispose of the patent to Lacy and two others; with whom, after playing for a time under Rich at Covent Garden, Garrick was united in 1746. Thence commenced the triumphant career of Old Drury, down to the retirement of the English Roscius in 1776. Garrick then held half the patent, which share was sold to Sheridan, Lindley, and Forde, for L.35,000. Lacy's half was subsequently purchased by Sheridan for L.45,000. Meanwhile, the Covent Garden patent, in 1767, after Rich's death, passed to Harris, Rutherford, the elder Colman, and Powell, at a cost of L.60,000. Colman soon seceded; and that these high prices were not profitable, became manifest, in 1778, by the coalition, as it was called, whereby the actors played at either house, as the exigency of circumstances might require. In 1792, "Old Drury" was pulled down, and till 1794, when the new house, erected by Holland, was opened, the actors played at the Opera-House. The new edifice was destroyed by fire in 1809; and, in October 1812, the present house (the fourth theatre), built by B. Wyatt, was opened, with a prologue by Lord Byron. The property was now in the hands of a committee of proprietors, by whose exertions L.400,000 had been raised, a tenth of which was appropriated to purchasing the old patent, Sheridan's share being bought for L.20,000. The like sum was divided between the remaining old patentees, Mrs Lindley, Mrs Richardson, and T. Sheridan. From that period to the present time, the theatre has been let by the committee to various enterprising managers, but one or two of whom have realized a profit by their speculations. The most successful, perhaps, of these, certainly the one who most deserved to be so, was Mr Macready, whose "revivals" gave a lustre to the stage which it had never before known; but which have been imitated, as far as less ample means would allow, by Mr C. Kean. Mr Macready's management closed in 1843, since which period the drama has had no proper and settled home on the stage of this magnificent theatre.

The fortunes of the other patented house have not been brighter. In 1803, John Kemble became one of the proprietors; and, five years subsequently, Rich's old edifice, which had been nearly rebuilt in 1792, was burned to the ground. In less than a year (in 1809), the new building by Smirke was opened, at advanced prices, which led to those famous O. P. riots, which lasted sixty-seven nights. Twenty years later, its affairs were in a bankrupt condition; subscriptions were solicited from the public, and the leading actors of various theatres performed gratuitously, in order to release the proprietors from embarrassment and the players from distress. Temporary success ensued; but the fortunes of the theatre were not permanently restored. In April 1847, it was, after much alteration, opened as an Italian Opera. In 1856, at the close of a masquerade-ball, it fell a prey to the flames, and on its site, in 1858, the "Royal Italian Opera" commenced its difficult and doubtful career.

But the history of these great edifices, without some notice of the actors and the pieces produced, would be like describing a gallery of pictures by expatiating on the frames rather than on the works of art. We have alluded to the pieces and the players of the earlier days. For a lengthened subsequent period, comedies were made up of grossness and smartness, tragedies, first of rant and then of such dulness, that we can only wonder how the audience could keep awake; that they did so is the most satisfactory testimony to the powers, the judgment, and the feeling of the actors. Then succeeded the comedy of sentiment, the comedy of conversation, and the comedy of farce. Tragedy remained as heavy as before; that quarry had been worked out by the noble craftsmen of earlier years. In its place, rose melodrama, mingling serious and comic, and giving music as an aid to expression. In later days, just as the habits of society began to be adverse to the theatre, the tone of dramatic writers improved; and at the present time, there are at once more nature and more refinement on the stage than at any other period,—with room, however, for farther improvement. Theatres.

Of the actors who adorned the stage between the commencement of the eighteenth century and the first appearance of Garrick in 1741, many, of course, belonged to the century preceding, and one, at least, maintained within the theatre the traditions of the Shakspeare period. That one was Betterton, who for more than half a century (1659–1710) reigned without a rival, and

> "Whose setting sun still shot a glimm'ring ray,
> Like ancient Rome's, majestic in decay."

In the space of time indicated above, this incomparable actor *created* one hundred and thirty new characters, of which two only can be said to retain possession of the modern stage, viz., Jaffier and Valentine, in *Love for Love*. From 1661 to 1706, Underhill, tall, corpulent, and clumsy, delighted those who came to laugh rather than to learn, and established a reputation by his creation of Sir Sampson Legend. A greater comedian than he, however, was Haines (1672–1700), whose Tom Errand, in the *Conscious Lovers*, was the crowning original effort of his theatrical career of eight-and-twenty years. Mrs Barry left the stage the same year as Betterton, after "treading" it majestically since 1673. The range of the powers of this really illustrious actress may be seen in the fact, that she was not only the original representative of Monimia, of Belvidera, and of Isabella, heroines of the tragedies of Otway; and of "such *another* poet as Otway"—as Dryden called Southern—but also created Clarissa in the *Confederacy*, and similar, but now less known, parts, belonging to a first comic actress. Perhaps, the best pupil she ever had was Mrs Knight, who, from 1684 to 1724, was the great representative of "ladies," and in Mrs Barry's absence was her most efficient "double." The following list contains the names of the other leading actors who commenced their career in the seventeenth, and ended it in the succeeding century. Such a list will afford some idea of the quality of the actors; and, in the names of one or two original parts, will show the leading dramatists who then challenged the approbation of the town. The dates exhibit the years of the first and last appearances of the respective players on the stage.

1680–1707. Mrs Bracegirdle. Angelica, in *Love for Love*.

1681–1703. Mrs Verbruggen (Mountfort). Bizarre, in the *Inconstant*.

1687–1714. Powel. Orestes, in Phillips' *Distressed Mother*.

1688–1707. Verbruggen. Oronooko, in Southern's tragedy; and Bajazet, in Rowe's *Tamerlane*.

1689–1715. Bowen. Sir Joseph Wittol, in *Old Bachelor*.

1690–1732. Wilks. Sir Harry Wildair, in the *Constant Couple*; Young Mirabel, in the *Inconstant*; Plume, in the *Recruiting Officer*; and Archer, in the *Beaux Stratagem*,—all pieces by Farquhar; Sir George Airy, in Mrs Centlivre's *Busy Body*; Juba, in Addison's *Cato*; Don Felix, in Mrs Centlivre's *Wonder*; and Lord Townly, in the excellent original comedy of a writer famous for his skilful adaptations of French plays to the English stage, *The Provoked Husband* of Sir John Vanbrugh.

1691–1713. Doggett. He played Shylock as a comic character and bequeathed a coat and badge, still rowed for, and cake and wine still enjoyed, on the 12th of August.

1691–1733. Colley Cibber, the creator of seventy-three new characters. Among which were Lord Foppington, in the *Relapse*;

Theatres. Richard III., in his own alteration and despoliation of Shakspeare's tragedy; Gibbet, in the *Beaux Stratagem*; Glo'ster, in Rowe's *Jane Shore*; and Sir Francis Wronghead in the *Provoked Husband*.

1692–1719. Mrs Rogers. Remarkable for her reluctance to play any but "good ladies." She was the long celebrated original Oriana, in the *Inconstant*.

1692–1723. Pinkethman. The first of comic grimacers, and the original Beau Clincher of the *Constant Couple*.

1696–1724. Mrs Cross. Miss Hoyden, in the *Relapse*; and Miranda, in the *Busy Body*.

1696–1726. William Bullock. Gibby, in the *Wonder*. Tradelove, in *Bold Stroke for a Wife*.

1696–1736. Mills, whose versatility is marked by the fact of his creation of two such opposite characters as Colonel Briton, in the *Wonder*, and Zanga, in Dr Young's *Revenge*. He was the first actor who received more than L.5 per week, a circumstance unprecedented previous to 1709.

1696–1741. Ben Jonson. This namesake of the poet

> "Fill'd the strong outline of the comic scene;
> Betray'd no symptom of the conscious joke;
> And, tho' upon the stage, appear'd no player."

His most remarkable original characters were Alderman Smuggler, in the *Constant Couple*; and Vellum, in Addison's *Drummer*.

1699–1730. Norris. A small comedian, with a shrill voice, whose most famous original parts were Jubilee Dicky, in the *Conscious Lovers*; and Scrub, in the *Beaux Stratagem*. This man, one of the drollest of comic actors, used to play Cato to country audiences.

1699–1741. Mrs Porter, of the school of Mrs Barry. In tragedy, she seemed inspired, and has never been excelled in her original part of Hermione, in the *Distressed Mother*.

Such were some of the actors who commenced in the last half of the seventeenth century, the closing year of which (1700) introduced, if we may so speak, to the succeeding century, judicious and perfect, Booth, whose genius was equal to the brazen Dick of Steele's *Confederacy* and the Cato of Addison's famous tragedy. His brilliant career lasted from 1700 to 1728. Contemporary therewith was the career of Mrs Oldfield, continuing, however, two years longer. As Booth ultimately replaced Betterton, so did Mrs Oldfield replace Mrs Barry. The range of this actress's characters was as wide, too, as that of the great actor, and his contrasts in Dick and Cato were matched by hers in Jane Shore and Violante, Andromache and Lady Townly, of which she was the original representative. Having noticed apart this couple, who worthily led the stage during rather more than the first quarter of the last century, the subjoined list is added to show of what other noble materials the English theatre consisted down to the accession of Garrick.

1700–1721. Park. Brass, in the *Confederacy*; Obadiah Prim, in *Bold Stroke for a Wife*.

1702–1721. Mrs Saunders, celebrated for her "maids." Flora, in the *Wonder*.

1703–1713. Mrs Bradshaw. Dorinda, in *Beaux Stratagem*; Arabella Zeal, in *Fair Quaker*.

1704–1710. Estcourt. Kite, in *Recruiting Officer*; Sir Francis Gripe, in *Busy Body*.

1706–1721. Mrs Bicknell, in whose lowest rusticity there was grace, and who was the original Cherry in the *Beaux Stratagem*.

1709–1728. Spiller, the comic actor of his day, who most completely identified himself with his part and forgot his audience. He has been seldom equalled, except by W. Farren, in old men.

1709–1738. Miller, who being unable to read with facility, had his parts read to him by his wife. He was inimitable in his original character of John Moody, and similar parts.

1710–1757. Ryan, a lover and fine gentleman, for more than thirty years. His conception was better than his execution. He could not play Richard; but Garrick, witnessing the attempt, discerned the aim which Ryan could not reach, and not only attained, but went beyond it.

1714–1750. Mrs Horton, the "second" of Mrs Oldfield.

1714–1751. Quin. His Comus is the most distinguished of the few parts he originally played and which have come down to us. In the last year of his acting, his salary was L.1000 per annum, the largest known down to that period.

1715–1739. Walker. For thirteen years he played lovers and young tragic heroes, before he was cast for, and became famous as Captain Macheath. Rich said of him that he was the only actor he knew who could both speak and sing well.

1718–1730. Boheme. Deserving of notice, because he excelled Booth in a point where that great actor failed—the expression of plaintive distress. Theatres.

From 1720 to 1759, Theophilus Cibber, whose burlesque tradition of ancient Pistol is followed by modern actors, sustained a respectable position on the stage, where he originated George Barnwell. Between the year of his appearance and that of Garrick, the most remarkable actors were —brilliant Palmer; Hippisley, famed for his expression of avarice and amorous dotage; Milward, loud, yet harmonious, who first represented Thompson's Alfred in the theatre at princely Clifden; Mrs Clive, who from 1728 to 1769 had no equal, and was the very Comic Muse herself; Mrs Pritchard the first of our tragic actresses who spoke in natural tones, and who was as mirth-inspiring in Tag (in *Miss in her Teens*) as she was literally heartrending in Mrs Beverley, characters of which she was the original representative; Mrs Cibber, whose Ophelia succeeding ladies have vainly striven to emulate; and last, Mrs Margaret Woffington, who, from 1740 to 1757, kept the theatrical world, whether followers of the tragic or the comic muse, in a state of delicious wonder and ecstacy.

It was when the English stage was thus composed, as regards its chief supporters, that the little theatre at Ipswich sent up to London, Garrick. From that period, 1741, to that of the great actor's retirement in 1776, he was, though not without worthy rivals, yet the chief, perhaps the sole true glory of the British theatre. Reynold's well-known picture, which places him between Tragedy and Comedy, equally ready to follow either, is, as far as painting can express it, the most perfect illustration of his wonderful powers. He originated about forty new characters, and these can be nearly divided as tragic or comic parts. Of the plays to which they belonged, however, only two are now often represented—the *Gamester*, in which he was the Beverley; and the *Jealous Wife*, in which he originally played Oakley.

From the year 1744 to the end of his career, his most dangerous rival was silver-toned Barry—the original Young Norval (in London), and Evander in the *Grecian Daughter*. Barry remained on the stage one year later than Garrick; and when both had withdrawn from their profession, the prospects of the drama seemed hopelessly dull indeed.

During the period last-named, the English theatre was perhaps at its brightest, taken as a whole. Then flourished, in addition to many of those noticed above, Shuter, Weston, Woodward, Foote (1744–76), Ross and Reddish, Yates, Digges, and Lee Lewes, "Gentleman Smith" and Macklin, who commenced in 1735 with recollections of Betterton, and ended his career in 1791, the contemporary of a few aged actors who have only recently departed from among us; King (1748–1802); Edwin, Palmer, and Quick; Hull (1759–1805); Lewis (1770–1809.)

The chief actresses of the Garrick period, besides those already named, were—Mrs Barry (subsequently Mrs Crawford); Miss Macklin and Miss Barsanti; *Perdita* Robinson and Mrs Green; Mrs Hartley; the brilliant Mrs Bellamy; Mrs Yates; Mrs Abington; Miss Pope, whose long career ran through fifty-two years, commencing from 1756; and Mrs Mattocks, whose longer career embraced the distant years 1752–1808.

In recalling the names of the actors who came upon the stage after Garrick had left it, but whose career was concluded previous to the nineteenth century, the only names of eminence are those of Henderson and Bensley; among actresses, that of Miss Farren is the most conspicuous. Mrs Siddons, indeed, belongs also to the Garrick period, for she stepped from the strollers' platform to the stage of old Drury in 1775; but she seldom played with "Roscius," and her career of triumph, commencing after his retirement, was brought to a final close at Covent Garden in

Thebes.

1819, when Edmund Kean was the Roscius of the new century.

From 1783, when John Kemble first appeared in London, to 1817, when he retired from the stage, the dignity of the British theatre was splendidly upheld by that founder of a school whose peculiar declamatory style has still an exponent in Mr Cooper. Great tragedian as Kemble was, none of his original tragic characters fixed themselves on the stage as an inheritance to younger actors. The parts which he was the first to play, and which are, at this day, more or less popular, belong to melodrama or sentimental comedy. They are Octavian (*Mountaineers*), Rolla, Sir Edward Mortimer (*Iron Chest*), Penruddock (*Wheel of Fortune*), Reuben Glenroy (*Town and Country*), and the Stranger. Kemble's power was at its highest when a formidable rival appeared in George Frederick Cooke (1800–1810), of whom, however, it has been happily said, that he played many parts ill, but that in the few he played well no living actor could at all approach him; two of those parts were Richard III. and Sir Pertinax Macsycophant. For about a quarter of a century, reckoning from 1807, there was not a more accomplished or refined actor on the stage than Charles Young. His eminent position was not won without a struggle, as few opportunities of distinguishing himself were afforded him during the first years of his acting in the same company with John Kemble. To the school of that actor he belonged to the last, but it was a school whose prestige failed before the nature, impulse, freedom, and terrible earnestness of Edmund Kean. As Macklin won the town by dropping the old intoning cadences of the earlier tragedians, so did the elder Kean delight it by avoiding the solemn declamation and imposing enunciation of the Kemble period; and, giving unshackled freedom to the promptings of the heart, kept them at the same time under the control of his head. In other words, his feelings and his judgment went in bright companionship, and, if he displayed Shakspeare "by flashes of lightning," he could as easily rule as he could raise the storm.

With the name of Edmund Kean the history of the modern theatre, and of actors who have passed away from the real as well as the mimic stage, properly ceases. The contemporary players who have survived him, and his successors who still occupy the scene, may be registered by future writers treating of theatrical annals. To render as complete as the brevity of an article will permit the details of the progress of the English theatre, the list of actors and actresses of high and low comedy, whose talents ennobled their art during the last quarter of the past and the commencement of the present century, might worthily be inserted here. Their names, however, and their histories are better known to many, and more accessible to all, than those of the earlier professors; and with this allusion to them we may close the subject. One additional circumstance alone demands to be recorded—namely, the increase of theatres since the time when the old patents were in force, and the performances of the various playhouses were restricted to pieces of a certain style, the legitimate drama, as it is called, being legally represented only in the theatres protected by the patents. On the Surrey side of the Thames, remote, however, from the site of the old Shakspearian theatres, stand now the well-frequented houses, the Surrey, Astley's, and Victoria. On the Middlesex side, Drury Lane and Covent Garden are the successors rather than the representatives of the old king's and duke's companies. What were once "summer-houses," such as the Haymarket, Lyceum, and Sadler's Wells, are now open all the year round, or without reference to season. In addition to these, the play-going public have the Strand, the Olympic, and the Adelphi—the last, the newest, and most commodious of our London houses; the St James's and the Marylebone, on the north-west of the metropolis;—the Princess's, in Oxford Street; and the Queen's, in Tottenham Court Road, do not indicate any peculiar privileges in their names. With these are to be noticed, the City of London Theatre, and the splendid suburban houses which have sprung out of the old music saloons, and which invite audiences from among the inhabitants of Whitechapel, Shoreditch, Hoxton, City Road, and even of the southern borders of Essex and Hertfordshire. These new theatres include the National Standard, near the terminus of the Eastern Counties Railway; the Britannia, in Hoxton High Street; the Grecian Theatre, in the City Road; and the Pavilion, in Whitechapel. In these spacious and highly decorated houses every species of performance, from tragedy and opera to farce and pantomime, is represented with an ability and effect which are not surpassed in the theatres lying more westward.

Revolutions only inferior to those which swept over the ancient Greek theatre have been undergone by our own. In Greece, the edifice, so-named from θέαομαι (*I see*), was devoted not only to plays, but to the solemn business of the state, of which the citizens formed the audience, and to which, even when the seats ceased to be free, the poor were admitted *gratis*, or by money provided for them by the state. In the crowded theatres, the successors of the apostles preached the gospel; and from some of the uses to which the locality was applied, a sense of degradation was connected with the verb *theatrizein* (θεατρίζειν), because there the innocent as well as the guilty "were *made a gazing-stock*, both by reproaches and afflictions." In England, although the playhouses themselves, from being private and not state or public property, have not been converted to as many various uses as in Greece, they have served for many purposes besides those of the drama. The most striking and significant change that has come over some of them is that by which "congregations" have been induced to assemble therein on Sunday evenings, and to listen to the word of God preached to them by zealous ministers, from the stage. This circumstance brings the English and Greek theatres in close connection; and with this allusion to it, which we could not omit when treating of such a subject, we take leave of *our* audience, and give up the stage we have occupied to more worthy actors. (J. D-R-N.)

THEBES (Θῆβαι, in early writers Θήβη), a celebrated city of ancient Greece, on a hill between the streams of Derce and Ismenus, in Bœotia, of which it was the capital. It is remarkable, alone among the Greek cities, as being equally illustrious in the mythical times of the ancient heroes, and in the subsequent historical ages. The traditional legends of Thebes, which formed so favourite a theme of the Grecian muse, both in epic and dramatic poetry, need not be here related, as an outline of them will be found in the articles Amphion, Cadmus, Epigoni, Eteocles, and Œdipus.

With regard to the origin of the city and people, no certainty can be attained, and a variety of opinions still prevails among historians. The tradition that Thebes was founded by a Phœnician colony under Cadmus, from whom the citadel was called Cadmea, and the people Cadmeans, is undoubtedly more trustworthy than most of the stories of foreign settlements in Greece, and has been adopted by some modern writers, while others have maintained that the Cadmeans came from Crete; and yet a third party suppose them to have been Tyrrhenian Pelasgians. However that may be, they did not retain permanent possession of the country, but were expelled by the Bœotians, an Æolian tribe from Thessaly, who gave their own name to

B.C. about 1500 or 1400.

B.C. about 1124.

Thebes.

the land. This took place, according to Thucydides, about sixty years after the Trojan war The next event of which we have any knowledge in the history of Thebes is the legislation of Philolaus, a Corinthian, who settled here about the thirteenth Olympiad. The government of Thebes seems to have been from a very early period aristocratical; and the immediate occasion of the laws of Philolaus probably was the occurrence of some dissensions among the privileged class themselves, for he did nothing to alter the general character of the constitution. As at Athens, the sacerdotal functions of the ancient kings were discharged by an officer with the name of Archon. The other towns of Bœotia, twelve or fourteen in number, seem to have had institutions similar to those of Thebes; and the whole formed one confederacy, represented by a council of deputies, which met annually at the temple of Minerva, near Coronea, and governed by officers called Bœotarchs, elected for the space of one year. These probably at first corresponded with the number of the cities; but afterwards became fewer, while the influence of Thebes was kept in the ascendant by the privilege of that city to appoint two, one of whom was superior to all the rest. The Bœotarchs had the right of presiding in the councils, and commanding the forces of the confederacy.

B.C. about 1724.

B.C. 519 or 510.

About the year 519 B.C., or as some compute 510, Platæa, one of these subordinate Bœotian cities, impatient of the Theban supremacy, revolted from Thebes, and applied for protection to Athens. A war which ensued between the Thebans and Athenians, terminated in favour of the latter; the independence of Platæa was secured, and the Asopus made the limit between Attica and Bœotia. These events form the earliest manifestation of the inveterate hostility between Thebes and Athens, which pervades the subsequent history of Greece. In the Persian war, Thebes deserted the cause of Greece, their troops surrendered at Thermopylæ, and fought against the Athenians at Platæa. Immediately after the latter battle the victors demanded the surrender of the authorities of Thebes, and put them to death, and the city would have been deprived of the supremacy in the Bœotian league, had it not been for the interest of Sparta to prevent the subordinate cities from joining Athens, by continuing the Theban supremacy. In 456 B.C., the Athenians under Myronides invaded Bœotia, gained a great victory at Œnophyta, and established democratic governments in Thebes and the other Bœotian towns. The aristocratical leaders went into exile; but in 447 returned, and having captured several of the towns, and defeated an Athenian army, succeeded in re-establishing the former aristocratic governments. During the Peloponnesian war the Thebans were firm allies of Sparta, and, indeed, were more bitter in their hostility to Athens than the Spartans themselves. But the success of Sparta in this war caused a total change in the sentiments of Thebes. That state, now that Sparta claimed a supremacy over the whole of Greece, became as hostile to it as it had ever been to Athens; and even began to countenance and assist the popular party in the latter city. Thus, it hardly needed the interference of the Persian satrap Tithraustes to raise a fresh civil war in Greece, and as early as 395 B.C. Thebes, Athens, Corinth, and Argos, had declared war against Sparta. At the battle of Coronea, in 394, the Thebans for the first time encountered the Spartans, and they were the only part of the allied army not routed on that occasion. The peace of Antalcidas, which put an end to this war in 387, deprived the Thebans of their supremacy over Bœotia, and in 382 the Spartans gained a still further advantage by treacherously seizing and retaining the citadel of Thebes.

B.C. 480.

B.C. 479.

B.C. 456.

B.C. 447.

B.C. 431–404.

B.C. 395.

B.C. 387.

The Thebans continued under the power of the Spartans for three years; but at length a conspiracy being formed against them by Pelopidas and some of the principal people in the city, the Spartans were all massacred or driven out, and the citadel was regained. These transactions so exasperated the Spartans that their king Cleombrotus immediately marched against Thebes, though it was then the depth of winter. The Athenians at first declined to assist the Thebans; but an attempt rashly made by the Spartan general, Sphodrias, on the Piræus, determined them to take up arms. Thus, the Thebans gradually recovered all the towns of Bœotia, and at length begun to act on the offensive against their enemies, and invaded Phocis. In the numerous encounters which took place, Pelopidas always signalised himself; and at Tegyra, in 375, he gained a complete victory over the Spartans, which proved a prelude of the more celebrated and decisive battle of Leuctra.

Thebes.

The rising power of Thebes now began to excite the alarm of the Athenians, and led them to make overtures for a general peace. Accordingly, in 371 B.C., a congress was held at Sparta, at which the Athenian envoys proposed to the other states the same terms as had been included in the peace of Antalcidas,—namely, that the independence of all the Grecian states should be guaranteed. A treaty on these terms was drawn up and agreed to; but as Sparta did not hold herself precluded, either by this or the former treaty, from acting in the name of her subjects in Laconia and Messenia, the Thebans, as on a former occasion, put forward a claim to sign the treaty in the name of Bœotia. This claim was, as formerly, rejected by the other contracting parties; and as this demand was insisted on, Thebes was excluded from the treaty. The Spartans immediately declared war, and instructed Cleombrotus, who was then in Phocis, to invade Bœotia. The Thebans, though alone opposed to the whole power of Sparta, resolved to resist to the last. Epaminondas, as Bœotarch, commanded their army, which did not amount to a third of the Spartan forces; and his skill, along with the valour of his friend Pelopidas, who commanded what was called the Sacred Band, consisting of men who had sworn to conquer or die, secured the independence of Thebes. The Spartan general, not trusting himself to an encounter among the mountains of Phocis, conveyed his men by sea to the port of Creusis, where he landed and encamped on the plain in front of Leuctra. Epaminondas resolved to give battle; and one of the most obstinate and bloody encounters recorded in Greek history took place. The result was the total defeat of the Spartan army and the death of Cleombrotus.

B.C. 371.

The victorious general, desirous to improve this great victory, sent a herald, crowned with garlands, to communicate it in form to the Athenians, in hopes that this would be an effectual means to reunite them to the Theban interest. But the Athenians, whose policy it now was to prevent either Sparta or Thebes from obtaining the sovereignty of Greece, would not even grant their herald an audience. The Thebans took care to strengthen themselves by alliances, and had brought the Phocians, Locrians, Acarnanians, Eubœans, and other states, under their dependence; so that they were now in a condition to act offensively against the Spartans. At the same time, the state of affairs in the Peloponnese gave them a pretext and an opportunity for interfering to their own advantage. The Mantineans restored their city, which had been formerly destroyed by the Spartans, and, along with the Tegeans, formed a scheme for establishing Arcadia as a united state independent of Sparta, and founding a new capital, Megalopolis. This scheme was highly approved by the Thebans; and, in order to promote its success, Epaminondas undertook his first invasion of the Peloponnese. He was joined by the Arcadian and other confederate forces; so that the whole amounted to 40,000, or, according to some accounts, 50,000 men, besides great numbers of those who followed the camp, rather for plunder than

B.C. 370.

Thebes.

fighting, and were computed at about 20,000 more. The army was divided into four columns, and moved towards Sellasia, the place of rendezvous, from which they pursued their march with fire and sword towards Sparta. The city was saved by the skill and vigour of Agesilaus; but Epaminondas succeeded in inflicting an irreparable blow on the supremacy of Sparta. Although the legal term of office for which he and Pelopidas had been elected had expired, they remained in the Peloponnese till they had not only seen the secure establishment of the Arcadian confederacy, but restored the Messenians to their ancient country, and rebuilt their capital. After this successful campaign the Thebans returned homeward, foiling on their way an attempt of the Athenians, under Iphicrates, to interrupt them at the isthmus. But on their return the generals were both arrested as state-prisoners, for having prolonged their command four months longer than the time limited by law. At last, however, in consideration of their services, they were both honourably acquitted. This prosecution had been chiefly carried on and encouraged by Meneclides, a discontented Theban, and a bold and able speaker, who by his artful calumnies at the trial, so far prevailed as to get Epaminondas deprived of the office of Bœotarch for a whole year, though he could not gain the same advantage against Pelopidas, who was a greater favourite of the people.

War renewed with Sparta.

Meanwhile the Spartans, with much difficulty, had recovered themselves from their great defeat at Leuctra, and were careful to strengthen themselves with auxiliaries from other states, especially from Athens, with which they renewed their old treaty. Soon after the Arcadians renewed the war, and took Pallene in Laconia by storm, put the garrison to the sword, and were presently assisted by the Archives and Eleans, and especially by the Thebans, who sent to them 7000 foot and 500 horse, under the command of Epaminondas. This measure so alarmed the Athenians, that they immediately sent Chabrias with some forces to oppose his passage, who, though he did not succeed in intercepting their advance, repulsed the Theban forces in an attack upon Corinth. For this ill success Epaminondas was deprived of his command, and reduced to the condition of a private citizen An occasion, however, soon offered to make his services again necessary to the state. The Thessalians, who had groaned some time under the tyranny of the usurper Alexander of Pheræ, sent an embassy to Thebes to implore their aid and protection; upon which Pelopidas was immediately sent as ambassador to expostulate with him on their behalf. He proceeded directly to Pharsalus in Thessaly, where he was met by the tyrant at the head of a numerous army, while he himself was only accompanied by a very small band; and no sooner had Alexander got him into his power, than he caused him to be seized and sent prisoner to Pheræ. The Thebans, highly resenting the indignity offered to their ambassador, sent immediately an army into Thessaly; but the generals were repulsed with great loss, and it was owing to Epaminondas, who was among them in a subordinate position, that they were not totally cut off. Epaminondas was then reinstated in the command, and sent with a new army to repair the late dishonour, and prosecute their revenge. The news of his being in full march greatly alarmed Alexander, who was glad to accept of a truce of thirty days, and to release Pelopidas, upon which Epaminondas withdrew his forces, and returned to Thebes.

The Thebans repulsed.

Epaminondas degraded.

Pelopidas seized by Alexander of Pheræ.

The Thebans, having now risen by their success in war to a position of superiority over the other Greek states, wished to secure this advantage by a general treaty; and as Sparta had consolidated her power by the peace of Antalcidas, through the intervention of Persia, they determined to follow that example, and sent Pelopidas as an ambassador to the court of Susa. He was successful in his negotiations with the king, and returned with conditions highly favourable to Thebes, on which the Persian monarch would conclude an alliance with Greece. The most important of these conditions were that Sparta should give up Messenia, and Athens her command of the sea. A congress was assembled at Thebes to consider these proposals; but with all their efforts the Thebans could not procure the acceptance of the treaty, and the war with Sparta was continued. Epaminondas invaded the Peloponnese the third time, in 366, in order to gain over the Achaian states to the cause of Thebes. This he succeeded in doing, but not without exciting the jealousy of the Arcadians, who had even before viewed with dislike the growing power of Thebes. Meanwhile the gallant but rash Pelopidas had fallen in an expedition against Alexander of Pheræ; although the ultimate issue of the expedition was successful. Affairs in the Peloponnese were, however, beginning to assume an unfavourable aspect. A war had broken out between Arcadia and Elio, which, though terminated by the intervention of the Achaians, led to the return of Elio to the Spartan side, and was soon renewed with increased fury. The leading party among the Arcadians, who were in the interest of Thebes, took the rash step of seizing upon the sacred treasury at Olympia; and this not only embittered the hostility of their enemies, but produced a reaction in Arcadia itself, so that, notwithstanding the remonstrances of the Theban party, a peace with Elio was concluded at Tegea. On learning this, Epaminondas immediately declared that the Thebans would again enter the Peloponnese, and, with those allies that still remained faithful, carry on the war with Sparta. Alarmed at this announcement, the Eleans, Achaians, and Arcadians sent to Athens and Sparta, and formed with them a coalition against Thebes. Epaminondas was nothing daunted by the adverse circumstances; but though he had only the Messenians and Argives, with the towns of Megalopolis and Tegea to rely upon in the Peloponnese, and Thessaly, Locris, and Eubœa in Northern Greece, collecting an army, he hastened to the south, and, in 362, passed the isthmus for the fourth and last time. At Tegea he effected a junction with the forces of his allies, which raised the whole number of his army to 30,000 infantry and 3000 cavalry. The confederate army against him had ordered their rendezvous at Mantinea, the place which they naturally concluded would be first attacked, as being the chief seat of those who had revolted from the Thebans. But while they were securing themselves on that side, Epaminondas, who wisely considered how far this confederacy and expedition must have drained the city of Sparta of its main strength, broke up privately from Tegea, and marched all night, with a design to have surprised the capital. His project being discovered, Agesilaus took measures to disconcert it; so that, though the Theban general made several vigorous assaults on that city, he was so stoutly repulsed, and the Spartans behaved with such intrepid valour, that he was forced to retire. He next attempted to take Mantinea by surprise; and would most probably have succeeded had not a body of Athenian cavalry come unexpectedly to its relief, and given him a fresh repulse. These two defeats greatly exasperated the Theban general, who had never before experienced such disasters; moreover the time allotted him for his expedition was almost expired, and he was in the midst of his enemy's country, without any certainty of obtaining supplies. Under all these difficulties, he rightly considered that he must immediately resolve upon a decisive battle, in which he might at once retrieve his affairs, or fall honourably in the attempt. In the battle which ensued, Epaminondas drew up his troops with his usual skill, and charged with such vigour and intrepidity as, after an obstinate resistance, to gain a complete victory. But in the very height of his

Thebes.

B.C. 366.

B.C. 364.

B.C. 362.

Epaminondas makes an unsuccessful attempt on Sparta, and Mantinea.

success he was carried mortally wounded from the field; and hardly had he learned the fact of his victory before he expired. The results of this victory did not compensate to Thebes for the loss of such a man as Epaminondas to guide her counsels, and lead her armies to victory. A general peace was concluded, in which indeed the independence of Messenia was recognised, but no important change took place in the relation of the different Greek states. Sparta, which during the preceding ten years had been preserved from utter ruin chiefly by the ability of Agesilaus, never again rose even to the second position in Greece; and Thebes was unable to retain the supremacy that Epaminondas and Pelopidas had secured for her. Athens, on the other hand, notwithstanding all her former reverses, had been, ever since the victory of Conon at Cnidus in 394, slowly but steadily recovering her ancient power; and had it not been for the old enmity which still subsisted between Thebes and Athens, these states might together have defended the liberty of Greece against the power of Macedon, that soon began to threaten it. But in place of this the two states were constantly opposed to each other, until it was too late to resist the common enemy, who gained strength by the policy pursued by the Theban

B.C. 358. government. As early as 358 a war broke out between Thebes and Athens for the possession of Eubœa, which the Athenians finally succeeded in obtaining. The next important contest in which Thebes was engaged was the

B.C. 357–346. Phocian or Sacred War, which began in 357 B.C., and in which Thebes was again opposed to Athens and Sparta, but supported by the power of Philip of Macedon. (For an account of the war, see MACEDONIA.) It terminated in 346, greatly to the advantage of Philip, but without in-

B.C. 339. creasing the power of Thebes. Thebes continued in alliance with Philip, until, on the occasion of a dispute between Amphissa and the Amphrictyonic council, that monarch suddenly entered Greece, and seized the commanding position of Elatea in Phocis. On the news of this event reaching Athens, the utmost alarm and confusion prevailed; but some measure of confidence was speedily restored, when, on the motion of Demosthenes, an alliance was proposed and successfully effected with the Thebans, who were now fully alive to the impending danger. In 338 the allies sent an army into the field against Philip, but suffered a total defeat at Chæronea. This battle decided the fate of Greece; Thebes opened its gates to the conqueror, and the chief citizens were put to death or banished. A Macedonian garrison was stationed in the citadel, and the sovereignty of Thebes over Bœotia was abolished.

B.C. 336. After the death of Philip, in 336, the Theban exiles returned, besieged the Macedonian garrison, and invited the other Greek states to declare their independence. But all their attempts were frustrated by the rapid advance of

B.C. 335. Philip's successor, Alexander, who, in 335, razed the city to the ground, sparing only, it is said, the house of Pindar, and sold its inhabitants into slavery. The citadel was still retained by a Macedonian garrison, but the rest of the city

B.C. 315. lay waste until, twenty years after, it was restored by Cassander. It is unnecessary to trace the history of Thebes further down. It never again formed an independent state, but was subject in succession to Macedonia, Rome, Constantinople, the Turkish empire, and the modern kingdom of Greece; and, in the course of the vicissitudes of 2000 years, it has suffered many calamities, and is now reduced to an insignificant town of 9000 inhabitants. The Thebans, along with the rest of the Bœotians, were from a very early time taunted by the other Greeks for their alleged dulness and stupidity. But it does not appear that there was any good ground for such a charge, unless it were their undoubted inferiority to the Athenians in quickness and versatility of intellect; and they can boast of such names as Hesiod, Corinna, Pindar, Pelopidas, Epaminondas, and Plutarch, among their natives. Thus, though they were far from attaining the high distinction of Athens in literature and philosophy, they were at least superior to Sparta in intellectual development; though during the long period when they were almost entirely under the influence of that country, they probably became assimilated, in no small degree, to the Spartan character.

THEBES. See EGYPT.

THEISS (anc. *Tibiscus*), a river of Hungary, flowing into the Danube, formed by the union about 20 miles E.N.E. of Szigeth of the Black and the White Theiss, which both rise in the Carpathians, on the borders of Galicia. It flows in an irregular course, at first westwards, receiving numerous affluents from either side, the most important of which are the Szamos from the S. and the Bodrog from the N. The latter joins it near Tokay, where it changes its direction, and flows for some distance generally southwest, with many windings. Farther down it receives the Hernad from the right, and below Szolnok, where its direction becomes almost due S., the Köros and the Maros from the left. It joins the Danube 22 miles E. of Peterwardein, after a total course of 500 miles, for the greater part of which it is navigable. The chief traffic on the river consists in the conveyance down its stream of salt, timber, and agricultural produce. The Theiss abounds in sturgeon and other fish, and has valuable fisheries.

THEMISTIUS, a Greek orator and philosopher, was a native of Paphlagonia, and flourished during the latter half of the fourth century. He became very eminent as a public teacher of philosophy, and distinguished himself by commentaries on some of the works of Aristotle. His eloquence procured him the appellation of Εὐφραδης, or the Eloquent. At Constantinople he taught for twenty years. Having been invited to Rome, he removed to that city, but, after an interval of two years, returned to his former place of residence, and there spent the remainder of his life. He was married, and had children. Although he adhered to the pagan superstitions, Constantius admitted him to the senate in the year A.D. 355; and his panegyrical oration on that emperor procured him the honour of a statue. From Julian, a pagan and a philosopher, he received in A.D. 362 the higher distinction of being nominated præfect of Constantinople. In A.D. 384 he obtained the same appointment from Theodosius the Great.

Themistius is regarded as one of the best writers of this declining age of Grecian literature. The first edition of his works, including commentaries on Aristotle, and only eight orations, was published by Trincavallus, Venet, 1534, fol. His orations afterwards found a very learned editor, Dionysius Petavius, who published two different editions, Flexiæ, 1613, 8vo, Paris, 1618, 4to. This second edition contains nineteen orations; but thirty-three are included in the edition of Hardouinn, Paris, 1684, fol. To this number an addition has lately been made by Angelo Mai: *Themistii Philosophi Oratio in eos a quibus ob Præfecturum susceptam fuerat vituperatus, inventore et interprete Angelo Maio, Bibliothecæ Ambrosianæ a LL.OO, Mediolani*, 1816, 4to and 8vo. Dindorf has published the most recent edition of the whole of the orations of Themistius, Leipzig, 1832.

THEMISTOCLES. See ATTICA.

THEMSCHE, or TAMISE, a market-town of Belgium, in the province of East Flanders, on the Scheldt, 22 miles E.N.E. of Ghent. It has a fine castle, a handsome church, a chapel, town-hall, and several schools; and manufactures of linen, printed cotton cloth, lace, cordage, leather, tobacco, and pottery. Pop. 6150.

THEOBALD, LEWIS, best known as an editor of Shakspeare, was the son of an attorney practising at Sittingbourne in Kent. His grammatical learning he received at Isleworth in Middlesex, and was originally destined for his

father's business; but this he speedily abandoned for the profession of an author, and having fixed his residence in the metropolis, he engaged in a variety of literary undertakings. To Mist's *Weekly Journal* he contributed a paper called "The Censor;" and his censures being pronounced with great freedom, gave no small offence to some writers more formidable than himself. One of those whom he provoked was the rabid Dennis. Pope's translation of Homer he at first extolled, and afterwards abused. He was the original hero of the *Dunciad*, but was displaced to make room for Cibber, to whom the poet's satire is in many instances inapplicable. Theobald endeavoured to avenge himself by publishing *Shakespeare restored; or, a Specimen of the many Errors as well committed as unamended by Mr Pope in his edition of this poet, designed not only to correct the said edition, but to restore the true Reading of Shakespeare in all the editions ever yet published*, Lond. 1726, 4to. This prelude was, after a considerable interval, followed by his edition of Shakspeare's *Works*, Lond. 1733, 7 vols. 8vo. In 1726 he had introduced on the stage *The Double Falsehood, or, the Distrest Lovers*, of which, as he averred, the greater part was written by Shakspeare. His arguments in favour of this hypothesis were not considered as satisfactory; and, according to the opinion of Dr Farmer, this drama was the production of Shirley. Theobald was the author or translator of twenty plays, enumerated in the *Biographia Dramatica*, vol. i., p. 706. He was likewise concerned in various translations; and at the time of his death he had made some progress in an edition of Beaumont and Fletcher. He died in the month of September 1744.

THEOCRITUS, the most famous of all the pastoral poets, was the son of Praxagoras and Philinna. He was a native of Syracuse, and flourished about 272 years before the Christian era. (Clinton's *Fasti Hellenici*, vol. iii. p. 7.) The younger Hiero, King of Syracuse, is celebrated in his verses; but he appears to have found a more liberal patron in Ptolemy Philadelphus, who attracted him to the Egyptian court, and of whom he speaks in terms of high commendation. Of his personal history, we possess no further memorials on which we can place much reliance. The pastorals of Theocritus, which have furnished models to all succeeding poets, are remarkable for their simplicity, very frequently elegant, but sometimes approaching to rudeness. They are written in the Doric dialect, which is peculiarly adapted for such composition. Thirty idyls bear his name, but it has been doubted whether they were all produced by the same poet. To him are likewise ascribed twenty-two epigrams; and the authorship of one or two fantastic productions he disputes with Simmias.

The first edition of Theocritus, containing only eighteen idyls, issued from Milan, along with the *Opera et Dies* of Hesiod. It is a folio volume, without date, but is supposed to have been printed in 1493. The edition of Aldus appeared in 1495, that of Junta in 1515; and the earliest edition, accompanied with the scholia, at Rome in 1516. The best of the old editions is that of Daniel Heinsius, *Ex Bibliopolio Commeliniano*, 1604, 4to. Besides the notes of the editor, it includes those of Joseph Scaliger and Isaac Casaubon. Among the more remarkable editions is that of Reiske, Lipsiæ, 1765–6, 2 tom. 4to. He was speedily followed by a more elegant, though not a more learned editor, Thomas Warton, Oxon. 1770, 2 tom. 4to. A valuable edition of Theocritus, including likewise Bion and Moschus, was published by Valckenaer, Lugd. Bat. 1779, 8vo. The editions of Harles, Jacobs, Dahl, Schäfer, Heindorf, and Wüstemann, have each their share of merit. The poems of Theocritus are inserted in the first volume of Brunck's *Analecta veterum Poetarum Græcorum*, and in the second volume of Gaisford's *Poetæ Minores Græci*, Oxon. 1816–20, 4 tom. 8vo. The scholia are to be found in the fourth volume. The latest edition of this poet is by Meineke, Berlin, 1856. Translations of this poet have been executed in nearly all the European languages. Of the idyls of Theocritus English translations were published by Thomas Creech in 1681, by Francis Fawkes in 1767, by Richard Polwhele in 1786, and by M. J. Chapman, in 1836. Polwhele has likewise translated the epigrams of Theocritus.

THEODOLITE. See TRIGONOMETRY.

THEODORETUS, or, as he is frequently called, THEODORITUS, was born at Antioch towards the close of the fourth century. According to his own account, his birth was preceded by divers miracles. He received his education in a neighbouring monastery presided over by Euprepius, where he had Theodore of Mopsuestia for one of his instructors. About the year A.D. 420 or 423, he became bishop of Cyrus in Syria. His connection with Nestorius involved him in a charge of heresy; and in A.D. 449, the council of Ephesus deposed him from his bishopric; but in A.D. 451 the council of Chalcedon recalled him from exile, and restored him to his office. He survived till A.D. 457. His works, compared with those of the other Greek fathers, are of very considerable value. He has written commentaries on most of the books of the Old Testament, and on the epistles of Paul. His ecclesiastical history, divided into five books, prosecutes the narrative from the year A.D. 322 to the year A.D. 427. It is printed with different editions of Eusebius, and the other Greek historians of the church. A collective edition of his works, with a Latin version, was published by Sirmond, Paris, 1642, 4 tom. fol. A supplementary volume was added by Garnier in 1684. Another edition was long afterwards published by J. L. Schulze, Halæ Sax. 1769–74, 5 tom. 8vo. Each volume is however divided into two parts. Dr Gaisford has very recently published a valuable edition of his *Græcarum Affectionum Curatio*, Oxon. 1839, 8vo.

THEODOSIA. See KAFFA.

THEODOSIUS. See CONSTANTINOPOLITAN HISTORY.

THEOGNIS, an elegiac poet of Greece, of a very excitable character, flourished in the 59th Olympiad, or about 544 years before the Christian era. According to Plato, who is followed by Suidas, he was a citizen of Megara, in Sicily; but Harpocratio contends that he was a native of Megara in Greece; and Corsini has satisfactorily shown that the latter statement is very probable. (Corsini, *Fasti Attici*, tom. iii. p. 109.) Theognis commonly uses the Ionic dialect, and not the Doric of the Sicilians; and his verses afford several other indications of an Achaian origin. He speaks of himself as a person of superior birth. From his fellow-citizens, he experienced harsh treatment; and having been driven into exile with his wife Argyris, he found a place of refuge at Thebes. As he survived the Median war, B.C. 490, he must have reached a very advanced age. (Clinton's *Fasti Hellenici*, vol. ii. p. 9.) But how or where he terminated his career, we find no information. His remaining work consists of a series of Γνῶμαι, or moral sentences, written in elegiac verse, and containing many pointed and striking sentiments, though some of them are not strictly moral. The name of the author's friend Cyrnus is very frequently introduced. Of this work there are many separate editions. It is likewise to be found in Brunck's *Gnomici Poetæ Græci* (1784), and in the first volume of Gaisford's *Poetæ Minores Græci* (1814–20). In the edition of Bekker (Lipsiæ, 1815, 8vo), one hundred and fifty-one verses are printed for the first time, and the total number is thus raised to 1389. A more recent edition, with a critical commentary and notes, was published by F. Th. Welcker, Francof. 1826, 8vo. Schneidewin (1838) and Bergk (1843) have both edited the works of Theognis, and Müller, Ulrici, and Bode have illustrated him.

THEOLOGY.

Theology. THE word *Theology*, in its more restricted sense, signifies *a discourse concerning God* (λογος περι του θεου) (1); but it is commonly employed to designate that science which treats not only of the divine existence and attributes, but also of the relations which subsist between God and his intelligent creatures, the duties which consequently devolve upon the latter, and the arrangements which God has entered into for their government and benefit. More particularly it is used to designate the scientific development of the doctrines upon these points embraced by Christianity (2).

1. The word θεολογειν and its cognates were first used to denote the efforts of those poets and philosophers who wrote of the origin of things and of the genealogy and exploits of the gods. (See *Diog. Laert.*, Bk. i. § 119, 122; Clement of Alexandria, *Strom.*, Bk. v. p. 670, 676; Cicero, *De Nat. Deor.*, iii. 21.) They were afterwards adopted by the earliest writers of the Christian Church, who styled the author of the Apocalypse, by way of eminence, ὁ θεολογος, *the Divine*; and the doctrine of Jesus, by way of eminence, θεολογια, *i.e.*, the doctrine that the λογος is θεος. From this special sense the title "theologian" came to be reserved as a title of honour for those who defended well the doctrine of our Lord's Divinity or that of the Trinity; thus it is applied to Basil the Great and Gregory of Nazianzus. Augustine uses the term "theologia" in its etymological sense when he says (*De Civ. Dei*, 8. 1), "Theologia est aut Sermo Dei, aut de divinitate sermo et ratio." The first by whom the term was used in its modern acceptation was the famous Abaelard, who, in the early part of the twelfth century, composed a treatise entitled *Theologia Christiana*.

2. The following are definitions of theology given by some of the most eminent expositors of the science:—GERHARD—"Theologia systematice et abstractive considerata est doctrina ex verbo Dei exstructa, qua homines in fide vera et vita pia erudiuntur ad vitam eternam."—*Locc. Theoll.*, ii. 13. QUENSTEDT—"Sumitur vox theologiæ vel essentialiter, absolute, et habitualiter pro notitia, quæ in mente habetur et animo hominis inhaeret, sive quatenus est habitus animi; vel accidentaliter, relate, systematice, quatenus est doctrina vel disciplina quæ docetur et discitur, aut libris continetur."—*Theol. Didac. Polem.*, i. 11. BUDDEUS—"Est itaque theologia . . . scientia rerum divinarum homini peccatori ad salutem consequendam cognitu necessariarum, prout ex Scriptura sacra nobis constant, cum facultate eas iterum alios docendi, confirmandi, atque defendendi conjuncta."—*Inst. Theol. Dogmat.*, p. 50. TURRETINE—"Theologia supernaturalis (systematice considerata) notat compagem doctrinæ salutaris de Deo et rebus divinis ex Scriptura expressæ, per modum disciplinæ alicujus in sua præcepta certa methodo dispositæ."—*Inst. Theol. Elenc.*, i. p. 5. REINHARD—"Theol. Theoretica est corpus eorum quæ homini Christiano credenda sunt, apte subtiliterque compositum."—*Vorlesungen üb. d. Dogmatik*, p. 30, 4th edit. BRETSCHNEIDER—"The design of theology is to unfold to us the doctrines of religion fundamentally and rightly, to discuss them convincingly and profitably, and to show how they may be successfully defended; its properties must be truth, certainty, and efficaciousness."—*Handbuch der Dogmatik*, i. p. 21, 2d ed. DE WETTE—"An exhibition of the Christian faith, from the point of view of intelligent conviction, according to epochs and in systematic completeness."—*Lehrbuch der Christlichen Dogmatik*, vol. ii. p. 15 ff, 3d ed. This last definition introduces an element, that of epochs, on which some of the German divines since Schleiermacher have been disposed to lay much stress. By Schleiermacher dogmatic theology was viewed as a branch of historical science. He defines it as "the science of the connection [*i.e.*, in a connected form] of the doctrines held at any given time in any Christian society."—*Kurze Darstellung d. Theol. Studiums*, § 97; *Der Christl. Glaube*, i., § 19, p. 114. He is followed in this by a very valuable writer, Twesten, who defines the object of theology as simply "the dogmatic of the church to which we belong," in his case "the evangelical Lutheran, we being members of the Lutheran Church."—*Vorlesungen üb. Dogmatik*, &c., i., p. 38, 4th ed. (See also Hagenbach, *Encyclopædie d. Theol. Wissensch*, p. 258 ff.)

The Christian theology embraces both what has been called Natural Theology, and that which is peculiar to the Scriptures of the Old and New Testaments. The distinction between these two is clear and well-founded (1). At the same time, it is not of that kind which renders it necessary Theology. that the two should be treated separately; for as Christianity is no less a republication of the religion of nature (see Hill's *Divinity*, b. ii. c. 3, 1), than an announcement of truths, of which the volume of nature bears no traces, the attempt to present the entire body of its theology in one continuous whole, necessarily involves the statement both of the doctrines of natural and those of biblical theology.

1. Concerning the extent of natural theology many opinions have been formed, while some have contended that there is no such thing. Into these disputes we mean not at present to enter. We believe that one of them could have had no existence among sober and enlightened men had the contending parties been at due pains to define with accuracy the terms which they used. Whatever be the origin of religion, it is obvious that no man can receive a written book as the Word of God till he be convinced by some other means that God exists, and that he is a Being of power, wisdom, and goodness who watches over the conduct of his creature man. If the progenitor of the human race was instructed in the principles of religion by the Author of his being (a fact of which it is difficult to conceive how a consistent theist can entertain a doubt), he might communicate to his children, by natural means, much of that knowledge which he himself could not have discovered had he not been supernaturally enlightened. Between illustrating or proving a truth which is already spoken of, and making a discovery of what is wholly unknown, every one perceives that there is an immense difference. "Præclare ergo Aristoteles, SI ESSENT, inquit, qui sub terra semper habitavissent, bonis, et illustribus domiciliis, quæ essent ornata signis atque picturis, instructaque rebus iis omnibus, quibus abundant ii, qui beati putantur, nec tamen exissent unquam supra terram: ACCEPISSENT AUTEM FAMA ET AUDITIONE, ESSE QUODDAM NUMEN, ET VIM DEORUM; deinde aliquo tempore, patefactis terræ faucibus, ex illis abditis sedibus evadere in hæc loca, quæ nos incolimus, atque exire potuissent; cum repente terram, et maria, cœlumque vidissent; nubium magnitudinem, ventorumque vim cognovissent, adspexissentque solem, ejusque tum magnitudinem, pulchritudinemque, tum etiam efficientiam cognovissent, quod is diem efficeret, toto cœlo luce diffusa: cum autem terras nox opacasset, tum cœlum totum cernerent astris distinctum et ornatum, lunæque luminum varietatem tum crescentis, tum senescentis, eorumque omnium ortus et occasus, atque in omni æternitate ratos, immutabilesque cursus: hæc cum viderent, PROFECTO ET ESSE DEOS, et HÆC TANTA OPERA DEORUM ESSE arbitrarentur."—Cicero, *De Nat. Deorum*, lib. ii. § 37.

It is therefore undeniable that there are some principles of theology which may be called *natural*; for though it is in the highest degree probable that the parents of mankind received all their theological knowledge by *supernatural* means, it is yet obvious that some parts of that knowledge must have been capable of a proof purely rational, otherwise not a single religious truth could have been conveyed through the succeeding generations of the human race, but by the immediate inspiration of each individual. We indeed admit many propositions as certainly true, upon the sole authority of the Jewish and Christian Scriptures, and we receive these Scriptures with gratitude as the lively oracles of God; but it is self-evident that we could not do either the one or the other, were we not convinced by natural means that God exists, that He is a Being of goodness, justice, and power, and that He inspired with divine wisdom the penmen of these sacred volumes. Now, though it is possible that no man, or body of men, left to themselves from infancy in a desert world, would ever have made a theological discovery, yet whatever propositions relating to the being and attributes of the first cause and the duty of man can be demonstrated by human reason, independent of written revelation, may be called *natural theology*, and are of the utmost importance, as being to us the first principles of all religion. Natural theology, in this sense of the word, is the foundation of the Christian revelation; for without a previous knowledge of it, we could have no evidence that the Scriptures of the Old and New Testaments are indeed the Word of God. (See Lord Brougham's *Discourse on Natural Theology*.) In his "Installation Address," recently delivered, the same great orator and philosopher says, "The great doctrines of natural theology demand the closest attention, and afford the most valuable support to the teachers of the revealed Word. Nothing can be more groundless than the jealousy

Theology. sometimes felt, but oftener professed, of natural religion by the advocates of revealed. Bacon, who had his prejudices on the subject of final causes occasioned by the abuse of that doctrine, describes natural religion as 'the key of revealed, which,' as he says, 'opens our understanding to the genuine spirit of the Scriptures, unlocking our belief so that we may enter upon the serious contemplation of the Divine power, the characters of which are so deeply engraven in the works of the creation.' (*De Dig. et Aug.* lib. i.) Newton has said, 'De Deo de quo utique ex phenomenis disserere ad philosophiam naturalem pertinet.' (*Principia, Schol. gen.*) Locke declares that he who would take away reason to make way for revelation, puts out the light of both, as if we should persuade a man to put out his eyes the better to receive 'the remote light of an invisible star by a telescope' (*Hum. Underst.*, iv. 19, 4); and Tillotson, in his great sermon preached before the king and queen upon the occasion of the naval victory in 1672, affirms that 'the principles of natural religion are the foundation of that which is revealed.'" (P. 51.)

The principles of this science are to be found only in the WORD and WORKS of God; and he who would extract them pure and unsophisticated, must dig for them himself in that exhaustless mine. To fit a man for this important investigation, much previous knowledge is requisite. He must study the works of God scientifically before he can perceive the full force of that testimony which they bear to the power, the wisdom, and the goodness of their author. Hence the desirableness of a general acquaintance with the physical and mathematical sciences before a man enter on the proper study of theology, for he will thus best obtain just and enlarged conceptions of the God of the universe. He should also make himself acquainted with the principles of logic, the philosophy of the human mind, and the different sources of evidence. Above all, he should devote himself to the study of the original languages of Scripture, and to the principles of biblical criticism and interpretation. He who is incapable of consulting the original Scriptures, must rest his faith, not on the sure foundation of the Word of God, but on the credit of fallible translators; and if he be at any time called on to vindicate revelation against the scoffs of infidelity, he will have to struggle with many difficulties which are easily solved by him who is master of the original tongues.

Having satisfied himself of the Authenticity and Divine Authority of the Scriptures (see SCRIPTURE), the student will set himself honestly, diligently, and devoutly to examine into their sacred contents, that he may thereby learn for himself the system of truths which they contain.

Assuming that God and the things of God can be known only by means of a *revelation* from Him (1); that there must be, and is, a perfect harmony between the revelation supplied in Nature and that furnished in Scripture; and that all Scripture is at harmony with itself, and all its statements, justly interpreted, of equal authority—the systematic theologian has to use his endeavour to construct into a harmonious and systematical whole the truths which he finds revealed concerning God and Divine things. And as by the very ground on which he professes to stand he renounces the idea of having to excogitate or devise a scheme of religious truth, and assumes to himself the office simply of an explorer of truth revealed, it is only by a scientific logical process, either inductive or deductive, that he can possibly gain his end, and build up the superstructure of his science.

1. HILARY.—A Deo discendum est quicquid de Deo intelligendum. QUENSTEDT.—Causa Theologiæ efficiens principalis Deus.

His first step in this course must be the collection and verification of his facts. As these are the data from which all his conclusions are to be drawn, the basis on which his entire superstructure is to rest, it is evident that no scientific inquirer can proceed a single step with security until he has attended to this. Careful scrutiny, and the application of all the necessary tests of accuracy, together with copiousness of collection, so as to draw the induction from the largest possible area, are indispensable in every scientific inquiry; and he who neglects these, though he may sometimes make a felicitous guess at truth, can never securely construct a system. As applied to biblical investigation, this indispensable requirement means the copious collection of passages bearing upon the subject in hand, and the ascertaining, by the use of proper methods of interpretation, the exact meaning of each in the connection in which it stands. It is necessary to lay stress on the latter of these; for it is obvious, that unless a passage be taken in its *true* meaning, its value as a proof-passage is destroyed. In natural science great stress is laid on what Bacon calls "the rejection of instances," by which he means the exclusion of all facts which, when properly tested, are found not to contain the quality or feature that belongs to the class. Now what this "purging of instances" is to the inductions of physical science, an exact and discriminating exegesis is to the inductions of theology. Every passage that will not abide this test is admitted into the process at the risk of vitiating the whole. Theology

Having, by a process of careful observation and scrutiny, collected and verified his materials, the systematic theologian has next to classify them according to their subjects; and having done this, he may proceed to compare and weigh those in each class, one with another, for the purpose of eliciting the great general truth which they in common express. In some cases he will find this done to his hand in the Bible; for, as part of that book consists of theological discussion, it is only what may be expected, that in some instances, if not in all, we shall find the general truth, to which a comparison of instances would lead us, enunciated as a principle already ascertained—a theological dogma already proved. In this case the theologian may content himself with simply *transcribing* the Scriptural dogma as a matter already settled; or he may proceed with it deductively, and show how it holds true in each of the instances on which it rests; or he may ignore for the moment the authoritative announcement, and build up analytically from these instances the dogma afresh for himself. Men will be determined which of these three methods to pursue very much (in all probability) by the peculiar habit of their own minds; but, for scientific purposes, the third seems by far the preferable method. It is this method which the inquirer must pursue in all cases where the oracle does not authoritatively pronounce the conclusion at which he seeks to arrive. In this case his only resource is to compare passage with passage, and to educe, as the general truth taught, that which harmonises them all. As in science, the *vera causa* of the phenomena observed and classified is that principle common to them all, and which accounts for all alike; so in theology, the true dogma is that which is found to combine into one harmonious whole all the passages bearing on the subject.

Now, it will be observed, that whether we take a dogma enunciated in sacred Scripture, and reason down to its revealed elements, or take these elements and reason up to the dogma, whether enunciated in sacred Scripture or not, we pursue a process purely *logical* in its character. In the former case we elicit truths *synthetically*, employing the ordinary syllogistic method, the fundamental principle of which is, that what appertains to a containing whole appertains also to each of the parts of which it is composed. In the latter case we proceed *analytically*, on the assumed principle, that what appertains to the constituent parts of a containing whole, appertains also to the constituted whole. These two principles lie at the basis of all reasoning. They prescribe the form into which all right reasoning is resolvable; and they divide between them the science of logic. When properly followed, therefore, they land us in a conclusion which is formally certain; and this being the case, we shall have for the material truth of that conclusion

Theology. exactly the same amount of certainty that we have for the premises from which it is drawn.

The science thus educed is sometimes called dogmatic, sometimes speculative, and sometimes polemic theology. These terms have reference to different aspects under which it may be viewed. As the truths with which it deals are principles held and taught as certain, it is dogmatic; as these truths are viewed not so much in their practical bearings as in their relation to each other as thought by us, it is speculative; and as there is hardly a position in the system of divine truth which has not been assailed by some one, and needs consequently to be defended as well as expounded, it is polemic. Besides these, such designations as acroamatic, having reference to its being taught orally in colleges; catechetic, from its being presented in the form of a catechism, &c., are to be found in older works, but are now no longer in use. Of late years much attention has been paid, especially in Germany, to what has been called Biblical Theology, the object of which is to set forth the doctrines contained in Scripture in their purely biblical form, apart from all traditional or philosophical additions and systems. This may be either general for the whole Bible, or special for any one of its books or of the sacred writers, as Paul or John for instance.

Theology, in the form in which it now exists, is a comparatively modern science. Among the Christian Fathers we find all the essential dogmas of our faith asserted and defended; but they made few, and these imperfect efforts, to present them in a systematic and complete form. The work of Origen *De Principiis*, Augustine's *Enchiridion ad Laurentium*, and the Ἐκθεσις της ὀρθοδοξου πιστεως of John of Damascus, are almost the only specimens that have come down to us of attempts on the part of the fathers to give a conspectus of the substance of Christian truth; but they are far from being what would now be required in works bearing such titles (1). The science of theology began with the scholastic divines, of whom Anselm, Abaelard, Hugo St Victor, Peter the Lombard, Alexander de Hales, Albertus Magnus, Thomas Aquinas, Bonaventura, Duns Scotus, Durandus, and Occam, are those whose writings in this department are the most important (2). Since the Reformation the science has been assiduously cultivated, and many digests of it have been published (3). Some of the greatest theologians, however, of modern times, such as Howe, Owen, Bull, Waterland, Edwards, Fuller, Whately, have contented themselves with the elucidation of particular departments and questions in theology, rather than sought to present the science in a complete form.

1. Originis *De Principiis cum annott.*, ed., E. R. Redepenning, Leip. 1836; Augustini *Enchiridion*, ed. Danæus, Geneva, 1575, and often since; Joan. Damasceni *Expositio Fidei Orthodoxæ*, in his works edited by Lequien, Par. 1712, tom. i., p. 124, and in Augusti's *Chrestomathia Patristica*, vol. i., p. 241; where also are to be found the *Catechesis Quarta* of Cyrill of Jerusalem, and the *Oratio Catechetica Magna* of Gregory of Nyssa, the former of which, however, has no scientific worth, and the latter treats only of the Trinity, the Incarnation, and the Sacraments, and that chiefly apologetically.

2. Anselm, Arch. of Canterbury, *Opera*, ed. Gerberon, Par. 1675, ib. 1721, fol., Ven. 1744, 2 vols.; Abaelard, *Opera*, ed. Duchesne, Par. 1616, fol.; *Epitome Theol. Christianæ*, edit. F. H. Rheinwald, Berl. 1835, 8vo; Hugo St Victor, *Summa Sententiaram*, in *Opp.*, Par. 1506, 4to, Rouen, 3 vols. fol., 1648; Peter the Lombard, *Sententiarum Libri Quatuor*, Ven. 1477, fol.; Alex. of Hales (Alesius), *Summa Theologiæ*, Ven. 1475, fol., and 1576, 4 vols. fol.; Albertus Magnus, *Opera Omnia*, ed. Jammy, Lyons, 1651, 21 vols. fol.; Thomas of Aquino (Aquinas), *Opera Theol.*, cur. Bh. de Rubeis, Ven. 1745, 28 vols. 4to; *Summa Theologiæ*, published first between 1462 and 1470, and often reprinted; Bonaventura, *Opera*, Rome, 1588–96, 6 vols. fol.; J. Duns Scotus, *Opera*, coll. et illust., L. Wadding, Lyons, 1639, 2 vols. fol.; G. Durand de St Pourçain, *Commentaria super IV. Libros sententt.*; William of Occam, *Centiloquium Theolog.*, Lugd. 1494–5–6, fol.

3. The theologian of the Lutheran Reformation was Melancthon, who, in his *Loci Theologici*, published first in 1521, set forth the pure Protestant doctrine in a systematic form. Of his followers in the Lutheran Church the following are most worthy to be named here:—Martin Chemnitz, *Loci Theol.*, ed. Leyser, Frankf. 1591, 4to, and often since; Leon. Hutten, *Compend. Locor. Theol.*, Viteb. 1610; *Loci Commun. Theol.*, Viteb. 1619; Joh. Gerhard, *Loci Theolog.*, Ven. 1610–25, 9 vols. fol., re-edited by J. Fr. Cotta in 20 vols. 4to, Tub. 1762–89; Abr. Calovius, *Systema Locor Theol.*, 12 vols. 4to, Viteb. 1655–77; Joh. Andr. Quenstedt, *Theol. Didactico-polem. sive, Syst. Theol. in duas sectt. did. et fol. divisum*, Viteb. 1685 and 1696, Leips. 1702; Joh. W. Baier, *Compend. Theol. pos.*, Jen. 1686, 1691, and 1757; Dav. Hollaz, *Examen Theol. Acroam. universam Theol. Thetico-polem. Complectens*, Holm. and Leips. 1707, re-edited by Teller, 1763, 4to; J. Franc. Buddeus, *Institt. Theol. Dog.*, 4to, Leips. 1723–24–27–41. Theology.

In the Reformed Church the primary theologian is Calvin, whose *Institutio Christianæ Religionis*, first published at Basle in 1536, and many times reprinted and translated into several languages, laid the basis of that theological system which still bears his name. Among his followers may be named Hyperius, *Methodus Theol. s. præcip. Chr. relig. locorum comm. libri* iii., Bas. 1568; Wolf. Musenlus, *Loci Comm. Theol.*, Berne, 1575, translated into English by John Man, 1568; Peter Martyr, *Loci Communes*, Bas. 1561, often reprinted, translated into English by Anthonie Marten, Lond. 1583, fol.; J. Coch (Cocceius), *Summa Doctr. de Fœdere et Testamentis Dei*, 1648, and often reprinted, the foundation of the so-called Fœderal Theology, embraced and expounded admirably by Hermann Witsius in his *Occonomia Fœderum Dei cum hominibus*, Leuwarden, 1687, Utrecht 1694, 4to, translated into English, 2 vols. 8vo, Lond. 1822; Pet. van Mastricht, *Theolog. Theoret. Practica*, Amst. 1682, and often reprinted; Fr. Turretine, *Instit. Theol. Elencticæ*, 4 vols. 4to, Lugd. Bat. 1696; Bened. Pictet, *La Theologie Chretienne*, 3 vols. 4to, Geneva, 1731; Joh. Marck, *Christ. Theologiæ Medulla*, Utr. 1742; H. Venema, *Institutes of Theology*, translated by A. W. Brown from the author's MS., Edin. 1850. To this school the majority of the English systems of theology belong. Of these may be named J. Owen, *Theologoumena Pantodapa sive de Natura, Ortu, Progressu et Studio Veræ Theologiæ*, Oxon. 1661; R. Baxter, *Catholic Theologie*, Plain, Pure, and Peaceable, Lond. 1675, fol.; *Methodus Theologiæ Christ.*, fol., 1681; Usher, *Body of Divinity*, Lond. 1647, fol.; Th. Ridgley, *Body of Divinity*, &c., 2 vols. fol., 1731; 4 vols. 8vo, 1819. Th. Gill, *Body of Doctrinal and Practical Divinity*, 2 vols. 4to, 1769; 3 vols. 8vo, 1796; Th. Boston, *Illustration of the Doctrines of Religion*, 3 vols. 8vo, Edin. 1773; Jn. Pearson, *Exposition of the Creed*, fol., Lond. 1676; Tim. Dwight, *Theology Explained and Defended in a series of Sermons*, many editions; G. Hill, *Lectures in Divinity*, 2 vols. 8vo, 1821; 2 vols. 12mo, 1833; Dick, *Lectures on Theology*, 4 vols. 8vo; Th. Chalmers, *Institutes of Theology*, 2 vols., 1849; G. Payne, *Lectures on Christian Theology*, 2 vols. 8vo, Lond. 1850; J. Pye Smith, *First Lines of Christian Theology*, 8vo, Lond. 1854; R. Wardlaw, *Systematic Theology*, 3 vols. 8vo, Edin. 1856.

The system which, without ceasing to be Evangelical, is most antagonistic to the Calvinistic is that of Arminius, whose works (*Opera Theologica*) were published in 1 vol. 4to, at Leyden in 1629, and have been since republished; they have been partially translated by J. Nichols, 2 vols. 8vo, Lond. 1825. To this school belong Sim. Episcopius, *Institt. Theol. Libri* iv., in his collected works, Amst. 1650; Steph. Courcelles (Curcellæus), *Institt. Rel. Christ. Libri vii.* in *Opp. Theol.*, fol., Amst. 1678; Ph. Limborch, *Theol. Christ.*, fol., Amst. 1686, 1735, fol.; G. Tomline, *Elements of Christian Theology*, 3 vols. 8vo, Lond. 1819; R. Watson, *Institutes of Theology*, 3 vols. Of Roman Catholic theologians the following may be mentioned:—J. Eck, *Enchiridion locor. commun. adv. Lutheranos*, Coln. 1525; Melchior Canus, *Locor. Theol. Libri* xii., Salmant. 1563, Lyons, 1704, 4to; Bf. Mt. Schnappinger, *Doctr. Dogmatum Eccles. Chr. Cathol.*, Augs. 1816, 2 vols. 8vo; H. Klee, *Syst. der Kathol. Dogmatik*, 3 vols. 8vo, Mainz, 1835; T. M. Gousset, *Theologie Dogmatique et Morale*, 4 vols. 8vo, Bruxelles, 1840–50.

Since the time of Semler, who in 1774 published *Institt. ad Doctr. Christ. liberaliter discend.* and in 1777 *Versuch einer Freier Theol. Lehrart*, a much more free, and in some cases, purely rational method has been followed by the theologians of Germany in the study of their science. A few of their more valuable works may be here mentioned—In. Chr. Dœderlein, *Instit. Theologiæ Christ. in Capitibus Relig. Theoreticis Nostris Temporibus Accommodata.*, 2 vols. 8vo, Alt. 1780, 6th edit. 1797; G. Chr. Storr, *Doct. Chr. pars Theoret.*, 1793, translated into German, with additions by C. Chr. Flatt, and into English by S. Schmucher, 2d ed. 1836, reprinted at Lond. 1839; Fr. Volc. Reinhard, *Vorlesungen üb. die Dogmatik*, 8vo, 1801, new edit. by Schott (the 5th), 1824; Fr. von Ammon, *Summa Theol. Christ.*, 8vo, 1803, 4th edit. 1830; J. A. S. Wegscheider, *Institt. Christ. Dogm.*, Hal. 1813, 7th ed. 1833; W. M. L. De Wette, *Lehrbuch der Christ. Dogmatik*, 2 vols., Berl. 1813, many editions; K. Gl. Bretschneider, *Handb. der Dogmatik*, 2 vols., 1814, 3d ed. 1822; F. Schleiermacher,

Theology. *Der Christ. Glaube nach den Grundsätzen der Evang. Kirche*, 2 vols., Berl. 1821, 3d ed. 1835; K. Hase, *Lehrb. d. Ev. Dogmatik*, Stuttg. 1826; *Hutterus Redivivus oder Dogmatik der Evang. Luther. Kirche*, Leipz. 1829, 7th ed. 1848; G. Chr. Knapp, *Vorlesungen üb. d. Chr. Glaubenslehre*, 2 vols. 8vo, Halle, 1827, translated into English, Lond. 1844; A. D. Ch. Twesten, *Vorlesungen üb. d. Dogmatik der Ev. Luth. Kirche*, 2 vols., Hamb. 1826–34; A. Hahn, *Lehrb. des Christl. Glaubens*, Leipz. 1828; C. Im. Nitzsch, *System d. Christ. Lehre*. 6th edit., Bonn, 1851; H. Schmid, *Die Dogmatik der Ev. Luth. Kirche Dargestellt*, 3d ed., Frankf. 1853; H. Martensen, *Die Christl. Dogmatik aus d. Dänischen*, 3d ed., Kiel, 1855; J. P. Lange, *Christl. Dog.*, 2 parts, 1849–51; J. H. A. Ebrard, *Christ. Dogmatik*, 2 vols., 1851–52.

Of systems more purely polemical may be mentioned the following:—Fr. Spanheim, *Controvers. de Relig. Elenchus*, Amst. 1701; Stapfer, *Theolog. Polemicæ Institutiones*, 5 tom. 8vo, 1743–47; Reinhard, *Theologia Polemica*, 8vo, 1745; Petavius, *De Theologicis Dogmatibus*, 3 vols. fol., 1700. To these may be added such works as Augusti's *Christliche Dogmengeschichte*, 8vo, 1835, &c.; Muenscher's ditto, 3d ed. by Von Coelln and Hupfeld, Cassel, 1832–34, with the continuation by Neudecker, 1838; Hagenbach's ditto, translated into English by Buch, 2 vols., Edinb. 1846–47; Sack, *Christl. Polemik*, Hamb. 1838.

Biblical Theology has been treated by the following:—Baumgarten Crusius, *Grundzüge der Biblischen Theologie*, Jena, 1828; N. Morren, *Biblical Theology, &c.*, 8vo, Edinb. 1835; Dan. v. Coelln, *Bibl. Theol.*, edited after the author's death by Dr D. Schulz, 1836; J. L. Sam. Lutz, *Bibl. Dogmatik*, edited after his death by Rud. Ruetschi, 1847; Oehler, *Theologie d. Alten Test.*, 1840; Hävernick, ditto, edited by Hahn, 1848; L. Usteri, *Entwickelung des Paulinischen Lehrbegriffes, &c.*, Zurich, 1834, 5th edit.; K. Frommann, *Der Johanneische Lehrbeg.*, Leipz. 1839; K. R. Köstlin, *Der Lehrb. des Evang. und der Briefe Johannis*, Berl. 1843.

As much of our success in all theological inquiries depends upon the spirit and temper in which these are prosecuted, we commend to the attention of the reader the following solemn charge with which the late Dr Taylor of Norwich was wont to preface his theological lectures:—

"I. I do solemnly charge you, in the name of the God of Truth, and of our Lord Jesus Christ, who is the Way, the Truth, and the Life, and before whose judgment-seat you must in no long time appear, that in all your studies and inquiries of a religious nature, present or future, you do constantly, carefully, impartially, and conscientiously, attend to evidence, as it lies in the Holy Scriptures, or in the nature of things, and the dictates of reason; cautiously guarding against the sallies of imagination, and the fallacy of ill-grounded conjecture.

"II. That you admit, embrace, or assent to no principle or sentiment by me taught or advanced but only so far as it shall appear to you to be supported and justified by proper evidence from revelation or the reason of things.

"III. That if, at any time hereafter, any principle or sentiment by me taught or advanced, or by you admitted or embraced, shall, upon impartial and faithful examination, appear to you to be dubious or false, you either suspect or totally reject such principle or sentiment.

"IV. That you keep your mind always open to evidence: That you labour to banish from your breast all prejudice, prepossession, and party zeal: That you study to live in peace and love with all your fellow Christians; and that you steadily assert for yourself, and freely allow to others, the unalienable rights of judgment and conscience."

"BENE PRECASSE," said Luther, "EST BENE STUDUISSE."

"ORATIO, MEDITATIO, TENTATIO THEOLOGUM FACIUNT," said the old divines.

Theology has to do with religion; indeed, the two are correlates, religion being the subjective apprehension and use of the truths, the system and science of which objectively it is the business of theology to set forth. Now religion is a relative term; it assumes the existence of two parties, God and man, who are at variance, and whom it is proposed to re-unite or re-bind (*religare*). The elements of all religion, then, are of necessity these:—1. God in his being, character, and claims. 2. Man as God's creature in his natural constitution and responsibilities, with the circumstances which have produced estrangement between God and man, and the consequences to which this has exposed him. 3. The medium through which reconciliation may be effected between God and man, and the grounds on which the efficiency of that medium depends. 4. The means by which men may come into enjoyment of this reconciliation, and the effect it is designed to produce upon their subsequent character and relations before God. These may be regarded as the essential elements of a religion for man, without which religion cannot exist. Concept of God.

Christianity claims to be a perfect religion, and the only true one; and these claims are grounded on the fact that she alone fully and correctly presents the truth on each of these four heads. She alone unfolds the true revelations of God, describes the true case and character of man, announces the true means by which reconciliation between God and man may be effected, and sets forth the true consequences of this reconciliation as respects both man's state and character, not only for this world but for that also which is to come. Christian theology, therefore, falls naturally into the divisions indicated by these four elements of the Christian religion. Its main parts are these four:—

I. THEOLOGY in its strict acceptation (λογος περι του Θεου)—The scientific development of the truths revealed concerning the Being, the attributes, the works, and the claims of God.

II. ANTHROPOLOGY (λογος περι του ἀνθρωπου)—The scientific development of what the Bible announces concerning man, especially concerning him in his relation to God, and concerning that which has produced estrangement between God and him, its nature, its extent, its source, its consequences.

III. CHRISTOLOGY (λογος περι του Χριστου)—The scientific development of what Scripture unfolds concerning the medium of reconciliation between God and man, especially as respects the person of the Mediator, the nature of his work, and the results of his official constitution and agency.

IV. SOTERIOLOGY (λογος περι της σωτηριας)—The doctrine of human redemption, or the development of what Scripture teaches concerning the salvation of men, especially concerning the nature of salvation, the grounds of it, the means of it, the agent of it, the ultimate cause of it, and the manifested results of it, as in this life so also in that which is to come.

To these some add as a fifth head ESCHATOLOGY, or the doctrine of the last things; but this may be fairly included under Soteriology.

PART I.

THEOLOGY, OR THE DOCTRINE CONCERNING GOD.

SECT. I.—*Concept of God.*

It is impossible for us to give any adequate definition of God; for, in order to define any object, we must be able to refer it to the genus to which it belongs, and to enunciate its characteristic difference from other objects belonging to the same genus, and both the genus and the characteristic difference must be previously and better known to us than the thing to be defined (comp. Aristotle, *Top.* i. c. 5, vi. 4). But there is no genus under which the Infinite and Eternal may be subsumed; even the most abstract category under which we might propose to place Him, that of substance, is inadequate; for we cannot use even this term of Him except by analogy (comp. Augustine, *De Trinit.*, bk. v.; *Opp.*, vol. iii. col. 316, 317, ed. Bas. 1569) (1).

1. The definitions which are given by theologians of God are little better than mere identical propositions. Thus Melanchthon says in his *Loci Theol.*, "Deus est essentia spiritualis, intelligens, æterna, verax, bona, pura, justa, misericors, liberrima, immensæ potentiæ et sapientiæ." Now, discounting from this definition those terms which describe God, not as He is in Himself, but as He is in relation to other beings, and which consequently do not properly enter into the concept of God; and discounting also those which describe qualities not exclusively distinctive of God, such as intelligence, freedom, and the moral qualities; there remain the terms "spiritualis, æternus, immensus," as definitive of the divine

Concept of God.

essence. But do we know these better than we know God? Are our ideas of spiritual essence, of eternity, of immensity, more simple and direct than is our idea of God? To say that God is such an essence, what is it but to say that $x = x$? (See Cic., *De Nat. Deorr.*, i. 22; Augustine, *De Cognitione Veræ Vitæ*, c. 7.)

Our incapacity scientifically to define God arises from our incapacity directly and adequately to think God. Nor is a definition necessary before we can advance to the consideration of what is knowable concerning Him (το γνωστον του θεου, Rom. i. 19); for however imperative such a preliminary may be in the mathematical sciences, where the reasoning is deductive, it may be safely dispensed with in investigations of a moral kind, where we do not set out from a position which holds our conclusion, and from which we are to educe it, but arrive at our position from the comparison of different momenta tending to it.

See Hamilton, *Discussions*, p. 15, 2d edit. Mansel's *Bampton Lecture*, lect. ii.—"Frigidis tantum speculationibus ludunt quibus in hac quæstione insistere propositum est quid sit Deus: quum intersit multum nostra potius qualis sit et quid ejus naturæ conveniat, scire."—Calvin, *Instit.*, i. c. 2, § 2.

But though unable either adequately to think or to define God, we are not unable to learn something concerning Him. The *sources* of information are two, Nature and Scripture: "Duo sunt," says Augustine, "quae in cognitionem Dei ducunt: Creatura et Scriptura" (1). The *methods* by which we obtain knowledge from the former of these sources are:—1. By *negation* (via negationis, κατ' ἀφαιρεσιν), in which we remove from God in our thoughts of Him all the imperfections belonging to creatures, and pronounce Him free from all such; 2. By *eminence* (via eminentiæ, κατα σχεσιν), in which we ascribe to God in absolute perfection the excellences we find in creatures according to their measure; and, 3. By *causality* (via causalitatis, κατα φυσιν), in which we ascribe to God those perfections which are requisite for the production and upholding of the created universe. Of these methods it is evident that the first two must always go together; for we cannot pronounce God absolutely free from imperfection without ascribing to Him infinite excellence. It is evident also that we must combine the teachings of the second method with those of the third, in order to reach just views of God; for it is only as we ascribe to Him that intelligence in perfection which we find in measure in ourselves that we think of Him as God, or as different from a mere world-power. Thus it appears that all these methods mutually supplement each other, and that it is from the skilful use of the whole that we obtain just views of God, so far as these are attainable by us (2).

1. To the two sources above noted some of the old dogmatic writers add what they call the "notitia insita Dei," and which they describe as "communis illa notio de Deo hominis cujusque animo per naturam inde ab utero insculpta et impressa, siquidem ex principiis istis nobiscum natis, seu κοιναῖς ἐννοίαις, quædam etiam Deum attinent."—Gerhard, *Locc. Theoll.*, i. 93. According to this, the knowledge of God is supposed to be one of those common notions or primary beliefs which form data of consciousness anterior to all reasoning. But when the tests by which all such notions are determined are applied to this, it will be found that it cannot abide them so as to make good its claim. This notion is resolvable into more comprehensive conceptions under which it is assumed; we affirm it to be true because something else is true; it is not a necessary truth of reason, for we can deny it without self-contradiction; and in fine, the notion of God which we possess is not in itself as evident as any proof that can be furnished of it, for we constantly seek to prove it by arguments drawn from data more evident to our minds than it.

2. This distinction of methods has come down to us from the earliest days of theology. We owe it to a Neo-Platonic writer of the fourth or fifth century, who wrote under the name of Dionysius the Areopagite. It figures prominently in the writings of the schoolmen, and has been generally adopted by modern divines. Though not explicitly enunciated in Scripture, all the three methods are exemplified by the sacred writers. Comp. for the *first*, Num. xxiii. 19; Mal. iii. 6. For the *second*, Is. xl. 18; Matt. vii. 11. And for the *third*, Paul's discourse on Mars' Hill, Acts xvii. 24–29.

Sect. II.—*Existence of God.*

Existence of God.

Though God is above all phenomena, yet it is only by means of the phenomena of being that we can ascend to a conviction of his existence. Now within this department there are two positions of which we are absolutely certain: the one is, *that something exists;* the other is, *that something must always have existed.* Of the former position we are sure, if from nothing else, from the fact of our own existence given to us in consciousness. The famous dictum of Des Cartes, "cogito ergo sum," understood as he meant it to be understood, not as logically inferring existence from thought, but as affirming that in the consciousness of thought is given the consciousness of personal existence, must obtain universal assent; as Des Cartes goes on to show, doubt here is suicidal, for "it would be contradictory to assume that what thinks does not exist at the moment in which it thinks" (1). Of the latter of the above positions we are assured as a deduction of reason; for if something exists now, something must always have existed or have at some time come into being. But something cannot come into being if nothing existed before; *ex nihilo nihil fit;* that which is nothing cannot make itself something; a thing must *be* before it can *do;* whence it follows that as something exists, something must always have existed (2).

1. *Princip. Philos.*, Pars i. § 7. The use of the term "ergo" by Des Cartes has probably misled those (among whom is Dr Reid) who have censured him as resting the proof of existence on the fact of thought, and thereby falling into *a petitio principii.* But Des Cartes does not mean to say, "Because I think, I exist;" he means that, being conscious of thought, he is also and therein conscious of existence. See Art. METAPHYSICS, p. 616; Hotho, *De Philosophia Cartisiana*, p. 11; Cousin, *Sur le vrai sens du cogito ergo sum;* and Des Cartes' own explanation in his *Respons. ad secundas objectiones*, p. 87, Amst. 1658.

2. See Howe's *Living Temple*, Part i., ch. 2 § 9.

Assuming that something has always existed, there are three hypotheses which may be formed regarding this eternal something in relation to the *cosmos* or universe:—1. That it is an intelligent being distinct from the universe, and by whom the universe has been framed; 2. That it is the universe itself, the matter of which (ὑλη) has always existed, developing itself in various forms and passing through innumerable changes, but never having in any proper sense begun to be; or, 3. That it is an intelligent substance not existing as a personality or distinct from the universe, but identical with it, developing itself in it, becoming conscious of itself in intelligent beings, and comprising in itself the sum of all existence. The first of these hypotheses is that of Theism, the second is that of Atheism, the third is that of Pantheism. Of these one must be true, and only one can be true. We proceed to exhibit the evidence on which the first, which theology adopts, rests.

The methods of proof of the existence of God are four—the historical, the physical, the anthropological, and the teleological.

I. THE HISTORICAL ARGUMENT.—Here the appeal is made to facts of experience; such as the common consent of all nations to the belief that God is, the fact that God has appeared and revealed Himself to men, and the fact of miracles proving the existence of the power by which they are wrought. The first of these facts presented itself to many of the ancient theists as carrying with it cogent evidence of the existence of God, and some modern writers have conceded to it the same distinction (1). It may be doubted, however, whether there is much force in this argument. Doubtless the fact that all nations have concurred in this belief affords strong presumptive proof that evidence in support of it is to be found somewhere; but that is a different thing from presenting such evidence itself, and beyond this it does not appear that this fact has any probatory force in relation to the present subject.

Existence of God.

Something more may be said in favour of the fact of theophanies (2). It may be admitted that what makes itself objectively manifest must have a real existence, and that if God has really manifested himself to the senses of his creatures, there is in that an evidence not to be resisted of his existence. At the same time, as no instance is on record of a theophany where a previous belief in the being of God did not exist, and as in such a case there is room for suspecting that what was assumed to be a theophany may have been a subjective deception, the reality of any asserted case of this kind will be admitted only where the belief of a God is already held on other grounds. As for the proof from miracles, it is plainly *a petitio principii;* for as the design of a miracle is to prove that God is with the party by whom it is wrought, the divine existence must be previously assumed before the supposition of miracle can be made.

1. See, for instance, Cicero, *De Nat. Deor.*, i. 17, ii. 4; *Tusc. Quæst.*, i. 13; Seneca, *Epist.*, 117; Maximus Tyrius, *Dissert.*, i.; Clement of Alexandria, *Stromat.*, bk. v. § 134, p. 735, ed. Potter; Lactantius, *Div. Inst.*, bk. iii. § 10; Turretine, *Instit. Theol. Elenc.*, i., p. 191, ed. 1696; Ridgeley, *Body of Divinity*, vol. i., p. 15; Payne, *Lectures on Christian Theol.*, vol. i., p. 26.

2. See Storr, *Biblical Theology*, translated by Schmucker, p. 87, of the London reprint, where other advocates of this view are mentioned; Bretschneider, *Handbuch der Dogmatik*, vol. i., p. 282, 2d. ed.

II. Physical Argument.—Here the reasoning infers from the facts of existence an author of these facts. Presented in its simplest form, it simply postulates the necessity of a cause to existence, and from that argues the existence of a great first cause of all. Whatever exists must have a cause. The universe exists, therefore it has a cause which, as the cause of the universe, is prior to all other causes. But in this simple form the argument is untenable; it proves too much; for by the same reasoning, as God exists, He must be held to be the product of a cause, therefore not to be God. In place of the purely physical argument, therefore, recourse has been had to a modification of it, which is known by the name of the *Cosmological* argument. This is presented in two forms.

1. The former of these is thus stated by Howe:—"It is evident that some Being was *uncaused*, or was ever of itself without any cause. For what never was from another had never any cause, since nothing could be its own cause. And somewhat, as appears from what has been said [viz., that as something is something must always have been], never was from another. Or it may be plainly argued thus: That either some being was uncaused, or all being was caused. But if all being were caused, then some one at least were the cause of itself, which hath been already shown impossible. Therefore the expression concerning the First Being, that it was of itself, is only to be taken *negatively*—that is, that it was not of another, not *positively*, as if it did sometime make itself. Or, what is there positively signified by that form of speech is only to be taken thus, that it was a being of that nature as that it was impossible it should ever not have been; not that it did ever of itself step out of not-being into being" (1).

1. *Living Temple*, Part i., ch. ii. § 10 ff.

2. For a statement of the latter form of the cosmological argument, we may borrow from its ablest expositor, Leibnitz. "God is the first cause of all things; for those things which have their definite limitations, as *ex gr.*, everything which we see and experience, are contingent, and have nothing in themselves which makes their existence necessary. It is obvious that time, space, and matter, which, mutually united, are in and by themselves indifferent and conformable, may assume totally different movements and forms, and in a wholly different order. Hence we must seek the *ground of the existence of the world*, which is nothing else than the sum of all contingent things, and this must be sought in the *substance*, which has the ground of its existence in itself, and which consequently is necessary and eternal" (1).

Existence of God.

1. *Theodicé*, Opp. ed Dutens, tom. i.

Besides Leibnitz, this argument has been urged by Wolf, Bilfinger, and others, and was by Kant regarded at one time as the only valid proof of God, a judgment from which he afterwards violently resiled. In substance it is found in Aristotle, *Physicæ Auscult.* bk. viii. ch. 5; Gregory Nazienz., *Orat.*, xiv. 28; John of Damascus, *Exposit. Fidei Orthodoxæ*, bk. i. c. 3; Diodorus of Tarsus in Photii *Biblioth.*, p. 209; Th. Aquinas, *Summa Theologiæ*, p. i. 2, art. 3; Gillespie, *Necessary Existence of God*, Edin. 1843, &c. Comp. Heb. i. 10–12; Ps. cii. 25–27; and 2 Cor. iv. 18, for alleged examples of it or implications of it in Scripture.

The objections which have been urged against this cosmological argument are:—1. That we cannot be quite sure that the world is a contingent existence, because it does not follow from the contingency of individual phenomena that the universe, as such, is contingent; 2. That we can never safely conclude from the necessary relation of concepts in our own minds to the *actual* existence of what these *speculatively* necessitate; and, 3. That even supposing the argument valid, it could only prove the existence of something said to be a first cause and a necessary substance; it cannot show either that that something is an intelligent being, or that it is distinct from the universe.

See Kant, *Kritik der Reinen Vernunft*, p. 631, Riga, 1787.

III. Anthropological Argument.—The reasoning here is founded on certain observed facts or phenomena of human consciousness. As these are different, the argument itself assumes different forms.

1. *Ontological Proof.*—The fact founded on here is the existence in the mind of a clear and distinct idea of God as the *ens perfectissimum*, the absolutely perfect being; from which it is argued that there must be an objective reality corresponding to the idea so existing in the mind, inasmuch as existence is as inseparable from the idea of the absolutely perfect, as the idea of a valley is inseparable from that of an elevation.

This argument is usually cited as that of Des Cartes, by whom it is propounded in several parts of his writings; see *Princip. Philos.*, p. i. c. 14; *Meditationes de Prima Philos.*, Med. 5. p. 38. ed. 1658, Amstd.; *Responsiones ad Quintas Objectiones*, p. 89, ff. But it was still more ably propounded long before him by Anselm of Canterbury in his *Proslogium de Dei Existentia*, in his *Monologium de Divinitatis Essentia*, and in his *Liber Apologeticus Contra Ganhilonem*, &c., tracts which will be found in the Benedictine edition of his works, 2 vols. fol., Paris, 1721, and in a translated form in the American *Bibliotheca Sacra*, vol. viii. p. 534 ff. In more recent times it counts among its exponents such men as Mallebranche (*Recherche de la Verité*, bk. iv. ch. 11. § 2), Mendelssohn (*Morgenstunde*, p. 306, 2d ed), and Hegel (*Encyclop. d. Phil. Wissensch.*, quoted by Hagenbach, *History of Doctrines*, i. 446). To these may be added the still greater name of Leibnitz; for though he says the argument is not absolutely complete, inasmuch as it postulates the *possibility* of the divine existence, which may be questioned, he virtually gives up this objection by saying that, "one has a right to presume the possibility of every existence, and, above all, that of God, until the contrary be proved; whence," he adds, "this metaphysical argument affords a morally demonstrative conclusion which conducts to this, that in the present state of our knowledge we must judge that God exists, and act accordingly." *Nouveaux Essais sur l' entendement Humain*, bk. vi. ch. 10. § 8. p. 404 of Raspe's edit.

This argument has often been treated with ridicule, as if it asserted, that we have only to be able to think a thing clearly in order to prove its objective existence. Such is the view usually given of Des Cartes' argument; but most erroneously, and in the face of repeated assertions and expositions to the contrary both by Des Cartes and by Anselm, as well as Mallebranche; nor is it likely that such reasoners as Leibnitz and Hegel would have been caught for a moment by it had it consisted of so transparent a paralogism as this. As it appears in the writings of its origi-

Existence of God.

nal expounders, it resolves itself into the following syllogism:—We must attribute to a thing what we clearly conceive to be included in the idea of it; but existence enters necessarily into our idea of God, so that we cannot think God but as existing; therefore, we must attribute existence to God, *i.e.*, God exists. The subtle argument thus presented is formally correct, and it can be invalidated only by calling in question the material accuracy of one of its premises. Now, of these, the former is unimpeachable; to deny it would be to deny one of the most certain laws of thought. But the latter is not so intangible. It involves a fallacy, we apprehend, in assuming existence to be a *quality* or *attribute* of objects, whereas it is merely a judgment of the mind as to the relation in which objects stand to it. The existence of the sun, for instance, is not an attribute of the sun, does not enter into the idea of the sun *ex necessitate;* it is simply an expression of a certain relation under which the mind cognises that luminary. It is an error, then, to say that existence presents itself to the mind as included in the mere idea of the All-perfect Being; the very fact that this is proposed for proof, shows that we can think God as non-existent without contradiction.

In the writings of Anselm, this argument is presented in a form which is less easily assailable. He puts it thus:—We have a conception of a Being than whom there is none more perfect—the All-perfect One. But a Being than whom there is none more perfect cannot exist in the intelligence only; He must also exist in reality. For let us suppose that He exists only in the intelligence, then something greater than He can be thought, viz., this Being as existent, which is greater than the same Being non-existent; so that the very Being than whom a greater and more perfect cannot be thought, is a Being than whom a greater and more perfect can be thought, which is an absurdity. There exists, therefore, both in the intelligence and in reality, a being than whom a more perfect cannot be thought; and this being is God. To this piece of scholastic subtlety, one knows not what to answer, except by denying that the concept of a being as existing, is necessarily the concept of a more perfect being than is the concept of that same being as non-existing; or by denying that we have in our minds the idea of an All-perfect Being, a being than whom a more perfect cannot be conceived.

See Leibnitz, *Nouv. Ess.* bk. iv. ch. 10. § 8.

2. *Psychological Proof.*—This name has been given to an argument which deduces the divine existence from the mere fact, that an idea or concept of a supremely perfect being may be, and is formed by us. It differs from the ontological argument in this, that it takes no cognizance of the contents of the concept as involving necessary existence; it simply posits the fact that such a concept exists, and concludes that it can be referred for its source only to an objective reality answering to it.

See Des Cartes, *Princip. Philos.* p. i. c. 18; *Meditationes de Prima Phil.* Med. 3.

In this reasoning there lurks a fallacy, inasmuch as the existence of God is assumed to account for an alleged fact, which fact is adduced as a proof of the existence of God. Des Cartes, indeed, virtually admits this, by saying, that "God in creating us has imprinted this idea upon us, that it might be like a mark of the artificer stamped on his work." Of course, before we can hypothecate creation and impressions by the Creator on his works, we must presume the existence of the Creator.

3. *Proof from the Operations of Conscience.*—Man not only judges his own actions as right or wrong, but he pronounces on himself a sentence of approval or the opposite, according to the judgment at which he arrives. But such a sentence necessarily implies a law or standard by which rectitude is estimated and rendered obligatory, and this no less implies a lawgiver and sovereign by whom the law has been enacted, and who will enforce its declarations. Existence of God.

See the striking passage of Cicero in his *De Republica*, iii. 23, long preserved only as a fragment by Lactantius, but now found in its proper place in the recovered treatise. See also Lactantius himself, *Div. Inst.*, vi. 8; and among modern writers, Jacobi, *Sämmtt. Schifter*, ii. p. 441; Chalmers, *Works*, i. p. 305; Tulloch, *Burnett Prize Essay*, p. 268; Buchanan, *Faith in God and Modern Atheism Compared*, i. p. 101; Storr and Flatt's *Theology*, Eng. Tr. p. 81, &c. Fichte, also, in a sense supports it; *Die Bestimmumung der Menschen*, p. 283; though it is rather a moral order of the universe than a moral governor for which he contends. It may be seriously doubted whether the argument be valid in itself for more than this. The moral order of the universe is reason sufficient why I *ought* to do this, and not that; if we go beyond this and introduce the idea of *obligation*, we already assume the divine existence; for how is it possible to have the idea of moral obligation unless we have *first* the idea and belief of God? (Moral Philosophy, p. 563.)

4. *Moral Proof.*—By this name is commonly known an argument urged by Kant, and by him pronounced to be the only valid argument for the existence of God. It may be thus stated:—We seek by necessity of our nature the highest good. But to this, perfect happiness is essential, *i.e.*, the state of a being to whom everything is and happens as he wishes. Now this can happen only when all nature coincides with his purposes and ends. Such coincidence, however, we do not experience; as active beings, we are not the causes of nature, and in the moral laws there lies not the least basis for an union of morality and happiness. Nevertheless, as we *must* seek the highest good, this must be also possible. Thus the necessary connection of both momenta is postulated, *i.e.*, the existence of a cause of all nature distinct from nature, which contains the basis of this connection. There must be a being who is the common cause of the natural and the moral world; and particularly such a being as knows our feelings, an intelligence, and one that, according to this intelligence, apportions happiness to us. Such a being is God.

Kant, *Kr. der Reinen Vernunft*, p. 847, ed. 1787; *Kr. d. Prakt. Vern.* p. 238, ed. 1797; *Kr. d. Urtheils kraft*, p. 448. Compar. Schwegler, *Geschichte der Philosophie*, p. 168, 3d ed. 1857.

To this moral argument it does not appear as if much weight could be attached. At the best, it is of merely subjective force, and cannot avail to evince the objective reality of the being whom it supposes. Further, it argues the existence of a divine being, from the fact that man feels himself obliged to obey conflicting laws. This certainly argues disorder *somewhere;* but may not the fault be with man himself, so that a return by him into a state of harmony with the order of the universe may bring all right? or may it not be merely some temporary disorder in the moral universe, some casual perturbation such as we see sometimes in the physical universe, which will pass away, and all will come right again of its own accord? Besides, as Fichte remarks, why make the highest good to consist in the felicity of individuals—in the satisfying of the wishes of imperfect creatures such as we are, rather than in the restoration of perfect moral order to the universe in the final victory of good over evil?

IV. Teleological Proof, or, Argument from Design.—The appeal here is to final causes, or the ends for which things manifestly exist; hence the name, from τελος, *finis, end.* This proof is sometimes also called the physico-theological, because it implies a theological conclusion from physical premises. It admits of unbounded illustration, but in itself it is capable of being very briefly stated. When we see two or more objects fitted to each other, so as thereby to secure a definite end or result, we are constrained to assume the agency of an intelligent mind by which the end was contemplated, by which the fitness of the given adaptation to secure that end was foreseen, and by which the objects themselves were adapted to each other, so as to accomplish what was thus designed, as well as of a

Existence of God.

power sufficient to effect the contemplated arrangement. This is an assumption which we make irresistibly; we cannot consider the facts without making it. Now, the universe, subject to our scrutiny, is full of such instances. Wherever our senses carry us, wherever our instruments unfold to us what our unaided senses cannot discern, wherever consciousness opens to us the phenomena of our inner being in every department of knowledge, we find instances of adaptation, traces of design. The inference is irresistible. There must have presided over the formation of this vast and everywhere well-ordered scheme a high intelligence by which it was conceived and planned, and a mighty power by which the whole was carried into effect.

This argument from design, as it is the most direct and convincing, so is it one of the oldest of the arguments for the existence of God. Though not formally stated in the Bible, it is frequently in substance adduced there. Comp. Ps. viii., xix., cvi.; Job xxxviii–xli.; Acts xvi. 15; xvii. 24; Rom. i. 9. It was a favourite argument with Socrates: comp. Xenoph. *Mem.* i. 4; iv. 3. See also Plato, *De Legg.* x. 68; xii. 229; *Phileb.* 244; Cicero, *De Nat. Deor.* ii. 2. 38 ff.; *Tusc. Quæst.* i. 28, 29. Among the Fathers this argument is urged formally by Theophilus (*ad Autolycum* i. 23); Gregory of Nazianzus (*Orat.* xxviii.); Gregory of Nyssa (*De opificio hominis*); Theodoret (*Graec. Affect. Cur.* p. 113, ed. Gaisford); and Lactantius (*De opificio Dei*); and it is alluded to by Minucius (*Octav.* 17, 18); Augustine (*Confess.* x. 6); Clement Alexand. (*Strom.* v. p. 288); and Athanasius (*Contr. Gent.* c. 30 and 34). Of modern writers who have illustrated this theme, it may suffice here to mention the following:—Paley, *Natural Theology, or the Evidences of the Existence and Attributes of the Deity, collected from the Appearances of Nature; The Bridgewater Treatises on the Power, Wisdom, and Goodness of God as manifested in Creation*, by Chalmers, Kidd, Whewell, Bell, Roget, Buckland, Kirkby, and Prout; Chalmers, *Natural Theology, Works*, vol. i. and ii.; Macculloch, *Proofs and Illustrations of the Attributes of God from the Facts and Laws of the Physical Universe*, &c.; Whewell, *Indications of the Creator;* Thompson, *Christian Theism;* Tulloch, *Theism;* Buchanan, *Faith in God and Modern Atheism;* Wardlaw, *Systematic Theology*, vol. i.

This argument from design has sometimes suffered injury from being adduced as valid from more than it is really competent to prove. It shows that *some* being exists, possessed of intelligence and power, and it may be presumed also of benevolence, by whom the world has been made; but whether this being be himself uncreated, and whether his power and resources be infinite, and whether he be wholly beneficent, this argument by itself can do little to determine.

Kant, who is generally spoken of as rejecting the physico-theological argument entirely, admits it to be valid for all that we contend for. "The proof," says he, "at the highest, can establish only a world-builder, who would be always limited by the fitness of the materials which he had to work up; it cannot establish a creator of the world to the idea of which all is subject; and this is far from being sufficient for the great end which is proposed, namely, to prove an all-sufficient primal essence."—*Kr. der R. V.* p. 654. But if any man ever proposed to prove as much by the argument from design, he is to be censured for using that argument beyond its competency. We are content to have it proved to us that there is a world-builder, and to Him, assured of his existence, we turn, if haply He will speak to us and tell us more of himself than we can gather from the mere study of his works. Thus natural theology hands over its students to the teaching of Scripture. It is like the Peri of eastern fable, that conducts her charge to the gates of that paradise she is not competent herself to enter.

Hume has offered one of his acute-looking but really sophistical objections to this argument from design. He says, that though in reference to the works of man, the indications of design afford valid proof of a designing intelligence, it is not so when we extend the proof from the universe to God, because the world is a singular phenomenon, of the making of which we have no experience. We infer from the contrivances in a watch that it had an intelligent maker, because we have seen such things made, but we never saw a world made, and hence from the mere beholding of its phenomena, we cannot infer that it had a maker. The fallacy here lies in the assumption—1. That it is in virtue of *experience* that we infer the existence of an intelligent designer from witnessing the evidences of design in any piece of work; and, 2. That we have such a thing as experience of intelligence producing results in the works of man. Both these assumptions are false. We do not *learn* to make the inference in question; we make it by a mental necessity, and make it as surely the first time we see evidences of design as we do in all subsequent instances. Nor could observation and experience, however extensive, give us this inference if we had it not independent of these. For in observing the works of man, what is it we have experience of? Simply of the motion of certain limbs and members of the body, followed by certain changes on pieces of matter on which they operate. We have never had experience, in Hume's sense of the term, of *a designing mind*. We have never seen, heard, felt, smelt, or tasted a mind at work in the production of anything. That such a mind presides over and directs the operation, is purely an inference. But if this be a legitimate inference in the case of man's works, why is it to be forbidden when we contemplate the universe, and pass from it to the existence of a maker of it? If we may validly say of a watch, "This must have originated in an intelligent mind," though we have had no experience of a *mind* making a watch, why may we not say, "This universal frame, this vast machine, must have had an intelligent maker," though confessedly we have no experience of world-making? In this objection Hume has just repeated the same juggle, to which he has stooped in his famous objection to miracles; he has availed himself of the ambiguity of the word "experience," and has shifted in the course of his argument from an experience of one particular kind to experience of any kind. Fix one meaning on that word all through, and his objection will come out in all its real weakness and sophistry.

Names of God.

SECT. III.—*Names of God.*

In proceeding to investigate the Bible revelations concerning God, the first thing that demands our notice is the *names* by which He has been pleased to make himself known to men. To the right apprehension of these, the Bible attaches importance. Its office, in fact, is to make known to us God's name. Revelation is not and cannot be an unfolding to us of God's *essence;* it is merely a setting before us of His *manifestation* (that is, His name) to His creatures. It is in keeping with this that all the appellations of God given in the Bible are significant, so that each of them stands as the symbol of some truth concerning Him.

The names of God in the Bible may be presented in three classes:—

I. By itself stands the proper and incommunicable name of God, יְהוָה. This is commonly pointed and pronounced *Jehovah*, but, as is admitted on all hands, incorrectly, the points thus introduced being those belonging to Adonai, which the Jews, *reverentiæ causa*, substitute in reading for the sacred name. Probably the true punctuation is יַהְוֶה, *Jahveh*, and the word is to be regarded as a formation from the substantive verb הָיָה (1). It denotes essential unchanging being, and is the appropriate designation of Him whose it is to be, who never began to be, and never can cease to be, ὃν και ω ὃν και ὁ ἐρχομενος, as the Apostle gives it, Rev. i. 4 (2). Of this name, *Jah* is a contraction.

1. See Reland, *Decas Exercitationum Philologicarum de vera pronunciatione Nominis Jehova*, 1707; Tholuck, *Vermischte Schriften*, i. 377; Gesenius, *Thesaurus*, and *Lexicon*, on the word; Hengstenberg, *Authentie des Pentateuchs*, i. 222. Horsley opposes the view above given in his *Biblical Criticism*, vol. i., p. 57.

2. The LXX. represent this name by *κυριος*, the vulg. by Dominus, which most of the authorised versions have followed. The French versions give usually L'Eternel, and this, Bunsen, in his *Bibel-Werk*, adopts, giving always in his translation Der Ewige. See his *Vorerinnerungen*, p. lxxxviii.

II. APPELLATIVES.—1. Of these the one chiefly in use is *Elohim* (אֱלֹהִים the plural of אֱלוֹהַּ, which is also used, though only by the older writers and in poetry). This word is derived from a root now lost to the Hebrew, but surviving in the Arabic, אלה, signifying to worship or reverence, so that, as applied to God, it conveys the idea that He is the being to be worshipped. 2. *El* (אֵל).

Attributes of God.

This is derived from the verb אוּל, to be strong or mighty, but it is applied to God, not as a predicate of his power, but simply as an appellation. 3. *Adon* (אָדוֹן), meaning *Lord*, and equivalent to *dominus* and κυριος. As applied to God, it is generally used in the plural Adonai, probably as the intensive plural = *summus Dominus*, the supreme Lord.

III. ATTRIBUTES, or EPITHETICAL NAMES.—Of these the following may be mentioned:—1. *Shaddai* or *El Shaddai* (שַׁדַּי), the Almighty; in the LXX. and New Testament, παντοκρατωρ. 2. This seems to have been the name earliest in use among the patriarchs (see Gen. xvii. 1-2). *El Hhai* (אֵל־חַי) ὁ θεος ζων, the living God. 3. *Eliyon* (עֶלְיוֹן), in the LXX. ὑψιστος, the Most High (see Gen. xvi. 20; Ps. xcvii. 9). 4. *El Tsebaoth* (אֵל־צְבָאוֹת) God of Hosts, an epithet denoting God's authority over all the powers of the universe, which are thought of as a host of which He is the commander. 5. To these may be added such terms as אָב, Father; בַּעַל, Master, κυριος, Lord, &c., which, however, are hardly to be regarded as in any just sense *names* of God.

The names thus given to God in the Bible, point Him out to us as the supreme all-governing Being, who has all power and authority, to whom reverence and worship are due, and who dwells in the majesty of His own essential being, having a name which only He can bear, and a glory which He will not give to another.

SECT. IV.—*Attributes of God.*

By the attributes of God are meant those qualities which we ascribe to Him for the purpose of expressing our conceptions of His infinite essence in relation to the universe and to ourselves in particular. These are not to be thought of as qualities superadded to the Divine essence, as the quality of strength, wisdom, or goodness, may be added to a man, or that of whiteness, length, roundness, may to a body. He can receive no addition, can experience no change; "nunquam novus, nunquam vetus," as Augustine expresses it (*Confess.* i. 4). His attributes, therefore, are himself—He, not his. Their relativity to Him is apparent only, not real; it exists only in our modes of contemplating Him. "The Divine attributes," says Quenstedt, "do not denote anything added to the Divine essence, but are only inadequate conceptions of an essence infinitely perfect. The Divine essence is like an incomprehensible ocean of all infinite perfections, which the human intellect is impotent to exhaust in one simple conception, and hence by various conceptions, as if sip by sip, it draws somewhat out of that infinity." (*System. Theol.* i. 296.) If it be asked, why, then, speak of the Divine attributes *as if* they were distinct from the Divine essence? the answer is, that objects not in themselves divisible may be discriminated in thought, and hence divines have laid it down that the Divine attributes are distinguishable from the Divine essence, "non ex natura rei, sed ratione tantum" (1). The distinction is subjective, not objective; "it is founded not in inner distinctions in the Divine essence, but in the accompanying representations with which the idea of this is placed in combination" (2); or, as Quenstedt expresses it, "the foundations of this distinction are various connoted extrinsic things—*i.e.*, diverse effects, or respects, or negations, in the order of which God is conceived by us." Whilst, however, this is held, we must beware, with Schleiermacher and others, of going to the extreme of pronouncing the distinction purely arbitrary or fictitious. God's attributes are not really distinct from Himself, for He is an absolutely pure uncompounded essence; but they have a ground in the nature of God; like all other true anthropomorphisms, they are human modes of conceiving and expressing actual facts in God in relation to His creatures, as He is revealed to us.

Attributes of God.

1. The schoolmen were divided as to whether the distinction should be held to be merely *nominaliter* or to be *realiter*. It was ultimately very generally agreed that neither was correct, and that it should be held to be *formaliter*, i.e., "secundum nostrum concipiendi modum" (Hollaz, *Examen. Theol. Acroam.* in Loco). See the ample discussion of this whole subject by Quenstedt in the place above cited. Comp. also Thom. Aquin. *Summa Theol.* p. i., qu. 13, art. 4.

2. Twesten, *Vorlesungen ueb. die Dogmatik*, ii. 27.

3. "This method of treatment has its origin in religious poetry, especially of a hymnal and lyric cast, as well as the accordant experience of common life, which seeks to vivify and confirm the simple representation of the Supreme Being, by speaking of him in expressions such as we are wont to use of finite beings" (*Glaubenslehre*, i., 256, 3d edit.) So, also, Hase says, in his *Evang. Dogmatik*, that the whole conception of the divine attributes is to be ascribed "to poetry and popular instruction rather than to science."

As the Divine attributes are not distinct from the essence of God, they are not really distinct from each other. Were they so, the totality of the Divine essence would be the sum or complement of these separate qualities, and hence God would not be pure essence, but a composite being, and so capable of division, and therefore of dissolution. As in the preceding case, they differ not *in re* but *formaliter*: we think them different because we have no other way of expressing or conceiving the different relations in which different objects stand to the one indivisible and immutable Jehovah.

Comp. Stapfer, *Theol. Polem.*, i., 74; Marck, *Medulla Christ. Theol.* p. 7; Arminius, *Works* by Nichols, ii. 115; Limborch, *Theol. Christ.* bk. ii., ch. 2; Venema, *Institutes*, p. 135. "The living God manifests the unity of His essence through a multiplicity of essential determinations or attributes. These attributes express one and the same essence from different sides; they are different fundamental utterances of one essence. They are consequently not without each other, but in each other; they mutually interpenetrate; and have their point of unity in one and the same Divine personality. Though they are thus distinctions which may be removed as well as adhibited, yet they are by no means to be viewed as mere human modes of conceiving the Divine essence; they are not human modes of conceiving, but God's own modes of manifestation. We cannot, therefore, assent to the nominalist doctrine, which treats ideas and general conceptions as *ours*, and hence also the conceptions with which we denote the Divine Being as simply the expression of *our* theory of the universe, not as something in God himself. Whilst we admit that the idea of God must be purged of all that is *simply* human, of all false anthropomorphisms, we must nevertheless regard nominalism as destroying the concept of manifestation (or revelation). There is a destruction of the innermost truth of faith, if it is only we who think God as holy and just, whilst He himself is not holy and just; if it is only we who invoke Him by these names, while He himself does not so make Himself known to us. Hence we teach, with realism, that the attributes of God are objective determinations in the revelation of God, and consequently have their seat in His inner being."—Martensen, *Christ. Dogmatik*, p. 112, 3d edit.

Different schemes of classification of the Divine attributes have been proposed. These may be digested thus:—I. According to the form in which they are expressed, they may be classified as *proper* or *metaphorical*, as *affirmative* or *negative*. Thus, eternal self-existence is a proper and affirmative attribute, whilst unchangeableness is metaphorical and negative. II. According to their inner relation to each other as *primitive* or *derivative*. Thus, absolute perfection may be held as the primitive attribute of God from which the others are derived; or love or holiness may be fixed on as the primitive, and the other moral perfections be held as modifications of it. III. According to God's relation to the world, as *immanent, quiescent, internal*, and *absolute*, or *transeunt, operative, external*, and *relative*; thus unity, truth, goodness are ranked as immanent perfections of God—perfections resting in His being, while omnipotence, grace, justice, &c., are regarded as transeunt or

Attributes of God.

outcoming perfections, passing, so to speak, from God over upon His creatures. IV. According to their relation to human capabilities, as *communicable* and *imitable*, or *incommunicable* and *inimitable*, the latter being the special characteristics of God, such as self-existence, infinity, omnipotence, whilst the former may exist in measure in his creatures, such as goodness and truth. V. According to their inner compass or tenor, as *general* and *ontological*—such as belong to the divine nature viewed *per se*, or *special*—such as are derived from the idea of God as a spiritual essence; thus eternity, immensity, immutability, are ontological attributes, while omniscience, wisdom, holiness, are special attributes. VI. According to the analogy of man's nature, as *metaphysical* and *natural*, or *moral*, the former including such perfections as belong to the Divine essence, the latter, such as characterise his mind and will. These are by some distinguished also as *universal* and *special*. VII. According to the varied relation of the consciousness of God to the pious feeling, as determined—1. By the feeling of dependence apart from any sense of guilt—eternity, omnipotence; 2. By the feeling of antithesis created by a sense of sin—holiness and righteousness; 3. By the feeling of difference arising from a sense of God's grace—love and wisdom. This is Schleiermacher's scheme, and it bears traces at once of the genius of the man, by which he made everything seem to fall in with his peculiar hypothesis, and of the fanciful and purely subjective character of all his modes of thought.

Of these schemes, that numbered VI. is, we think, on the whole, to be preferred, not only as the most obvious and natural, but also as most in keeping with the principle that our thought of God is formed after the analogy of our own spiritual nature. With the precaution, then—that in distinguishing the metaphysical or natural from the moral or ethical attributes of God, we do so merely in accommodation to our own limited modes of thinking, for in reality they are not, and cannot be separated—we may proceed to arrange the Divine perfections under these two heads:—

I. Natural Perfections of God.—These are manifested in relation to existence or being in general, and under the three conditions of existence in time, existence in space, existence in degree, *i.e.* protensive, extensive, and intensive existence.

i. *Natural Perfections of God in relation to Protensive Existence.*—Here we proceed wholly *via negationis*. We deny of God that He is subject to any temporal limitations—that is, we affirm—

1. His eternal being; in other words, we deny that He ever began to be, or can cease to be, or is subject to any succession of being. His eternity is, as Schleiermacher has expressed it, "the timeless primal causality of God, conditioning not only the temporal but time itself" (1). He is, says the Apostle, Βασιλευς των αἰωνων, 1 Tim. i. 17 (2); or, in the words of the Psalmist, "from eternity to eternity."

1. *Glaubensl.* i. p. 268. Comp. Augustine, *Confess.* xi. 12, 13, p. 213, ed. Pusey. See also Nitzsch, *Chr. Lehre.* p. 159.

2. Comp. Ps. xc. 2, 4; cii. 25-27; Is. xl. 28; xli. 4; Rom. i. 23; 1 Tim. vi. 16; 2 Pet. iii. 8, &c. Theologians distinguish eternity *a parte ante* from eternity *a parte post*, and affirm both of God. In the former case the assertion is tantamount to an assertion of His self-existence, or, as it is sometimes denominated, His *Aseitas*, which does not mean that He either produced himself or exists without a ground or reason of existence, but that He has the ground or reason of existence in himself, that He exists of and from himself.

2. It is affirmed that God is not subject to any change through the lapse of time—*i.e.*, He is unchangeable. He never advances, never recedes. With Him there is no succession, no variation, no vicissitude. In the Divine essence and its attributes there is perpetual identity.

Comp. Ps. cii. 26; Mal. iii. 6; Eccles. iii. 4; Heb. xiii. 8; James i. 17.

ii. *Natural Perfections of God in relation to Extensive Being.*—Here also we proceed wholly by way of negation. Attributes of God.

1. We deny that God exists in space. Space, like time, belongs to Him, not He to it. He is *indivisible*, *immense*, *invisible*; a simple essence without parts, whom no limits can enclose or define, whom no eye hath seen or can see.

2. We deny that God's operations are determined by space, *i.e.*, we affirm that He moves and acts on all things irrespective of any limits imposed by space—His is a "spaceless causality, conditioning all space and all things in space" (Schleiermacher, i. p. 273).

These two negations comprise what is intended by the *omnipresence* of God. This means something more than merely that God operates by a diffused energy everywhere, as the sun may be said to operate within the sphere of his influence; it means, that He is, and operates immediately and directly, everywhere. His *præsentia operativa* is not to be distinguished from His *adessentia;* nor, to use the language of the schoolmen, is the *immediatio virtutis* to be distinguished from the *immediatio suppositi.*

Comp. 1 Kings, viii. 27; Ps. cxxxix. 7-13; xliii. 2; lxvi. 1; Jer. xxiii. 23, 24; Amos, ix. 2, 3; Acts, xvii. 24-28. As the omnipresence of God is what we can form no positive conception of, it behoves us to be very cautious in the language we use regarding it. Such expressions as that of Augustine, "Deus non alicubi est" (*Quæst Diverss.* 9, 20), or that of Des Cartes, "Deus est nuspiam, sive nullibi," at the utmost only dimly hint at some idea; they can hardly be said to express one. On the other hand, if we say, with Augustine, "In illo sunt omnia;" or, with Newton and Clarke, that "Space is the sensorium of deity;" or, with the Roman poet, "Jupiter est quodcunque vides, quocunque moveris" (Lucan, *Phars.* ix. 580); or, with Pope (*Essay on Man*, i. 267, &c.)—

> "All are but parts of one stupendous whole,
> Whose body Nature is and God the soul.
>
> . . . . . .
>
> To Him no high, no low, no great, no small,
> He fills, He bounds, connects and equals all"—

we incur no small risk of imbibing or conveying pantheistic notions. But on a subject of this sort, it is hardly possible for us to use any language that shall be otherwise than imperfect, or when strictly examined incorrect. (See Stewart's *Dissertation* prefixed to this work, p. 147.)

The opinion that the omnipresence of God is merely his operative energy diffused through the universe, had its origin among the Socinians, and passed from them to the Arminian school. (See Episcopius, *Instit.* bk. iv. sect. 2, c. 13.) It has been adopted, among others, by Döderlein (*Institt.* i. 363); von Ammon (*Summa*, sect. 41); Wegscheider (*Institt.* sect. 63); and Schleiermacher (*Chr. Glaub.* i. 280). The last says, "The all-presence of God is to be understood as only an almighty presence, *i.e.*, as the conditioning of space itself and all space-things in God."

The affirmation that God is not limited by space, stands closely connected with the assertion of His *spirituality.* When we say "God is a spirit," what do we mean but that He is a living personal power not limited by conditions of space?—a being that cannot be seen or touched, is not extended or figured, does not need to move from place to place in order to be actually present in any given spot (1). Comp. Ps. cxxxix. 7; John iv. 24. It is in connection with this that God is emphatically called in Scripture "the living God," a phrase which has reference to the continuous agency of the Divine being as spirit. Hence some of the old divines speak of God as "*Actus purus,*" or "*Actus simplicissimus;*" by which they mean that God, as the infinite life, contains within himself the complement of all actual and possible modes of being (2).

1. Robert Hall, Serm. on Is. xxxi. 3; *Works*, fol. v. p. 7, and vol. vi. p. 1.

2. "God is not *a* spirit, but God is spirit, *i.e.*, consummate life. He has the complement of being, whereby He is distinguished not only from pretended gods as *living* and *true*, but from all other actual life and being, as He who alone hath immortality, and as the Creator of all things" (Nitzsch, *Christ. Lehre.* p. 144.)

iii. *Natural Perfections of God in relation to Intensive*

Attributes of God.

Being.—Here we deny that in God there is any limitation in degree of existence. Hence we ascribe to Him—

1. Infinitude of being, *i.e.*, boundless fulness of essence. Though there are other beings and other intelligences and powers besides Him, their existence imposes no limit or qualification or restraint on His. He remains alone God, of infinite greatness, in whom all fulness dwells.

2. Incomprehensibility; by which is meant that no being but Himself can comprehend God. Comp. Job xi. 7; Ps. cxlv. 3; Rom. xi. 33; 1 Tim. vi. 16, &c.

3. Majesty and glory unlimited. He dwells in light which is inaccessible and full of glory. The Lord is clothed with majesty; honour and majesty are before Him; He is the Father, of an infinite majesty. His is the kingdom and the power and the glory for ever.

II. Moral Perfections of God.—The term "moral" here is used in a wide acceptation as opposed to "natural," and embraces not only ethical, but also mental or intellectual attributes. The subject thus divides itself into two parts—the former relating to the intelligence, the latter to the will of God.

i. *Attributes of God in respect of Intelligence.*—The intelligence of God is that by which He perfectly knows himself and all things by one pure, eternal, and simple act. This intelligence is infinite; God is *omniscient* (1). He knows all things, both as they find their reason in himself (things absolutely possible), and as they really exist out of Him (*scientia necessaria, sc. libera*). He foresees all that shall happen, as well as knows all that is—the necessary as necessary, the conditioned as conditioned. And this intelligence is at once most real, and most minute; simultaneous as well as intuitive (2).

1. See Job xxviii. 24, xxxiv. 21; Ps. xxxviii. 10, lvi. 9, xciv. 5–9, cxxxix. 2–16; Is. xxix. 15, 16, xli. 22–26; Jer. i. 5, xvi. 17, xxiii. 24; Matt. vi. 8, 32, x. 28–30; Luke xvi. 15; Acts i. 24, xv. 18; Rom. viii. 27, xi. 33; 1 Cor. ii. 10, 11, iii. 20, iv. 5; Heb. iv. 13, &c. Of God's prescience every prediction recorded in Scripture is a proof: "Præscientia Dei tot habet testes, quot facit prophetas" (Tertullian, *Adv. Marc.* 1. 2).

2. Some scholastic divines add to the *scientia necessaria* and the *scientia libera* of God the *scientia media*, by which they intend a knowledge of what would have happened had something else, which was not to happen, happened. For this they adduce as scriptural authority, 1 Sam. xxiii. 10–13; Ps. cxxxix. 2, 4; Jer. xxxviii. 17–20; Ez. iii. 6. The term is due to the Jesuit Fonseca, by whom and Molina the idea was chiefly worked out and applied, though it was not unknown to older writers. (See especially Gregor. Nyss., *De Morte Praematura Infantum;* Augustine, *De Dono Perseverantiae*, c. 9; Gerhard, *Loc. Theol.*, i. p. 171.) Comp. Döderlein, *Inst. Theol. Christ.*, i. 304. It has been objected to as imputing to God what is incident only to our imperfect modes of knowing. "Since the possible," it has been said, "is nothing else than a condition of human thought, inasmuch as for us a thing is either thinkable or unthinkable, objectively either possible or impossible, and since everything is either something or nothing, there can be no *scientia media*, properly speaking, with God" (Bretschneider, *Handbuch*, i. 325). But since, as the same writer observes, our whole discourse of God's omniscience is anthropopathic, there is no greater objection to our speaking of God as knowing what might have happened had certain conditions been fulfilled, than there is of His knowing things as past, present, or future. (See Reid's remarks on this subject, with Hamilton's note, *Works*, p. 632.)

In virtue of His perfect intelligence, God is all-wise, ever selecting the best ends, and employing the means best fitted to secure these ends. The evidences of this meet us in every department of creation, and in every event of history; while Scripture is full of the most emphatic assertions of it. The highest manifestation of it is in the scheme of redemption through the incarnation and work of Christ.

Job xii. 12–17, xxviii. 20–23; Ps. civ. 24; Prov. iii. 19, viii. 12–31; Is. xl. 12–14; Jer. x. 12, li. 15; Rom. xi. 33, xvi. 17; Eph. iii. 10, 11; 1 Tim. i. 17; 1 Cor. i. 20, iii. 19; Eph. i. 8, iii. 10; Col. ii. 2, 3.

ii. *Attributes of God in respect of Will.*—Of the divine will we predicate:—

1. Absolute Freedom.—In all that God decrees, and in all that He does, He follows only His own mind and purpose; "Deus sui juris est," as it has been expressed. This, however, is not incompatible with his acting from necessity of nature; for God must ever be consistent with himself, and find the highest reason of all that He does in himself. Attributes of God.

2. Omnipotence.—Whatever God wills He can do and does. His power is limited only by His will, which is directed only to what is good. Herein lies one essential distinction between Him and His creatures—He can do all things immediately by simple volition, whilst they can operate only through the medium of organs, and that within narrow limits.

Gen. xviii. 14; Ps. xxxiii. 6, 9, cx. 6; Is. xliii. 13, xliv. 34 Jer. xxxii. 17; Matt. xix. 26; Luke i. 37, xviii. 27; John x. 29 Rom. i. 20, iv. 20; Eph. iii. 20; Heb. xi. 3; Rev. iv. 11.

3. Veracity.—Whatever God has revealed of His will to men is ever what He wills to do and does. He cannot lie; He cannot repent. He wills only what is in harmony with Himself; and in His decrees, His deeds, His declarations, the same harmony prevails: He decrees what He wills; He does what He decrees; He fulfils what He says. Hence He manifests Himself as faithful to all His promises, infallible in all His engagements, and constant in all his dealings with His creatures.

Ps. xxxi. 6, xxxiii. 11; Rom. iii. 3 ff. xi. 29; 2 Cor. i. 18 ff.; 2 Tim. ii. 13.

4. Holiness.—God is emphatically the Holy One; by which is intended not merely that He is infinitely removed from all that is sinful, not merely that his mind and will are ever in harmony with the good and the pure, but especially that in Him all moral excellence dwells, that He is the chief good, that His absolutely free will ever consorts most perfectly with his most perfect intelligence (1). In this aspect holiness may be viewed as that of which all the other ethical attributes of God are but manifestations (2).

1. Lev. xix. 2. (See a dissertation on the word קדוש, here used, by Achelis in the *Theologische Studien und Kritiken* for 1847, p. 187.) Ps. v. 5 ff.; Is. vi. 3; Matt. v. 48, xix. 17; Eph. iv. 24; 1 John i. 5; 1 Pet. i. 15, ii. 9.

2. "Quando Deus se ipsum amore purissimo amare concipitur, ut simul ab omnis imperfectione remotus censeatur, amor ille vocatur sanctitas."—Buddeus, *Inst. Theol. Doc.* p. 237. The doctrine of Kant, that the Divine holiness is the perfect accordance of the will of God with the moral law, is not only inadequate, but a reversal of the truth. The moral law is the *utterance* of God's holiness, and is what it is because He is perfectly and absolutely holy. "Sanctitas Dei—attributum quo Deus fons legis moralis est."—Klein, *Darstellung d. Dogm. Syst.*

5. Love.—God, as the chief good, desires to communicate what is good, so that his universe shall be filled with creatures possessing all the good of which they are capable. The primary and only adequate object of the love of God is God himself; but it flows over on his creatures, and is manifested in the bounties of creation, and especially in the wonders of redemption (1). In respect of His creatures, we have to distinguish His love as—1. Love of complacency (*amor generalis*), or His delight in that goodness which He has implanted in His creatures, and in them on account of this; 2. Love of benevolence (*amor particularis*), or His regard to the human race, for whose recovery He has sent His son into the world; and, 3. Love of friendship (*amor specialissimus*), or his regard to those who believe in Christ and are partakers of his grace (2). Of this love His long-suffering (μακροθυμια, Rom. ii. 4); His forbearance (ἀνοχη, Rom. ii. 4, iii. 25, ix. 22); His gentleness (χρηστοτης, Rom. ii. 4, xi. 22); His pity (Ps. ciii. 13; Luke i. 72, &c.); His mercy and grace (Exod. xxxiii. 19, xxxiv. 6, 7; Ps. ciii. 8); Isa. xxx. 18; Dan. ix. 9; 2 Pet. iii. 9, &c.), are manifestations.

1. Ps. xxxiii. 5, lii. 1, c. 5, cxix. 68, cxlv. 9; Matt. xix. 7; John iii. 36; Rom. v. 8, viii. 32, xv. 33; James, i. 17; 1 John iv. 8, 16.

Attributes of God.

2. These phrases are sometimes applied in a sense different from that above given. Thus, love of benevolence is used to indicate the Divine desire that all His creatures should be happy, as far as compatible with higher requirements, while love of complacency is reserved to express His regard for such as are holy and pious—holy angels and redeemed sinners. But the usage above signalised is that of the divines by whom the phraseology was first introduced.

6. Justice.—God has promulgated a law or system of moral truth, under which He has placed his intelligent creatures, and this He ever upholds, and in accordance with this He ever acts. Hence He will assign to each according to his deeds. From all He exacts perfect obedience; and every transgression and disobedience shall receive a just recompense of reward. As His rule is founded in right, as His law is a perfect expression of moral truth, and as His administration is conducted with an unerring regard to what equity demands, He is manifested to His intelligent creatures as the just God, all whose ways are just and true. The justice of God, however, is not incompatible with the admission of a vicarious satisfaction for the transgressor, so that he may escape the penalty he has incurred.

1. Ps. vii. 9 ff. ix. 4, 5, xi. 7, xviii. 20 ff.; Is. xlv. 21; Jer. ix. 24; Matt. xi. 22 ff.; Rom. ii. 6–11; 1 Cor. iv. 5; 2 Cor. v. 10; Eph. vi. 8; Col. iii. 25; Rev. xv. 3.

7. Rectitude.—God acts not only always in accordance with the law He has promulgated, but always also in accordance with Himself. What He does, therefore, may be something beyond or above law; but it will not only not be contrary to law, it will be also perfectly becoming Himself. He cannot deny Himself, or act otherwise than like Himself. It is in this sense especially that God is styled δικαιος in such passages as John xvii. 25; Rom. iii. 26; 1 John i. 9, ii. 29; Rev. xvi. 5.

This attribute is often identified with that of justice. But justice, strictly speaking, has respect to acting according to law, whereas the righteousness of God often has respect to His sovereign acting, whereby, on grounds satisfying to Himself, He suspends or supersedes law. Besides, as has been justly observed, "Jehovah would have been a God of rectitude although no being had existed in the universe besides Himself, because rectitude is what God is, or His nature is the standard of holiness. But in that case justice could not with propriety have been predicated of Him, because justice supposes the establishment of moral government, and relates to the conduct of God, as the moral governor, towards every being connected with that government. When no system of moral government exists, as would be the case if Jehovah existed alone, there would be no room for the exercise of justice."—Payne, *Theological Lectures*, i. p. 97. The rectitude of God is identified by this very acute writer with His holiness. For this there is much better ground than there is for identifying it with his justice. Still the holiness of God, as the sum total of His moral perfections, may be advantageously distinguished from His rectitude, or the perfect conformity of all His ways with that moral perfection.

The sum of these attributes, natural and moral, constitutes the glory of God. He is the Lord of glory, and to Him alone is glory to be ascribed. Of this glory the central ray is His holiness. He is "glorious in holiness" (1). And as He has manifested to us this His glory, He is to be worshipped and reverenced by us. We are to give to Him glory, and to Him alone. All worship offered to any other than Him is impiety and idolatry: He will not give his glory to another, nor his praise to graven images (Is. xlii. 8) (2).

1. "He is called the Holy One above thirty times in Scripture; the seraphim in an ecstasy cry out, Holy, holy, holy! denoting by that repetition the superlative eminence of His holiness. This is an universal attribute which runs through all the others. Hence we find in Scripture, that His power or arm is holy (Is. lii. 10); His truths and promise holy (Ps. cv. 42); His mercy holy (Acts xiii. 34). A vein of purity runs through His whole name. Without holiness His wisdom would be subtilty, His justice cruelty, His sovereignty tyranny, His mercy foolish pity; all would degenerate into something unworthy of God. Holiness is the infinite purity and rectitude of his essence."—Polhil, *A View of some Divine Truths*, ch. iii.

Unity of God.

2. "Majestas Dei est attributum ex quo Deus non tantum dicitur gloriosus, sed etiam ipsi soli cultus gloriosus debetur."—Hollaz. On this ground the Protestants denounce as idolatrous the worship of angels and saints in the Romish Church. (See Fletcher's *Lectures on the Principles and Institutions of the Romish Church*, Lect. vi.)

As God is thus all-perfect and glorious, so is He ever blessed. He is ὁ μακαριος θεος, the blessed God (1 Tim. i. 11), the blessed and only potentate (1 Tim. vi. 15). Perfect exemption from want and evil on the one hand, and the perfect unity of power, knowledge, and will, with love on the other, with the enjoyment arising from the sense of this, furnish to us the idea of the happiness of God.

1. Nitzsch, *Christl. Lehre*, § 78. Modern divines sometimes shrink from the anthropopathism of ascribing *feelings* of happiness or blessedness to God, and would resolve this into the consciousness of His own absolute perfection, and of the fullest *αὐτάρκεια* thence arising.—Ammon, *Summa Theol.*, p. 140, § 69. But the older divines, with closer adherence to Scripture, ascribe to God a sense of enjoyment in Himself. "Convenit equidem quodammodo beatitudo Dei cum summa ejus perfectione, quippe quæ itidem omnium attributorum divinorum complexum denotat, sed discrimen in eo intercedit quod in beatitudine Dei jucundissimus etiam ille sensus, qui ex ista tot bonorum perpetua possessione oritur, simul in censum veniat."—Buddeus, *Instit. Theol. Dog.*, p. 250. The following remarks of a recent writer deserve notice:—"Love spread over the universe, streaming back upon Himself, is blessedness. Blessedness is the expression for life completed in itself. It is the eternal *peace* of love, which is higher than all reason—its Sabbath-rest in its own perfection. But the Sabbath of love is not to be identified with the eudaemony and the inert enjoyment of the heathen deities; its holy rest is eternal working. 'My Father worketh hitherto' (John v. 17). In the closer development of the concept of blessedness there comes up this difficulty: whilst, on the one hand, God must be thought as He who is sufficient for Himself, who needs nothing (Acts xvii. 25); on the other hand, His blessedness must appear as conditioned by the completion of His kingdom, since the Divine love cannot be satisfied except as it is blessing, as it is all in all. The only solution of this contradiction is furnished by the consideration that God lives a double life—a life in Himself in unobserved peace and self-sufficiency; and a life for and with his creations, since He submits himself to the conditions of finitude, nay, suffers his power to be limited by the sinning will of men. In this co-life of God with his creation, the biblical ideas of a Divine grief, wrath, and such like, find their applications; which evidently posit a conditioning of the Divine blessedness. But for this there is no place in His inner life which is independent of the creation; a life of perfectness, and of the contemplation of the certain fulfilment of all His purposes. With the ancient theosophs, therefore, we may say, 'In the outer chambers there is grief, but in the inner chamber there is nothing but joy.'"—Martensen, *Christ. Dog.*, p. 123. (See on this section generally the works on Natural Theology, and Zanchius, *De Natura Dei sive de Div. Attributis*; Charnock *On the Divine Attributes*; Burder, *The Scripture Character of God, or Discourses on the Divine Attributes.*)

Sect. V.—*Unity of God.*

This is sometimes presented as one of the Divine attributes, but improperly; for these are qualities that may be predicated of the Divine existence, whether there be many Gods or only one God, and unity is a condition of relation, not a quality of essence (1). The unity of God—more properly his soleity or monadity (μονος θεος, John v. 44; 1 Tim. i. 17)—is the necessary consequence of his absoluteness, for a plurality of absolute beings is a contradiction; where there are more beings than one, each must limit the other (2). Monotheism is the strongly declared doctrine of Scripture; and to this nature gives concurrent testimony (3). This unity is a unity of subject, and not merely a unity of kind: there is but one Being in whom this idea of God is realized (4).

1. "Minus apte nonnulli unitatem Dei attributis Divinis adnumerant, quum potius sit fundamentum, quod veræ numinis ideæ supponi debeat."—Wegscheider, *Instit. Theol.*, p. 228, 6th edit.

2. "Rationes peri possunt, 1. A Dei *simplicitate*, quod est simplicissimum et impartibile, non potest esse nisi unum; 2. A Dei *infinitate*, non possunt esse plura actu infinita citra contradictionem;

Unity of God.

3. A Dei *perfectione*, quod perfectissimum est, omnesque perfectiones in se plenissime continet, non potest esse nisi unum; 4. A *summa* Dei *bonitate*, summum bonum non potest esse insi unum."—Quenstedt, i. 305. These different reasons are ultimately one; they all resolve themselves into the idea of God as the infinite and absolute. "Deus si perfectus est, ut esse debet, non potest esse nisi unus, ut in eo sint omnia."—Lactant., i. 3.

3. As the marks of design in the universe convince us that it is the work of Divine power, so the perfect harmony which pervades the universe evinces that that power is the property of *one* intelligence. That on this globe the several elements serve for nourishment to plants, plants to the inferior animals, and animals to man; that the other planets of our system are probably inhabited, and their inhabitants nourished in the same or a similar manner; that the sun is so placed as to give light and heat to all, and by the law of gravitation to bind the whole planets into one system with itself—are truths so obvious and so universally acknowledged, as to supersede the necessity of establishing them by proof. The fair inference therefore is, that the solar system and all its parts are under the government of *one intelligence*, which directs all its motions, and all the changes which take place among its parts for some wise purposes. To suppose it under the government of two or more intelligences would be highly unreasonable; for if these intelligences had equal power, equal wisdom, and the same designs, one of them would evidently be superfluous; and if they had equal power and contrary designs, they could not be the parents of that harmony which we clearly perceive to prevail in the system. The truth thus intimated by the harmony of nature is plainly and frequently asserted in the Scriptures: "Unto thee," says Moses to his countrymen (Deut. iv. 35 and 39, vi. 4), "it was showed, that thou mightest know that the Lord is God; *there is none else besides him.* Know therefore that the Lord *he is God* in *heaven above* and upon *the earth beneath: there is none else.*" And again, "Hear, O Israel, the Lord our God is *one Lord;*" or, as it is expressed in the original, "Jehovah our God is one Jehovah," one Being to whom existence is essential, who could not have a beginning and cannot have an end. In the prophecies of Isaiah, God is introduced as repeatedly declaring the same truth. (Isa. xiv. 5, 6, 18, xliv. 8.) In perfect harmony with these declarations of Moses and the prophets, our Saviour, addressing himself to his Father, says (John xvii. 3), "This is life eternal, that they might know *Thee, the only true God*, and Jesus Christ whom Thou hast sent;" and St Paul, who derived his doctrine from his divine Master, affirms (1 Cor. viii. 4), that "an idol is nothing in the world; and that there is *none other God but one.*" (See also Ps. lxxxvi. 8–10, cv. 3; Matt. xix. 16; John v. 44; Eph. iv. 6; 1 John v. 20, &c.)

The unity of the Divine nature, which, from the order and harmony of the world, appears probable to human reason, these texts of revelation put beyond a doubt. Hence the first precept of the Jewish law, and, according to their own writers, the foundation of their whole religion, was, "Thou shalt have none other gods before Me." Hence, too, the reason of that strict command to Jews and Christians to give worship to none but God: "Thou shalt worship the Lord thy God, and him only shalt thou serve;" because he is *God alone.* Him only must we fear, because He alone hath infinite power; in Him alone must we trust, because "He only is our rock and our salvation;" and to Him alone must we direct our devotions, because "He only knoweth the hearts of the children of men."

4. "By the unity, or rather the soleity (*einzigkeit*) of God is to be understood, not the unity of the subjective *concept* of God, such as every species possesses in our understanding, but the aloneness of the object to which the concept belongs, or the oneness of the *individual.* 'God is one,' does not thus mean, there is one kind (species) of God, as we say—*e. g.*, there is one race or species of men; but there is but one Being who is God, and whom alone it is competent or lawful to call God."—Bretschneider, *Handbuch d. Dogmatik*, i. p. 299, 2d edit.

The Christian Fathers strenuously asserted the unity of God in opposition to the Polytheism of the Greeks and Romans, the Dualism of the Persians, and the Tritheism of certain heretical Christian sects (1).

1. Hermas, *Pastor*, ii. 1; Justin Martyr, *Cohortatio ad Gentiles*, c. 14–23; *De Monarchia*, i. 6; Tertullian, *Apologet.* 17; *Adv. Marcion*, i. 3–6, 11; *De Test. Animae*, &c.; Lactant., i. 3, 5; Augustine, *De Civit. Dei*, l. iv. and x.; *Cont. Faustum*, xxi. 1; Athanasius, *Cont. Gentes, Opp.*, i. 45 ff.; Ioan. Damascen. *Adv. Manichæos*, and *De Haer*, 101 ff., &c.

The unity of God is that of a being possessing a personal and proper essence distinct from that of the world. This is to be maintained against those who confound the Divine essence with that of the universe, whether by regarding God as the vivifying, animating soul of the world, or by identifying Him with the world as the ἓν καὶ πᾶν, the One in All, and the All in One—a Being impersonal, and yet able to produce persons, and which comes into manifestation and consciousness in the physical and intelligent universe. (See PANTHEISM).

The Trinity.

See also G. B. Jäsche, *Der Pantheismus nach Seinem Hauptformen, Seinem Ursprunge und Fortgange*, &c., 2 vols., 1826–28; Krause, *Opuscula*, p. 73 ff., Regiomont, 1813.

SECT. VI.—*The Trinity.*

The Scripture makes known to us three distinct Beings, to whom divine names, attributes, works, and honours are ascribed—the Father, the Son, and the Holy Spirit (1). To reconcile this with the revealed and strongly asserted unity of God, some have resorted to the hypothesis, that the distinction is not essential, but merely modal or economical; that it simply brings before us the fact, that God manifests Himself in three different relations to the race of men; or that it merely aims at impressing on us the practical truth, that in the work of redemption God recovers man to Himself, by Himself, through Himself (2). It may be admitted that this is the practical aspect of the truth, as it is presented to us in Scripture, and that beyond this we cannot probably realise or construe in thought this revelation of God; but that this comprises the whole of the truth which it is the design of Scripture to intimate to us by this distinction, has ever been held to be a heresy in the Church. As a more just and full expression of the truth, the doctrine of a Trinity in the Divine essence has been embraced. According to this, whilst the Divine essence is held to be one, there are recognised three distinctions in this unity, which for convenience sake are designated Persons (*Personæ*, προσωπα), or *Hypostases* (ὑποστασεις, *subsistentes*), the Father, Son, and Holy Ghost. The expression given of this doctrine in the so-called Athanasian Creed, is that generally adopted by Evangelical divines:—"We worship one God in Trinity, and Trinity in Unity; neither confounding the persons nor dividing the substance. For there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, of the Son, and of the Holy Ghost is all one: the glory equal, the majesty co-eternal."

1. The supreme Deity of the Son and of the Spirit is here assumed; the Scripture proof of both will be found farther on. It may be proper, however, here to notice those passages in which Scripture joins the Father, the Son, and the Holy Ghost, in such a way as to lead to the conclusion that all are alike, and equally to be reverenced as divine. Such are Is. lxiii. 9, 10, xlviii. 16, xxxiv. 16; Matt. xxviii. 19; 2 Cor. xiii. 14; Tit. i. 3, 4, &c. Of these, the most remarkable are Matt. xxviii. 19, and 2 Cor. xiii. 14. In the former of these we have the commission of Christ to His apostles, and the formula of the baptismal rite by which they were to make men His disciples. "Go," says our Saviour, "and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost." What was it the apostles were to teach all nations? Was it not to turn from their vanities to the living God; to renounce their idols and false gods, and so to be baptized in the name of the Father, and of the Son, and of the Holy Ghost? What now must occur to the Gentile nations on this occasion but that, instead of all their deities, to whom they had before bowed down, they were in future to serve, worship, and adore, Father, Son, and Holy Ghost, as the only true and living God? To suppose that GOD and TWO CREATURES are here joined together in the solemn rite by which men were to be admitted into a new religion, which directly condemns all *creature-worship*, would be so unreasonable, that we are persuaded such a supposition never was made by any converted polytheist of antiquity. The nations were to be baptized in the name of three persons, in the *same manner*, and therefore, doubtless, in the *same sense.* It is not said in the name of GOD and his two faithful *servants;* nor in the name of GOD, and CHRIST, and the HOLY GHOST, which might have suggested a thought that *one* only of the three is God; but in the name of the FATHER, and of the SON, and of the HOLY GHOST. Whatever honour, reverence, or regard, is paid to the first person in this solemn rite, the same

The Trinity.

is paid to all three. Is He acknowledged as the object of worship? So are the other two likewise? Is He God and Lord over us? So are they. Are we enrolled as subjects, servants, and soldiers under Him? So are we equally under all. Are we hereby regenerated and made the temple of the Father? So are we likewise of the Son and Holy Ghost. In 2 Cor. xiii. 14 we have the apostolical form of benediction: "The grace of our LORD JESUS CHRIST, and the love of GOD, and the communion of the HOLY GHOST, be with you all." Would St Paul, or any other man of common sense, have in the same sentence, and in the most solemn manner, recommended his Corinthian converts to the love of God, and to the grace and communion of two creatures? We should think it very absurd to recommend a man at once to the favour of a king and a beggar; but how infinitely small is the distance between the greatest earthly potentate and the meanest beggar, when compared with that which must for ever subsist between the Almighty Creator of heaven and earth and the most elevated creature! (See Smith's *Scripture Testimony to the Messiah*, vol. ii., p. 342, 4th ed.; Wardlaw's *Discourses on the Socinian Controversy*, pp. 49–51, 4th edit.)

Besides the direct statements on which this doctrine rests, there are many forms of expression and allusion which receive their readiest and most natural explanation from this doctrine. Such are the usage of the plural by God in speaking of Himself (Gen. i. 26, iii. 22, ix. 6, 7; Mal. i. 6, &c.); the construction of these plural names of God with singular adjuncts; the distinction between the angel of Jehovah, who was yet in some sense God, and Jehovah himself, &c. (See Hengstenberg's *Christology*, i. p. 107 ff. Eng. trans.; Smith's *Scripture Testimony*, i. 296–329; Alexander's *Connection and Harmony of the Old and New Testaments*, pp. 66–90, 2d edit.)

2. This view bears generically the name of *Modalism*. It includes various species, of which Sabellianism is the oldest. Sabellius, a Presbyter of Ptolemais (about A.D. 250), maintained "that the appellations Father, Son, and Holy Spirit, are only so many different manifestations and names of One and the same divine Being. He thus converted the real distinction of persons (the Trinity of essence) into a distinction of mere modes (the Trinity of manifestations)" (Hagenbach, *History of Doctrines*, by Buch, vol. i., pp. 243, Edin. 1846. See also Neander, *Church Hist.*, vol. ii., pp. 352–369; Gieseler, *Eccl. Hist.*, i. p. 219; Lardner, *Credibility, &c. Works*, iii., p. 75, ed. 1788; and especially Dorner, *Entwickelungsgeschichte der Lehre von der Person Christi*, i. 703 ff.) In the writings of some modern speculators this modalistic view appears as an assertion that the distinction of Father, Son, and Holy Spirit is merely a distinction of powers or energies in God (see Meier, *Philos Betracht. ueber die Christl. Religion*, St. iii., p. 194 ff.; Töllner, *Verm. Aufsätze*, ii. 1); while others resolve the distinction into one of mere relation of God to the world and to men. This latter is the doctrine of Kant and his school (see Kant, *Religion innerhalb der Grenzen d. blossen Vernunft*, p. 211, ed. 1794; Krug, *Eusebiologie oder Philos. Religionslehre*, p. 238; Königsb. 1819; Ammon, *Summa Theol. Christ.*, p. 166, 4th ed., Lips. 1830).

It has been asked by opponents of this doctrine, how can three Divine persons be but one and the same God? This is a question which has been often put, but which, we believe, no created being can fully answer. It is to be observed, however, that no intelligent Trinitarians affirm that these Divine Persons, or Hypostases, are *one* and *three* in the *same* sense; for this would be a contradiction in terms. What is affirmed is, that in one sense they are three, and in another one; though how this is, or what may be the difference between the one sense and the other, we are utterly unable to tell. The case is one which admits of no explanation. The Divine nature, and its manner of existence, is to us wholly incomprehensible; and we might with greater reason attempt to weigh the mountains in scales, than by our limited faculties to fathom the depths of infinity. The Supreme Being is present in power to every portion of space, and yet it is demonstrable that in His essence He is not extended. Both these truths, His inextension and omnipresence, are fundamental principles in what is called *natural religion;* and when taken together they form, in the opinion of most people, a mystery as incomprehensible as that of the Trinity in unity. Indeed, there is nothing of which it is more difficult to form a distinct notion than *unity* simple, and absolutely indivisible. Though the Trinity in unity, therefore, were no Christian doctrine, mysteries must still be believed; for they are as inseparable from the religion of nature as from that of revelation; and atheism involves the most incomprehensible of all mysteries, even the beginning of existence without a cause. We must indeed form the best notions that we can of this and all other mysteries; for if we have no notions whatever of a Trinity in unity, we can neither believe nor disbelieve that doctrine. It is, however, to be remembered, that all our notions of God are more or less analogical; that they must be expressed in words which, literally interpreted, are applicable only to man; and that propositions understood in this literal sense may involve an apparent contradiction, from which the truth meant to be expressed by them would be seen to be free, had we direct and adequate conceptions of the Divine nature.

The Trinity.

As the doctrine of the Trinity, though not contrary to reason, is above reason, it can neither be rationally explained nor rationally impugned. It is to be regretted, therefore, that some zealous supporters of it, instead of resting their cause solely on Scripture, have endeavoured by philosophical speculations, or by analogies drawn from the physical universe, to throw light on this subject (1). It is to be regretted, also, that divines have so overloaded the doctrine with attempts to state exactly the relation of the three Persons in the Trinity to each other; for they have thus put into the hands of the adversary implements of attack against it which the doctrine, simply as drawn from Scripture, does not furnish (2).

1. See Kidd's *Essay on the Doctrine of the Trinity, attempting to prove it by Reason and Demonstration*, &c.; Melancthon, *Corp. Doct. Christ.*, p. 323 sq., Lips., 1560; Keckermann, *System. Theol.*, lib. i. c. 3; Schelling, *Ideen zur Naturphilosophie*, p. 139, 2d ed.; *Vorlesungen iib. d. Akad. Studium*, p. 184; Marheineke, *Grundlehre der Christl. Dogmatik*, p. 131, &c. Of these attempts a very competent judge has said: "In all these philosophical representations there is apparent a certain arbitrariness, such as would justify their authors in contending for a Duad, or a Tessarad, just as well as a Triad in God; whilst they obliterate what is essential to the Biblical doctrines of the personality of the Son and Spirit."—Bretschneider, *Handbuch der Dogmatik*, 2d ed., i. p. 476. Another very shrewd thinker, himself an opponent of the doctrine, has observed:—"Neminem fugit . . . . quamlibet Trinitatis explicationem philosophicam sive unum subjectum et triplicem ejus rationem aut operationem, sive tria subjecta intelligendi et volendi facultate prædita defendat, necessario abire vel in *Sabellianismi* (*Modalismi*) vel in *Tritheismi* aut *Arianismi* dureta, ab ecclesiis olim damnata."—Wegscheider, *Theol. Christ. Dog.*, p. 30, 6th ed. This is true, and therefore it is safest to resolve, with Morus:—"Rem simpliciter eloquimur, et Patri Filio, Sanctoque Spiritui, his tribus distinctis, communem esse divinam naturam, sive divinas perfectionas, docemus, delarantes simul ideo non statui alium alio plus minusve habere, nec statui plures Deos esse."—*Epitome Theol. Christ.*, p. 69. "The attempt has been made to illustrate the Trinity by analogies from nature. Cassiodore (on Ps. l.) makes use for this purpose of that of fire. He finds in it, 'Speciem ignis, splendorem et calorem; splendor ab igne nascitur, calor ab igne et splendore generatur. Splendor est de igne, et tamen sunt coæva. Sic tria in sole occurrunt; ipsa solis substantia, radius et lumen, et tamen in his tribus est eadem lux; ut radius de sole nascitur sic Filius de Patre generatur, calor ab utroque progreditur, sic Sp. S. ab utroque spiratur." Basil (*Ep. ad Naz.*) adduces the colours in the rainbow. Luther, with others, fixed upon the fact that flowers have form, scent, and virtue or power. Others refer to the three genders and numbers of grammar; the three parts in a proposition—the subject, the predicate, and the copula; the three positions in a syllogism; the three dimensions in space; the threefold faculty of man—that of knowledge, that of will, and that of feeling," &c. (Bretschneider, *Handb.* i. 389.) Of these analogies some are absurd; and even the best, the first, is far from being a true analogy, or one calculated to throw light on the real difficulty in the concept of the Trinity—that of the union of personal distinction with essential unity.

2. To each of the Persons in the Trinity has been ascribed a "*character hypostaticus—i.e.*, complexus notarum quibus personæ divinæ inter se differunt." These notæ or marks are partly internal and partly external. By the former are meant the eternal relations existing between the divine persons themselves, by which their subsistence as persons is from eternity determined, τρόποι ὑπαρξεως. These are—1. The *actus personales*, or *opera immanentia quibus definitur ratio subsistantiæ trium personarum.* The Father's personal act, in relation to the Son, is *generation*, by which is meant the producing, not of the essence of the Son, but of his

Works of God.

subsistence as a person; in other words, it is that eternal relation of the Father to the Son, in virtue of which the reason of the subsistence of the Son is in the Father; and in relation to the Spirit is *spiration—i.e.*, that eternal relation of the Father to the Spirit, in virtue of which the Father contains the reason of the subsistence of the Spirit. The Son's personal act is that, with the Father, He breathes forth the Spirit. The Spirit's personal act, in relation to the Father and to the Son, is that He proceeds from both. 2. *Proprietates personales—i.e., peculiares subsistendi modi quibus personæ divinæ inter se differunt.* Thus the Father begets and breathes, Himself unbegotten (ἀγεννητος) and unbreathed (ἀπνευστος); the Son is begotten but begets not, he breathes but proceeds not (γεννητος ἀλλ' ἀπνευστος); the Spirit begets not, is not begotten but proceeds (ἐκπορευτος). 3. *Notiones Personales—i.e., relationes personarum internæ in abstracto consideratæ.* Thus the personal notion with the Father is paternity and spiration, or, under another aspect, unbegottenness (ἀγεννησια); with the Son, filiation and spiration, or γεννησις; with the Spirit, procession (ἐκπεμψις). The external marks are the transeunt works which belong to each person in the economy of redemption, and those which, though not peculiar to one more than the others, are in Scripture usually ascribed to one, such as inspiration to the Spirit, τρεποι ἀποκαλυψεως. Of these minute distinctions, some are founded on what appear to be misinterpretations of Scripture phraseology, while others are of mere human invention, and are not intelligible. (See M. Stuart's *First Excursus on the Ep. to the Romans*; Wardlaw's *System. Theology*, ii. 22 ff.; Payne's *Lectures on Theology*, i. 239 ff.)

Attempts have been made to identify the doctrine of the Trinity with certain mythological representations current in some of the heathen systems, and also with certain speculations of ancient philosophy, especially among the Platonists. But beyond establishing some curious coincidences, such attempts have proved fruitless; nothing has been adduced that can in the least invalidate the perfect originality of the doctrine as contained in, and drawn from the Scripture.

See Cudworth's *Intellectual System*, especially chapter iv. § 36 ff.; Caesar Morgan, *Investigation of the Trinity of Plato*, Camb. 1853; Mushet *On the Trinities of the Ancients*, Lond. 1837; Tholuck, *Die Speculative Trinitaetslehre des Spaeteren Orients*, Berl. 1826; Dorner, *Lehre von d. Person Christi*, i. 4–15; Dwight, *Theology*, Serm. 71. On the subject of the Trinity generally, see Pearson *On the Creed*; Burnet's *Exposition of the Thirty-nine Articles*; Wardlaw's *Discourses on the Socinian Controversy*; Stuart's *Letters to Dr Channing*; *Horsley's Letters to Priestley*; Fuller's *Works*, vol. i. and vol. iv.; Waterland's *Importance of the Doctrine of the Holy Trinity Asserted*; Faber's *Apostolicity of Trinitarianism*; Howe's *Calm and Sober Enquiry concerning the Possibility of a Trinity in the Godhead*, Lond. 1694, and in his collected works. Alsop's *Anti-Sozzo*, 1675. For the history of the dogma, see the works of Muenscher, Augusti, and Hagenbach on the *History of Doctrines*; and Fd. Ch. Baur, *Christliche Lehre von der Dreieinigkeit und Menschwerdung Gottes in ihrer Geschichtl. Entwickelung*, Tüb. 1841.

Sect. VII.—*Works of God.*

The Divine Being manifests Himself by his works. Within the sphere of our observation, He has made Himself known by the works of Creation and Providence. All things with which we are conversant are the mediate or immediate product of His hands, and bear marks of His wisdom and power in their original constitution (1). By His almighty fiat, being was given to what did not before exist, and by His plastic energy has everything been framed and ordered as it exists. He is, in the strict sense of the term, the Creator of all things (2). And as all things have been made by Him, so it is by Him that all are sustained,—their being preserved, their form, places, and uses secured; their mutual order and harmony continued (3).

1. Gen. i. and ii.; Ps. xxxiii. 6, c. 3; Ps. civ. 2–5, 24, 25; cxxxvi. 5–9; Is. xliv. 24; Zech. xii. 1; Heb. xi. 3; Rom. xi. 36.

2. It must be acknowledged that the Hebrew word ברא does not always imply the production of substance, but very often the forming of particular organised bodies out of pre-existing matter. Thus when it is said (Gen. i. 21, 27), that "God *created* great whales, and every living creature that moveth, which the waters brought forth abundantly after their kind;" and again, "that he *created* man male and female;" though the word ברא is used on both occasions, we are not to conceive that the bodies of the first human pair, and of these animals, were brought into being from nonentity, but only that they were formed by a proper organization being given to pre-existent matter. But when Moses says, "In the beginning God *created* the heaven and the earth," he cannot be supposed to mean, that "in the beginning God only gave form to matter already existing of itself;" for in the very next verse we are assured that after this act of creation was over, "the earth was still *without form* and void," or in other words, in a chaotic state.

Reverence due to God.

That the Jews, before the coming of our Saviour, understood their lawgiver to teach a proper creation, is plain from that passage in the second book of the Maccabees, in which a mother, to persuade her son to suffer the cruellest tortures rather than forsake the law of his God, uses the following argument: "I beseech thee, my son, look upon the heaven and the earth, and all that is therein, and consider that God made them out of things that were not." To the same purpose the inspired author of the epistle to the Hebrews, when magnifying the excellence of faith, says, "Through faith we understand that the worlds were framed by the word of God, so that things which are seen were not made of things which do appear;" where, as Bishop Pearson has ably proved (*Exposition of the Creed*), the phrase μη ἐκφαινομενων is equivalent to ὀυκ ἐξ ὀντων in the quotation from the Maccabees.

The very first verse, therefore, of the book of Genesis informs us of a most important truth, which all the uninspired wisdom of antiquity could not discover. It assures us, that as nothing exists by chance, so nothing is necessarily existing but the three Divine Persons in the one Godhead. Everything else, whether material or immaterial, derives its substance, as well as its form or qualities, from the fiat of that self-existent Being, "who was, and is, and is to come."

It does not, however, follow from this verse, or from any other passage in the sacred Scriptures, that the whole universe was called into existence at the same instant; neither is it by any means evident that the chaos of our world was brought into being on the first of those six days during which it was gradually reduced into form. From a passage in the book of Job (xxxviii. 7), in which we are told by God himself, that when the "foundation of the earth was laid the morning stars sang together, and all the sons of God shouted for joy," it appears extremely probable that worlds had been created, formed, and inhabited, long before our earth had any existence. Nor is this opinion at all contrary to what Moses says of the creation of the stars; for though they are mentioned in the same verse with the sun and moon, yet the manner in which, according to the original, they are introduced, by no means indicates that all the stars were formed at the same time with the luminaries of our system. Most of them have been created long before, and some of them since, our world was brought into being; for that clause (ver. 16), "He made the stars also," is in the Hebrew no more than "and the stars;" the words *he made* being inserted by the translators. The whole verse, therefore, ought to be rendered thus, "And God made two great lights; the greater light to rule the day, and the lesser light with the stars to rule the night;" where nothing is intimated with respect to the *time* when the stars were formed, any more than in that verse of the Psalms (cxxxvi. 9), which exhorts us to give thanks to God who made the moon and stars to rule by night; for his mercy endureth "for ever." The first verse of the book of Genesis informs us that all things spiritual and corporeal derive their existence from God; but it is nowhere said that all matter was created at the same time.

3. Ps. xxxvi. 6–9, cxiii. 6–9, cxix. 90–92, cxxxvi. 25; Prov. viii. 15, 16; Dan. ii. 21; Matt. vi. 26, x. 29; John v. 17; Acts xvii. 28, &c. See on this subject especially Calvin's *Institutes*, bk. i. ch. 16.

Sect. VIII.—*Reverence due to God.*

The revelation which God has been pleased to give of himself to His intelligent creatures, is designed to raise their minds and hearts up to Him, and enable them to think of Him as He is, and feel towards Him as they ought. As before observed, He requires us to give unto the Lord glory and strength; to give unto the Lord the glory due unto His name; to worship Him in the beauty of holiness (Ps. xxix. 1, 2). He commands us to sanctify the Lord of Hosts himself; to let Him be our fear, and to let Him be our dread (Is. viii. 13). And he warns us against polluting His holy name, profaning His name, and taking His name in vain (Ez. xxxix. 7; Lev. xviii. 21; Ex. xx. 7). Such reverence towards the Almighty even natural reason

Reverence due to God.

teaches to be most fit and imperative. No man who contemplates the Divine perfections, as made known in Creation and Providence, can doubt that it is his duty to fear and reverence the Being to whom such matchless perfections belong. He who thinks irreverently of the Author of nature can never have considered seriously the power, the wisdom, and the goodness displayed in His works; for whoever has a clear notion of these must be convinced that He who performed them has no imperfection; that His power can accomplish everything which involves not a contradiction; that His knowledge is intuitive, and free from the possibility of error; and that His goodness extends to all without partiality and without any alloy of selfish design. This conviction must make every man on whose mind it is impressed ready to prostrate himself in the dust before the Author of his being; who, though infinitely exalted above him, is the source of all his enjoyments, constantly watches over him with paternal care, and protects him from numberless dangers. The sense of so many benefits must excite in his mind a sense of the liveliest gratitude to him from whom they are received, and an ardent wish for their continuance.

While silent gratitude and devotion thus glow in the breast of the thoughtful observer, he will be careful not to form even a mental image of that all-perfect Being to whom they are directed. He knows that God is not material; that He exists in a manner altogether incomprehensible; that to frame an image of Him would be to assign limits to what is infinite; and that to attempt to form a positive conception of Him would be impiously to compare himself with his Maker.

The man who has any just notion of the perfections of the Supreme Being will never speak lightly of Him, or make use of His name except on great and solemn occasions. He knows that the terms of all languages are inadequate and improper, when applied directly to Him who has no equal, and to whom nothing can be compared; and therefore he will employ these terms with caution. When he speaks of His mercy and compassion, he will not consider them as feelings wringing the heart, like the mercy and compassion experienced by man, but as rays of pure and disinterested benevolence. When he thinks of the stupendous system of nature, and hears it perhaps said that God formed it for His own glory, he will reflect that God is so infinitely exalted above all His creatures, and so perfect in Himself, that He can neither take pleasure in their applause, nor receive any accession of any kind from the existence of ten thousand worlds. The immense fabric of nature, therefore, only displays the glory or perfections of its Author to *us*, and to other *creatures* who have not faculties to comprend Him in Himself. When such an one talks of *serving* God, he does not dream that his services can increase the Divine felicity; but means only that it is his duty to obey the Divine laws. Even the pronoun *He*, when it refers to God, cannot be of the same import as when it refers to man; and by the philosophical divine it will seldom be used but with a mental allusion to this obvious distinction.

As the man who daily venerates the Author of his being will not speak of him on trivial occasions, so will he be still further from calling upon him to witness impertinences and falsehood. The slightest reflection will convince him that the world, with all that it contains, depends every moment on that God who formed it; and this conviction will compel him to wish for the Divine protection of himself and his friends from all dangers and misfortunes. Such a wish is in effect a prayer, and will always be accompanied with adoration, confession, and thanksgiving. But adoration, confessions, supplications, and thanksgiving constitute what is called *worship*, and therefore the worship of God is a natural duty. It is the addressing of ourselves as His dependants to Him as the supreme cause and governor of the world, with acknowledgments of what we enjoy, and petitions for what we really want, or He knows to be convenient for us.

Original State of Man.

See Wollaston's *Religion of Nature Delineated;* Wilkins', *Principles and Duties of Natural Religion.*

PART II.

Anthropology, or Doctrine concerning Man.

Sect. I.—*Original State of Man.*

God made man of the dust of the earth, and breathed into him the breath of life, and man became a living soul (1). These statements indicate that man received from his Maker a bodily constitution essentially the same as that given to the lower animals, which the earth at the Divine command brought forth; and also that he received, as a separate boon, the gift of life, which in his case inheres not in the bodily organisation, so as to cease when that is destroyed, but in a different substance, the soul, by which the life is retained after the body is dead (2). We are further told, that God made man upright, that he was created in the image and likeness of God, and that God pronounced him "very good." We are thus led to predicate *perfection* of man in his original estate—perfection not merely of physical constitution, but perfection of intellectual and moral constitution, and actual moral and spiritual integrity (3). At the same time, his perfection was not supernatural, nor was it the *full* perfection of man, for that can be reached only through experience and discipline.

The image and likeness of God in which man was created has often been taken to signify moral excellence alone, and sometimes to signify a superhuman degree of such excellence. That moral excellence must be regarded as forming *part* of this image cannot be questioned in the face of such passages as Col. iii. 10; Eph. iv. 24; but that it consisted wholly in this is a mistake. The image of Him who is the source of all intelligence, must include the faculty of intellect and the possession of knowledge; and as we know that man still retains the image of God in some sense *after* the fall (see Gen. ix. 6; James iii. 9.), whilst he lost by that his moral resemblance to God, we are bound to believe that that image consisted originally in something besides moral excellence and purity.

1. Gen. ii. 6, 7. The expression נפש חיה, a living soul, has been frequently taken for more than it really means. A common view is, that it refers to the possession by man of an intellectual nature; and some refer it to the moral excellence originally conferred on him. But the phrase itself simply denotes the possession of animal life. (See Gen. i. 20, 24; ii. 19; ix. 12, 15, 16.) This, indeed, man has not, as the lower animals have, resident merely in his bodily organisation, so as to cease when this is disintegrated; but the evidence for this does not rest on such an expression as that before us.

2. It is doubtless in allusion to this that the Apostle lays so much stress on man's possessing a soul-body (ψυχικον σωμα.), 1 Cor. xv. 44, 45. The recognition of this peculiarity also seems essential to our attaching due importance to the biblical trichotomy of our nature as composed of body, soul, and spirit. (See Olshausen, *De Nat. Num. Trichotomia, H. T. Scriptoribus recepta, Opusc.* p. 143.)

3. "The image of God in Adam appeared in that rectitude, righteousness, and holiness in which he was made; for God made man upright (Eccles. vii. 2), a holy and righteous creature, which holiness and righteousness were in their kind perfect; his understanding was free from all error and mistakes; his will biased to that which is good; his affections flowed in a right channel towards their proper objects; there were no sinful notions and evil thoughts in his heart, nor any propensity or inclination to that which is evil; and the whole of his conduct and behaviour was according to the will of God. And this righteousness was *natural*, and not personal and acquired. It was not obtained by the exercise of his free-will, but was created with him, and belonged to his mind as a natural faculty

Original State of Man.

or instinct." (Gill's *Body of Divinity*, b. iii. ch. 3.) If by these concluding words be meant that Adam's moral excellence was not the result of acquired habits, but was connate with him, the statement may be admitted. But this truth should not have been so expressed. Virtue does not exist apart from choice or free-will. (MORAL PHILOSOPHY, p. 560.) It would be more correct to say that man, in his original state, was made to choose that which is good; and as he was free from any bias to evil, so he was capable of discerning good, and inclined to prefer it.

Many learned men, and Bishop Bull (*English Works*, vol. iii.) among others, have supposed, that by the image of God is to be understood certain gifts and powers supernaturally infused by the Holy Spirit into the minds of our first parents, to guide them in the ways of piety and virtue. This opinion they rest chiefly upon the authority of Tatian, Irenæus, Tertullian, Cyprian, Athanasius, and other fathers of the primitive church; but they think, at the same time, that it is countenanced by several passages in the New Testament. Thus when St Paul says (1 Cor. xv. 45, 46), "and so it is written, the first man Adam was made a living soul, the last Adam was made a quickening spirit," they understand the whole passage as relating to the creation of man, and not as drawing a comparison between Adam and Christ, to show the great superiority of the latter over the former. In support of this interpretation they observe, that the apostle immediately adds, "howbeit, that was not first which is spiritual, but that which is natural, and afterwards that which is spiritual;" an addition which they think was altogether needless, if by the quickening spirit he had referred to the incarnation of Christ, which had happened in the very age in which he was writing. They are therefore of opinion, that the body of Adam, after being formed of the dust of the ground, was first animated by a vital principle, endowed with the faculties of reason and sensation, which entitled the whole man to the appellation of a living soul. After this, they suppose certain graces of the Holy Spirit to have been infused into him, by which he was made a quickening spirit, or formed in the image of God; and that it was in consequence of this succession of powers communicated to the same person, that the apostle said, "howbeit, that was not first which is spiritual, but that which is natural."

We need hardly observe that, with respect to a question of this kind, the authority of Tatian and the other fathers quoted is of no great weight. Those men had no better means of discovering the true sense of the Scriptures of the Old Testament than we have; and their ignorance of the language in which these scriptures are written, added to some metaphysical notions respecting the soul, which too many of them had derived from the school of Plato, rendered them very ill qualified to interpret the writings of Moses. Were authority to be admitted, we should consider that of Bishop Bull and his modern followers as of greater weight than the authority of all the ancients to whom they appeal. But authority cannot be admitted; and the reasoning of this learned and excellent man, from the text of St Paul, is surely very inconclusive. It makes two persons of Adam; a first, when he was a natural man, composed of a body and a reasonable soul; a second, when he was endowed with the gifts of the Holy Spirit, and by them formed in the image of God. In the verse following, the apostle expressly calls the second man, of whom he had been speaking, "the Lord from heaven;" but this appellation we apprehend to be too high for Adam in the state of greatest perfection in which he ever existed. That our first parents were endowed with the gifts of the Holy Ghost may be granted; but as these gifts were adventitious to their nature, they could not be that image in which God *made* man.

Man thus constituted was placed by God in a pleasant and fitting habitation, in an enclosed demesne, in a district which bore the name of Eden, or pleasant land (1). Here there was provided for him all that was needful for sustenance, and along with that whatever could minister to those pure and simple tastes with which he had been endowed. In this pleasant abode Adam was placed as in a school and a temple, that his nature might be cultivated, that his religious tendencies might have scope, and that, in the contemplation and service of God, he might enjoy the highest felicity of which his nature was capable. His life was to be one of activity; he had to dress the garden and to keep it. His intellectual powers were called into early exercise by God's teaching him to use language, and summoning him to the effort of naming the different tribes of animals by which he was surrounded. Endowed with social instincts and affections, these were at once stimulated and satisfied by the formation of one who should be an help-meet for him—one who, bone of his bones and flesh of his flesh, should be his equal, companion, and aid. In close and constant communication with God, and surrounded by innumerable evidences of the Creator's power, wisdom, and goodness, his religious powers and tendencies were stimulated and directed, and he was taught to worship God and wait upon Him. To this the institution of the Sabbath (2) was doubtless designed to contribute, as well as the two symbolical trees in the midst of the garden, the Tree of Life and the Tree of the Knowledge of good and evil; of the former of which man might eat, and probably did eat sacramentally, as a pledge of that life which he was to enjoy so long as he was obedient, and a sign of that higher life to which success in his probation would conduct him; and the latter of which furnished the test of his obedience, the means of his probation (3). Of this tree he was forbidden to eat, on pain of death should he transgress this prohibition (Gen. ii. 8–25).

Man's Temptation and Fall.

1. The word Paradise, which is the term applied to the abode of our first parents by the LXX., the Vulgate, and the Syriac translators, is of Persian origin (= *pairi daëza*, in the old Zend, an enclosure), and was the customary designation of those large parks, *μιστους δενδρων και θηριων*, as Zenophon says (*Hell.* iv. 1, 15), which were used as pleasure-grounds by the Persian princes and nobility (Zenoph. *Cyrop.* i. 4, 11). It was introduced into the later Hebrew under the form of פרדס, Cant. iv. 13; Neh. ii. 8; Eccl. ii. 5.—On the situation of Eden, see Rosenmüller, *Biblical Geography*, vol. i. p. 46, ff., Eng. Tr.; Kurz, *History of the Old Covenant*, vol. i. p. 71, Eng. Tr.; Kitto's *Biblical Cyclopædia*, art. *Paradise*.

2. See Owen's Preliminary Exercitations to his *Exposition of the Epistle to the Hebrews*, part v. exer. iii. & iv.; Taylor's *Scheme of Scripture Divinity*, ch. vi.; Horseley's *Sermons*, vol. ii. serm. xxi.–xxiii.; Wardlaw's *Discourses on the Sabbath*, disc. i.

3. Comp. Vitringa, *Observationes Sacræ*, bk. iv. c. 12; Poole's *Comment.* on the passage.

SECT. II.—*Man's Temptation and Fall.*

Man was thus placed under probation. How long he sustained his state of probation we cannot tell; but we may presume it was long enough to prove the fitness of his condition for the ends it was designed to answer, and to enable our first parents to make some progress in intellectual and spiritual culture. We know, however, that whether it continued for a long time or a short, it ended unhappily. Seduced by Satan, who, in the guise of a serpent (1), took advantage of her simplicity and heedlessness, Eve was led first to doubt the goodness and fairness of God in the restriction under which they had been placed, and to despise His threatening in case of disobedience. After this, it was not difficult to work upon her feelings, to stimulate appetite, curiosity, and ambition, so as to hurry her to a breach of the law on which man's continuance in Paradise depended. "She saw that the tree was good for food, and that it was pleasant to the eyes, and a tree to be desired to make one wise;" and seeing this, and being already, by the wiles and falsehood of the tempter, drawn off from her primeval sense of God and reverence for Him, "she took of the fruit thereof, and did eat." No unpleasant consequences seem at the time to have ensued; and triumphing, perhaps, in her experiment, "she gave also to her husband, and he did eat." In his case there was no deception; what he did he did consciously, and fully aware both of the evil of what he did and of the penalty he incurred. (1 Tim. ii. 14.) (2).

1. Some have supposed that the term "serpent" (emphatically *the* serpent, הנחש) is used by Moses (Gen. iii. 1), as by Paul (2 Cor. xi. 3) and John (Rev. xii. 9), merely as a designation of Satan, without intending to intimate thereby anything as to the form which he assumed. It has been also supposed that he came to Eve in the guise of an unfallen angel, and that allusion is made to this by the apostle when he says that "Satan is transformed into an angel of light" (2 Cor. xi. 14), as there is no other occasion on record to which such an allusion would so well apply. In the subsequent

Man's Temptation and Fall.

part, however, of the Mosaic narrative there are statements which seem to necessitate the belief that an animal serpent was somehow mixed up with this transaction; and such has been the prevailing belief of the Church, as well as the prevailing testimony of tradition.

2. Attempts have been made to set aside entirely the historical character of the narrative in the third chapter of Genesis, and to resolve it into an allegorical poem, setting forth the genesis and growth of evil in the soul. In support of the historical character of the passage, however, there is much to be urged. In the *first* place, it occurs in a book of history, a book the design of which is to narrate facts; and it is inserted there apparently as a piece of the history the writer has to narrate. The preliminary presumption, therefore, is, that it is an account of a real occurrence; at least the *onus probandi* here lies on those who oppose this position.

ii. The sober simplicity of the style in which the whole is narrated favours this conclusion. An historian *may* introduce a parable or an apologue into his history, though it is usual for the historian to give formal notice of this when he does it; but there is in all such cases such a manifest departure in the style of the portion introduced from the style of the narrative portion of his book, that, even if he did not formally announce his intention, the reader would be at no loss to discover the change. In the case before us, however, there is no such alteration of style; the narrative of the temptation and the fall moves on in the same simple matter-of-fact style as any subsequent part of the book.

iii. The traditions of all nations, so far as they bear on the subject of man's primeval state, are in favour of the literality of the Mosaic history. The tradition of a golden age of unsullied purity and perfect happiness, as the first stage of man's history on earth; the important place occupied by the serpent in the traditions of the ancient nations, and the uniform identification of the evil spirit in these traditions with the serpent-form hostile to man, and the glimpses which the ancient mythologies give of some great deliverer who is to appear for the rescue of oppressed humanity: all may be held as corroborating, so far as they go, the Mosaic narrative. (See Faber's *Horæ Mosaicæ*, l. i. c. iii.)

iv. The allusions to the Mosaic narrative as to a record of real events, in other parts of Scripture, afford strong evidence of its historical character. Passing over some of a more doubtful character in the Old Testament, what can be more explicit than the allusions made to it in the New? (Comp. such passages as those already cited from Rom. v. 12–21; 1 Cor. xv. 21, 22; 2 Cor. xi. 3; 1 Tim. ii. 13; John viii. 44; 1 John iii. 8; Rev. xii. 9, 10, xx. 2.) "The last chapter of the book describes, with the most marked allusion to the third chapter of Genesis, a time when all the effects of his (Satan's) temptation are to disappear. In Genesis the ground is cursed, and a flaming sword guards the tree of life. In the Revelation they who enter through the gates into the city, which is there described, are said to have a right to the tree of life; the tree grows in the midst of the street, and on either side of the river; and the leaves of it are for the healing of the nations; and, it is added, there shall be no more curse. The effects of the curse are exhausted with regard to all who enter into the city. Thus the beginning and the end of the Bible lend their authority in support of each other. The transaction recorded in the beginning explains the reason of many expressions which occur in the progress of the sacred Scriptures; and the description which forms the conclusion reflects light upon the opening. Whatever opinion we may entertain of the third chapter of Genesis, when we read it singly, it swells in our conceptions as we advance; and all its meaning and its importance become manifest when we recognise the features of this early transaction in that magnificent scene by which the mystery of God on earth shall be finished."—Hill, *Theology*, ii. p. 10. (Comp. Holden's *Dissertation on the Fall of Man*; Sherlock, *Dissertation on the Sense of the Ancients before Christ upon the Circumstances and Consequences of the Fall*, appended to his *Discourses on the Use and Intent of Prophecy*; Stackhouse's *History of the Bible*; Horseley's *Biblical Criticism*, vol. i.)

But even if this narrative were to be taken as allegorical or mythical, we should still have to recognise the substance and main facts of it as real. For if it be an allegory, there must be something which the allegory is designed to teach; and if it be a myth, there must be a historical basis, of which this is the poetical representation. This throws us back on the question, *What* it is that the allegory is employed to teach? *What* are the facts of which this myth is the poetical adumbration? In reply to this, if it be answered—and this is the only answer that can be given—that we have here an allegorical or mythical representation of the introduction of sin into our world, and the result of that sin to the first man and his posterity, I do not see that it matters much, in a theological point of view, whether we take the narrative literally or not. The only difference is that, taken literally, the narrative teaches directly and by explicit affirmation what, taken figuratively, it teaches indirectly and by shadows. This, whilst it seems to render the attempt to deny the literal reality of the narrative a very needless piece of hyper-criticism, from which nothing is to be gained to any side, renders it less necessary that the theologian should contend for that literality, as if any vital position of his science depended on it.

Man's present State since the Fall.

The result of man's transgression was his fall from a state of innocency (*status integritatis*); his being doomed to death, the penalty he had incurred; and his being cast out of Paradise to endure a life of sorrow, toil, and pain. The death which he incurred was not merely the death of the body; it was supremely spiritual death, consisting in exclusion from the Divine favour, and in exposure to all the spiritual disadvantages of his altered position. He passed from a state of high moral life to one of moral death, of which the sorrows of life, the disorders of the natural world, and physical death itself, are but the fruits and the tokens (1). Into this state man entered as soon as he had sinned, according to the threatening—"In the day thou eatest thereof thou shalt surely die." God came and brought him to an instant reckoning before the tempter had time to withdraw; and then He pronounced on all parties the doom which they had incurred. To Satan he assigned degradation and hopeless, fruitless conflict with the good which was still, in spite of his craft and wickedness, to remain in the world; whilst to man He conveyed, in the very existence of that conflict, a ray of hope, and at the same time assured him of the final triumph of the good over the bad, notwithstanding all the efforts of the powers of evil to the contrary.

1. See Edwards *On Original Sin*, part ii. ch. ii. sect. ii.; Alexander's *Connection and Harmony of the Old and New Testaments*, p. 100, 2d edit.

SECT. III.—*Man's present State since the Fall.*

The Bible represents man universally as in a state of sin. Not only does it expressly declare that all have sinned and come short of the glory of God; that there is none righteous, no not one; that there is not a man that sinneth not; that if we say we have no sin we deceive ourselves, and the truth is not in us (1), with many other similar statements; but the truth of this is assumed throughout by its writers, and is involved in the whole scheme of religion which it unfolds. It is because all have sinned that all are subject to death; because all have sinned that it became necessary that salvation should be provided of God's grace for men. Christ represents Himself as having come to seek and to save the lost; and that all are in this condition is involved in the assertion, that except a man be saved by Christ he perishes for ever. The doctrine of regeneration also involves the fact of sin, for if any man were sinless, it would not be necessary for *all* to be born again before they can see the kingdom of God. Thus emphatically and unequivocally has the Scripture concluded all men under sin.

1. Comp. 1 Kings viii. 46, 47; John xiv. 4, xv. 14; Eccles. vii. 20, 29; Is. liii. 6; Rom. i. 18, iii. 23; Gal. iii. 22; 1 John i. viii. &c.

What the Bible thus plainly declares is abundantly attested from other sources. It is attested by man's own conscience, which ever accuses him of having done wrong and incurred blame. It is attested by the fact, that all men impute *blame* to others for what they do contrary to rectitude, and regard all men as under this imputation. It is attested by the unwillingness which all men have naturally to realise the being and claims of God, and their own relation to Him, as shown by their habitual extrusion of Him from their thoughts, and by their manifest uneasiness when the subject is pressed upon them. It is

Nature of Sin.

attested by the constant care which men in society take to guard themselves by penal laws against the consequences of the assumed wickedness of others. It is attested by the fact, that all religious systems which have prevailed amongst men are constructed on the assumption that men are sinners, and are directed to the end of delivering men from the consequences of this by propitiating the just wrath of Heaven. And it receives large and striking attestation from the prevalence of disorder and deformity in nature, which bears in the scars and blots that disfigure it, and in the confusion and discord by which its functions are impeded, the unmistakable traces of the moral disorder of the being for whose use it was destined, and by whose fortunes it cannot but be affected.

Butler's *Analogy*, part i. ch. iii; Dwight's *Theology*, serm. 29; Bushnell's *Nature and the Supernatural*, ch. v. and vi.

SECT. IV.—*Nature of Sin.*

The sacred writers employ different terms to designate that with which man is chargeable as a sinner. These may be classified as follows:—

1. Those which represent sin as *an erring from the right way—a swerving from the prescribed path.* To this belong the often recurring words, חֲטָאָה, חֲטָאָה, חֲטָאת, all of which are formed from the root חָטָא, *he erred*, or *missed his mark* (see Judges xx. 16). The Greek word ἁμαρτια, which is the standard designation employed in the New Testament, has a similar etymological meaning, being connected with the verb ἁμαρτανω, which signifies originally, *I miss* or *err* (Hom. *Il.*, iv. 491, του μεν ἁμαρτε, "Him, indeed, he missed;" x. 372, ἑκων δ' ἡμαρτανε φωτος, "He intentionally missed the man"). The idea here conveyed is, that sin is a missing of or departing from the way which has been marked out for us, a failing to hit the mark set up. To this class also belong שְׁגָגָה, from שָׁגַג, *he wandered*, and שְׁגִיאָה, from שְׁגָגָה, with the same meaning.

2. Those which represent sin as *a defection from God.* Here we have such words as סָרָה, from סוּר, *he resisted*, or *drew back;* sometimes, as in Jer. xxviii. 16, translated "rebellious" in the Auth. Vers.; סָרַר, from סָרַר, *he was refractory* or *contumacious;* עָוֹל, from עָוַל, *he turned aside, declined;* פֶּשַׁע, from פָּשַׁע, *he revolted;* παραπτωμα, an offence, *i.e.*, against God; ἀσεβεια, want of reverence for God, godlessness, the state of those who are ἀθεοι.

3. Those which represent it as *lawlessness or guiltiness.* Here we have רֶשַׁע from רָשַׁע, which in Hiphil signifies to declare guilty of a breach of law; so the Greek ἀνομια, ἀδικια, and παραβασις.

4. Those which represent sin as *moral evil;* such as עָוֹן (comp. Gen. xliv. 16), κακον, αἰσχρον, πονηρον, &c.

As in all these terms there lies, on the one hand, the idea of something which man ought to be or to do—some mark he is bound to hit, some path he is bound to follow, some law he has to obey, some excellence he ought to exemplify; and, on the other hand, the fact of his failing to come up to what is required of him; we receive from them the general conception of sin as a not doing of or being, on the part of man, what he is required to be and to do.

When we seek to acquire a still more precise concept of sin, an especially valuable guide is supplied to us by such a passage as 1 John iii. 4, ἡ ἁμαρτια ἐστιν ἡ ἀνομια, "sin is lawlessness," or opposition to law. With this may be compared Rom. iii. 20, "By the law is the knowledge if sin;" and v. 13, "Sin is not imputed where there is no law."

Nature of Sin.

According to this representation the essence of sin lies in its contrariety to law, the law of God. With this fall in—1. The peculiar character of the first sin, the essential evil of which lay in its being a violation of God's law; 2. The fact that God treats sin with *punishment*, which can happen righteously only under a system of law; and 3. The fact that sin cannot be forgiven except on the ground of atonement, the necessity for which arises from the claims of law and the danger that would accrue to government were sin pardoned without an atonement.

With this must be connected the view of sin so often and so emphatically given in Scripture as *rebellion against God, disobedience to God* (comp. *e.g.*, Gen. xiii. 13, xxxix. 9; Exod. xxxii. 33; Deut. xx. 18; Ps. li. 4; Matt. vi. 14, 15; Rom. v. 15–20; 2 Cor. v. 19; Eph. ii. 1–4, &c.) This is viewed as something beyond mere transgression (see Job xxxiv. 37); it implies at once disregard to law, apostacy of heart from God, and ungrateful alienation from Him. These two aspects of sin, however, coalesce through the consideration that a law implies a lawgiver, and as God is the giver of the law of which sin is a transgression, such an act is not only against the law but against God also.

The formal notion of *sin* is thus, not so much moral evil in itself as moral evil viewed as an act of transgression of the Divine law, and rebellion against God, involving ingratitude to Him and apostacy from Him.

MELANCHTHON—"Peccatum est defectus vel inclinatio vel actio pugnans cum lege Dei." GERHARD—"Peccatum est discrepantia, aberratio, deflexio a lege." CALOVIUS—". . Illegalitas sive difformitas a lege." SHORTER CATECHISM—Sin is any transgression of or want of conformity to the law of God. Augustine maintained that sin was essentially something "concupitum, cogitatum, dictum, factum *adversus* Divinam legem" (*Contr. Faus.*, bk. xxii. c. 27); and the same idea lies in Melanchthon's "pugnans." Augustine's view has been pressed by papal theologians into the service of their doctrine of works of supererogation. A distinction is made, also apparently acknowledged by Augustine, between moral perfection and immunity from sin, the former being absolute and complete conformity to the law of God, the latter being reached by a sincere and honest and determined effort after such conformity (the *obligatio ad finem* and the *obligatio ad media* of Bellarmine, *De Monachis*, ch. 13, &c.); and on this is erected the conclusion that a man may attain merit before God, even though he may not reach absolute perfection. As this conclusion would be utterly invalidated were the maxim "Omne minus bonum habet rationem mali" admitted, this maxim is denied, and sin is held to be only what is a positive transgression of the law. But if the law requires what is good, what man's moral sense approves, and what he feels that he ought to attain, is not every shortcoming from that felt by his own conscience to be evil? and to what is such a shortcoming to be traced but to the presence and working of evil in his mind? Why should a man do less than a law, holy, just, and good, requires him to do, except that something not holy, just, and good sways him to a course which is less or other than the law requires? If it be said, on this ground there never can be a sinless creature, for a creature being limited must ever fall short of absolute goodness and holiness, it is enough to reply, that if there is sin only where there is transgression of or want of conformity to law, and as no law can be just and good which demands of a creature more than he can perform, sinless perfection may be reached by a creature by perfect conformity to a law which is far from embodying or requiring absolute goodness. All creature perfection is relative perfection, and when this is reached, sinlessness for the creature is reached.

Schleiermacher rejects the definition of sin as transgression of the Divine law, on the ground that law has reference merely to *conduct*, and therefore cannot be a norm of that goodness which depends more on the inner act of the mind than on the mere outward performance (see his *Glaubenslehre*, i. p. 363; ii. p. 229, sect. 66, 2, and sect. 112, 5, 3d edit.) But this is an arbitrary and untenable restriction of the concept of law, especially of that Divine law which "is exceeding broad," and which extends to the feelings and intents of the heart no less than to the outward conduct. Schleiermacher, moreover, has here overlooked the fact that there can be no *moral* law which simply enjoins conduct; from the moral constitution of man, in commanding what is outwardly good, it summons forth also his moral sense to the approval of it, and is obeyed only as that is fully rendered (see Müller, *Christian*

Principle of Sin.

Doctrine of Sin, Eng. Tr., vol. i., p. 43 ff.) Schleiermacher's own definition of sin is, that it is "a positive antagonism of the flesh to the spirit," where by "flesh" he means "the totality of the so-called lower powers of the soul," and by "spirit" he means what he calls "the God-consciousness." "If," says he, "we suppose a condition in which the flesh has a receptivity only for the impulses which issue from the place of the God-consciousness, without being an independent motive principle; in such a case no antagonism between the two would be possible, and in so supposing we have supposed a sinless condition. Both potences would then, in each momentum in the self-consciousness, be perfectly one, for each momentum would begin in the spirit and also end in the spirit, and the flesh would only be as a living intermedium, as a sound organ, without bringing into view anything not originated in and approved by the spirit, whether its own proper act or an adulterated part of an act issuing from the spirit." More popularly he afterwards says of sin, that "it is committed when we lust after what Christ contemned and the contrary," a definition which he supports by a quotation from Augustine (*De Vera Relig.*, 31): "Non enim ullum peccatum committi potest, nisi aut dum appetuntur ea quæ ille contemsit aut fugiuntur quæ ille sustinuit." It would be easy to multiply statements favouring Schleiermacher's doctrine from Augustine (as, for instance, "animum peccati arguimus cum eum convincimus, superioribus desertis, ad fruendum inferiora praeponere" (*De Lib. Arbit.*, iii. 1); but though such may be regarded as useful practical descriptions of sin, they cannot be regarded as scientific definitions of it. Schleiermacher's way of stating the doctrine, besides, is objectionable; for what he calls "God-consciousness" is really, in point of fact, a man's own conscience; and to make sin consist solely in going against this, is either to erect a purely subjective, and therefore flexible, standard of rectitude, or to pretend to answer the question, What is sin? by simply moving it a stage further back. When the flesh draws one way and the spirit another, unless the spirit have in itself the *reason* of what it approves, we have still to ask *why* is it that the flesh inclines to sin. A similar fallacy lies in the view of sin given by Poiret, that "profound but mystical thinker," as Sir W. Hamilton has designated him (*Notes to Reid*, p. 784): "Peccatum est indecentia, incongruitas, repugnantia in re secum vel cum suo statu."—*De Cogit. Ration.*, bk. iv. c. 11, sect. 1. This presumes that in man himself is found the norm or standard of what ought to be. If self were law, repugnance to self would be sin. But this can be said only of God.

Sect. V.—*Principle of Sin.*

Sin, in its nature, is lawlessness. But does this *per se* constitute the evil of sin? Is not this the mere effect of the operation of some *principle* of evil in the soul? All man's voluntary acts flow from some inner principle or spring. What is the principle of sin in man that leads him to that lawlessness which is sin?

The antagonist of sin is moral goodness or holiness. If we can ascertain the principle of holiness in the creature, it will go far to enable us to determine the antagonist principle of sin.

Moral goodness or holiness in the creature is conformity to the moral nature of God (Moral Philosophy, pp. 556, 563); not conformity to the Divine law simply as law, but conformity to that perfect nature of which the Divine law is the utterance. But this conformity can exist only where there is a harmony between the Divine mind and the creature mind; in other words, where the mind of the creature has perfect sympathy with God in that complacency with which He necessarily regards His own all-perfect nature. We find the principle of holiness in the creature, then, in complacency in the Divine nature, as made known to us. Delight in God, as the absolutely holy,—adoring, admiring love to Him for what He is, so far as that may be apprehended by us: this is the germ from which alone, and from which surely, all holy affections and actions spring in the creature.

We are commanded to be holy *as* God is holy, *i.e.*, our holiness is to be of the same *kind* as His. But the holiness of God is His most perfect love of Himself (Buddeus, *Inst. Theol. Dog.*, p. 238), and in the exercise of which He shows Himself in all His affections in exact conformity to His own perfect nature (Venema, *Theology*, p. 161). It follows that our holiness, to be *as* His, must flow from a like love for God, and complacent delight in Him. This falls in with and is supported by our Lord's teaching, that all moral goodness is resolvable ultimately into supreme love to God (Matt. xxii. 36, 39), and the place which the apostles assign to this as the root and spring of all goodness (1 Cor. viii. 2, 3; Rom. v. 1–5; Eph. iii. 17–19, iv. 15, &c. (See Wardlaw's *Christian Ethics*, lect. vi.–viii.)

Kinds of Sin.

We are thus brought to the conclusion, that the principle of sin, and of all moral evil, must be an absence of love to God—the state of those who, in the Bible sense of the term, are ἄθεοι. It is not necessary that this should amount to positive enmity to God, to hatred of Him, or to a dark conscious repugnance of heart from Him; the negative state is enough; if the heart be a stranger to love to God, there the principle of sin is enthroned. Hence the apostle, in tracing the progress of human depravity and degeneracy, finds the commencement and source of the whole in man's becoming irreverent and unthankful, in his not glorifying God as God, in his not liking to retain the knowledge of God in his thoughts. He thus became destitute of the only sure guiding principle of goodness, and as a consequence he was left to a reprobate mind, and soon became proficient in all evil (Rom. i. 21–23).

It may be objected, that we thus fix upon a negative rather than a positive principle of sin. But this, instead of being an objection, seems rather a recommendation; for as sin itself is a negative state ("peccatum defectivus motus est; omnis autem defectus ex nihilo est," August. *de lib. art.* ii. 20), just as darkness is the negation of light, and cold the negation of heat, the principle appropriate to it is a negative one. Those who insist upon determining a positive principle of sin, find this in creature love in general, or selfishness as a form of creature love. The latter alternative is exposed to the obvious objection, that by adopting it we are shut up to pronouncing all actions selfish, or admitting that some actions of man are sinless; nay, that though man withholds his affection from God, yet, if he bestow it not on himself, but on other creatures, he is so far sinless. Deterred by such considerations, most have followed Augustine in placing the germ of sin in creature love in the general: "Hoc enim peccabam quod non in ipso sed in creaturis ejus, me atque ceteris, voluptates, sublimitates, veritates quærebam, atque ita irruebam in dolores, confusiones errores" (*Confess.* i. 31). But may not this be with greater propriety regarded as a primary *result* of alienation of heart from God—the first step in sin, rather than as the principle and source of sin itself? Wrong thoughts of God, wrong affections towards God, draw men away from Him, and lead them to give to the creature that which is due only to the Creator. The next step is all rebellion; for the mind, averse from God, no sooner comes into relation to His law, than it repels its claims, resists its authority, and violates its injunctions. (See Müller's *Christian Doctrine of Sin*, vol. i. p. 93 ff.)

Sect. VI.—*Kinds of Sin.*

Though all sin has essentially the same nature, and proceeds from the same evil principle, there are different forms in which it presents itself to observation. Hence theologians have been led to classify sins according to certain differential qualities, as follows:—

Class A.—In respect of their immediate object—that against which they are immediately committed. Here we have—

1. Sins against God; also sins of the first table of the law, *peccata primæ tabulæ Decalogi.*
2. Sins against our neighbours; } *Peccata secundæ tabulæ*
3. Sins against ourselves. } *Decalogi.*

B. In respect of the law of which they are a transgression.

1. Sins of commission—*Peccata positiva quæ committuntur adversus legem vetantem.*
2. Sins of omission—*Peccata negativa, quæ committuntur adversus legem jubentem.* Comp. Matt. xxv. 42–45, "Inasmuch as ye did it *not*;" James iv. 17, "Therefore to him that knoweth to do good and doth it not, to him it is sin" (1).

C. In respect of the compass of the act itself.

Kinds of Sin.

1. Inward sins, *peccata interna, sive cordis, ἐπιθυμιαι πονηραι*—all such tendencies and emotions as oppose, or are inconsistent with the law of God,—evil thoughts, lusts, and passions.

2. Outward sins, *peccata externa, sermonis et operis*—all words and deeds which transgress the law.

D. In respect of the party charged with them:—

1. Sins directly committed by himself, *peccata propria.*

2. Sins committed by others in which he partakes, *peccata aliena, permissionis, participata* (2).

E. In respect of intention on the part of those committing them:—

1. Voluntary sins, *peccata voluntaria, προαιρετικα, quæ deliberato consilio committuntur* (3).

2. Involuntary [unpremeditated] sins, *quæ non deliberato consilio committuntur.* These may be either,

a. Sins of ignorance, transgressions of an unknown law, and that either (1.) helpless ignorance, as where the law has not been revealed [These are properly not sins at all. Comp. John xv. 22, "If I had not come and spoken to them they had not had sin;"] or, (2.) ignorance that may be overcome, as *e.g.* that of the Jews in crucifying Jesus: "I wot," said Peter to them, "that through ignorance you did it, as did also your rulers;" and that of Paul in persecuting the Church, "I did it," says he, "ignorantly in unbelief." In both these instances, however, the ignorance was culpable, because it might have been helped.

b. Sins of rashness or precipitancy, into which a man falls from the suddenness of the temptation. To such Paul refers when he says, Gal. vi. 1, "Brethren, if a man be overtaken (*προληφθῃ*) in any fault," &c.

c. Sins of infirmity arising from the influence of physical causes. Comp. Matt. xxvi. 41, "The spirit indeed is willing, but the flesh is weak."

F. In respect of enormity and punability:—

1. Clamant sins, *peccata clamantia vel manifesta*—such as those of which Paul speaks when he says, "Some men's sins are open or manifest beforehand (*προδηλοι*) going before to judgment." Sins of this class are such as, whether man punish them or not, the righteous judgment of God will be sure to overtake those who have committed them. Comp. Gen. iv. 10, xviii. 20, xix. 13; Exod. iii. 7, 9; Deut. xv. 9; James v. 4 (4).

2. Non-clamant sins, *peccata non clamantia, muta, quæ Deus longanimitate sua dissimulat et tolerat.* Comp. Acts xvii. 30.

3. Mortal sins, *peccata mortalia,* or *mortifera.* Comp. 1 John. v. 15–18. These, as distinguished from venial sins, are commonly described by Protestant divines as sins committed deliberately by the regenerate, and which destroy spiritual life; while the latter are sins of rashness, &c. So far as this is true, it coalesces with the following.

4. Sins of greater or lesser aggravation. Matt. xi. 24; Luke xii. 47; 1 Tim. v. 8.

5. Sins remissible or irremissible. The only irremissible sin is that against the Holy Ghost, Matt. xii. 31. Comp. Mark iii. 28; Luke xii. 10; Heb. vi. 4–6.

1. There is perhaps here a want of sufficient precision. Every positive act of sin is a breach of a law which forbids that sin, but it is also a breach of a corresponding law which enjoins the opposite good. On the other hand, every omission of good which the law enjoins is not necessarily a breach of the law which forbids the opposite evil. We cannot commit evil without omitting the antagonist good; but we may omit good without necessarily committing the antagonist evil. *E.g.*, one cannot tell a lie, which is a breach of the law forbidding falsehood, without at the same time breaking the law which commands to speak the truth; but one may omit to obey the law which commands to show kindness to all men without directly breaking the law which forbids to do injury to any man. We must distinguish then here, and say that all sins of commission are also sins of omission, but all sins of omission are not also sins of commission. And we must distinguish further between a law of primary obligation and a law of secondary obligation. By the former we mean one which arises directly out of our relation to God, and which is always binding; by the latter, we mean a law arising out of our relations to our fellow-men, and which is binding only under certain conditions. Now, in reference to the former, there is no distinction between a sin of omission and one of commission; every omission of the commanded good is a commission of the prohibited opposite evil, and *vice versâ.* In reference to the latter there is a distinction between sins of omission and sins of commission, to the extent that though the commission of a forbidden evil is also of necessity the omission of the opposite good, the omission of a commanded good is not necessarily the commission of the opposite evil.

Source of Man's Sinfulness.

2. This distinction is founded on such passages as Rom. i. 32, "Who knowing the judgment of God, that they who commit such things are worthy of death, not only do the same, but have pleasure in them that do them, or consent with them that do them;" and 1 Tim. v. 22, "Neither be partaker of other men's sins." But neither of these passages seems to authorise the distinction. There is, undoubtedly, a distinction between sins which we ourselves commit, and sins which we are pleased to see others commit; but, in the latter case, the sin, *quoad nos*, is not in the thing actually done, but in the approval which we bestow upon the doing of it; and this is as much a *peccatum proprium* to us as the doing of the act is a *peccatum proprium* to the party committing it. Then, as to the apostle's caution against our becoming partakers of other men's sins, his meaning plainly is, that we are not to sanction, authorise, or encourage men to do wrong, inasmuch as we thereby become participators, as it were, in the sins which they commit. But in this, as in the former, the sinful part of the act *quoad nos* lies in what we really do, viz., the sanctioning of what is wrong, or the permitting a person to do what we know to be wrong. The sin of an act, as an act, belongs wholly to the party committing it; the sin that attaches to others, in the case supposed, accrues from their regarding with satisfaction that sinful act, or encouraging to the commission of it by their sanction. In fact, the reason of the thing forbids such a distinction as this. There is no such thing as a sin chargeable on a party which is not a *peccatum proprium* to that party. If he can say truly, "I did not do it, another did it," he says what completely removes from him the charge of that sin. He may, indeed, approve and consent to it, or sanction and encourage in it, and in so far he is guilty of sin; but the sin of which he is guilty is his own sin, viz. the transgression of God's law, which he has committed in approving of what is evil, or sanctioning what is wrong; of the evil done, or the wrong committed, the sin rests wholly on the party who acted in the case. We would set aside this distinction, then, as one altogether unfounded.

3. These would be more properly called premeditated sins. All sin is voluntary. It is a fundamental principle in ethics, that neither viciousness nor virtuousness can be predicated of any act if it be not voluntary. "Nunc vero," says Augustine, "usque adeo peccatum voluntarium est malum ut nullo modo sit peccatum si non sit voluntarium."—*De Vera Relig.*, c. 14. If the party apparently performing the act be not acting in accordance with his will, he really ceases to be an agent; he becomes passive in the hands of another; and the act, so far as he is concerned, possesses no moral quality whatever. The apostle, indeed (Heb. x. 26), uses the words *ἑκουσιως ἁμαρτανειν*; but he is speaking there of apostasy, and the sins against which he cautions are such as lead to apostasy. He that, knowing the natural result of such sins, runs into them with his eyes open, virtually rejects the gospel, and for him there is no second Saviour.

4. These clamant sins have been enumerated in the mnemonic verse—

> "Clamitat ad cœlum vox sanguinis et Sodomorum
> Vox oppressorum, mercesque retenta laborum."

As in this distich Exod. xxii. 23 seems to be overlooked, the second verse has been altered by some, thus—

> "Vox oppressorum, viduæ, pretium famulorum."

Perhaps still better thus—

> "Oppressi ac viduæ mercesque retenta laborum."

(See Bretschneider, *Handbuch*, ii. p. 11, sect. 119; Hahn, *Lehrbuch*, p. 416.)

Sect. VII.—*Source of Man's Sinfulness.*

Having considered the fact of man's sinfulness, and the nature, principle, and modifications of sin, it now comes in course that we should ask, whence this fact? To what are we to trace this universal sinfulness of the race?

Now, as sin is the same thing in all men, its essential

Source of Man's Sinfulness.

principle and manifestations being the same in all, it must be regarded as something adhering to our nature in our present state of being. Were it not so we should either find some men who are not sinners, or some whose sins sprang from a different principle from that which lies at the source of those of others.

Further, the fact that all sin, both in act and in principle, is the same as that sin by which our first parents fell—viz., in act, a transgression of the law of God; and in principle, alienation of heart from God—is a fact which, if it does not suggest, certainly falls in with the conclusion that the first sin has had something to do with the production of all that have followed.

Once more, if sin be the same thing in all men, and therefore something adhering to our nature as at present existing, it must be something which is either added to that nature in each individual man immediately by God, or it must be something which accrues to each man in consequence of the connection of all men with the common source of the race. Besides these two, there is no way in which we can suppose that a quality belonging to the nature of all men could have come to be attached to that nature; nothing but community of derivation, either directly from God, or by connection with a common head, being adequate to account for a quality belonging to all men. The former supposition, however, is altogether incredible, and must, therefore, be rejected, inasmuch as it would make God directly and immediately the author of sin. We are, therefore, shut up to the latter, and must trace the universal sin of men to their connection with the first man, Adam. We do not at present express any opinion as to the *nature* of that connection—that will be subsequently investigated; we simply indicate the conclusion, that to a connection of *some* sort with the original man, the sinfulness of the human family must be traced.

What these general considerations thus render probable, is placed beyond doubt by the testimony of Scripture.

1. The sacred historian of man's origin and early experience, after telling us that Adam was made in the image and likeness of God, tells us that his son Seth—the successor of Adam in the line of the godly—the heir after him of the patriarchate or covenant-headship of the children of God—was begotten by him "in his own image and likeness." It would not be competent for us to lay much stress upon this expression by itself, but when it is considered that the expression occurs only here—that it occurs on the first occasion that seems suitable after the narrative of Adam's fall—that it enunciates a marked contrast with what the historian has previously described as the original state of man—and that there seems no reason for its being introduced here except to mark that man no longer comes into being in the image and likeness of God, but now bears the image of his sinful and fallen parents; there seems strong ground for concluding from this passage, that an intimation of no very doubtful kind is conveyed in it, of a connection between Adam's sin and fall, and the sinful and corrupt nature of his posterity.

This is confirmed when we find the apostle describing the natural condition of men as a bearing of the image of the earthly (1 Cor. xv. 49). The most natural and satisfactory explanation of this is, that an allusion is made in it to man's natural condition, as a result of the descendants of Adam being born in his image and likeness, and no longer in the image and likeness of God.

2. There are many passages of Scripture which distinctly assert that sin is connatural to man. "And God saw that the wickedness of man was great upon the earth, and that every imagination of the thoughts of his heart was only evil continually" (Gen. vi. 5). "The imagination of man's heart is evil from his youth" (Gen. viii. 21). "What is man, that he should be clean? and he that is born of woman, that he should be righteous?" (Job xv. 14, 15); "Shall mortal man be just before God? shall a strong man be pure with his Maker? (Job vii. 20). Behold I was shapen in iniquity, and in sin did my mother conceive me" (Ps. li. 5). "That which is born of the flesh is flesh" (John iii. 6). "I am carnal, sold under sin" (Rom. vii. 14, &c.) (1). None of these passages, it is true, assert any connection between man's sin and that of Adam; but they all more or less clearly intimate that sin is not an accident that befalls this man or the other—not something which is conveyed to man from external sources, and grows upon him wholly from without; but something which operates from within—something which is in man as man—something which if not of the nature of a *vitium originis*, is at least the result of a privation of which all men are the subjects; and as this can belong to all men only in virtue of their being descended from a common stock, these passages implicitly support the position now before us.

Source of Man's Sinfulness.

1. On these passages, see, on the one side, Taylor *On Original Sin*, and, on the other, the replies of Edwards and Payne, in their respective treatises on this subject.

3. To the same effect is that remarkable expression of the apostle, Eph. ii. 3, "by nature the children of wrath even as others." Here the being by nature children of wrath is described as the common condition of the race: the Ephesians were so *even as others*—not by any peculiarity of their state or character, but because all men are so. As regards the phrase τεκνα ὀργης, it is best explained by reference to the Hebrew idiom, according to which a person was said to be the son of any object or quality when that object or quality exercised a dominant influence on his condition or state; compare בְּנֵי־תְמוּתָה, Ps. cii. 21, = persons delivered over to death, exposed to its attack; οἱ υἱοι του φωτος, Luke xvi. 8, = persons under the illuminating influence of Divine teaching; καταρας τεκνα, 2 Pet. ii. 14, = persons under the curse of God. Thus taken, the phrase τεκνα ὀργης is much the same as if the phrase ὑπ' ὀργην had been used; = persons under wrath—*i.e.*, the wrath of God. Now this says the apostle, all men are φυσει by nature—*i.e.*, they become so not by any external influence, ordinance, or power, but by an internal tendency which develops itself in them from their birth. It is impossible to attach to this any clear or consistent meaning, but by understanding it of the native sinfulness of the human race, exposing them universally to the Divine displeasure and consequent condemnation.

Some who oppose the position we are supporting endeavour to get rid of the argument from this passage by denying that φυσει means here by *nature*, and asserting that it is to be taken in the sense of *really or truly*; while others represent it as meaning "by customary practice" (Whitby On the Place). But for the former of these there is not the shadow of authority, and for the latter Whitby constructs a kind of authority only by mistranslating and mangling a passage from Suidas. "His words," says he, "are these: When the apostle saith, we are by nature the children of wrath, he saith not this according to the proper acceptation of the word *Nature*; for then he had cast the blame on the Author of Nature; but he understands by it a long and evil custom." What Suidas says is, that Paul "says this not according to *this* signification of nature (οὐ κατα τουτο σημαινομενον φυσεως, with reference to what precedes—viz., where φυσις is stated to be used in the sense of *essential cause*; τουτ' ἐστι την αἰτιαν καθ' ἣν οὐ κατα συμβεβηκος ἀλλ' οὐσιωδῶς αἱ οὐσιαι κινουνται), ... but he means by it *an immanent and most evil disposition* (or *affection*), and a long and wicked habit (ἀλλα την ἐμμονον καὶ κακιστην διαθεσιν, καὶ χρονιαν καὶ πονηραν συνηθειαν). What support there is here for Dr Whitby's exegesis the reader can judge for himself; there can be but one opinion of the fairness of Dr Whitby's quotation. There are only two senses in which the candid scholar can take Paul's words here; either they mean that men are born children of wrath (compare the use of φυσει by Isoc. *Evagr.* 16, where a man's φυσει πατρις is contrasted with his νομῳ πολις), or they mean that they become children of wrath through the development of a native principle (as David is called by Josephus φυσει δικαιος, *Ant.* vii. 7, 1; and as φυσις is used Rom. ii. 14; 1 Cor. xi. 14, &c., in the N.T.) For our present object, it is

Source of Man's Sinfulness.

of little moment which of these two be preferred: in either case, the *native* sinfulness of man is asserted by the apostle.

4. The fact of a connection between Adam's sin and that of mankind is expressly asserted in several passages of Sacred Scripture.

Is. xliii. 27: "Thy first father hath sinned." God is in this context by the prophet charging the people of Israel with iniquity, and the words cited appear to have the force of an assertion that they were sinners, as the fallen members of a fallen family—the worthless branches of a degenerate stock. Some interpreters, indeed, would take the word *father* here collectively, as including all the progenitors of the Israelites; but though this interpretation might be admitted if the word father stood alone, it is entirely precluded by the use of the adjective *first* before it: by no principle of interpretation could the phrase, "thy *first* father," be construed to mean "*all* thy fathers." This language plainly fixes our regards upon some *individual* as here referred to; and amongst individuals our choice lies between Abraham, the progenitor of the Jewish people, and Adam, the progenitor of all men. But the reference of the passage to Abraham seems excluded by the thing here predicated of the party spoken of, viz., that *he sinned.* This must be looked on as emphatic—as constituting in some way a marked and peculiar fact in his history, which distinguished him from others. Now this could not be said of Abraham. He doubtless was a sinner; but he was a sinner just as other men are. He committed no special and peculiar sin, which stands out in contradistinction from those of others as the sin of Abraham. His peculiar distinction among men is rather the eminent piety to which he attained than any eminent sin of which he was guilty. It was otherwise with Adam. The great event in his history is the sin he committed. This stands out from all the other events recorded concerning him as the *peculiar* event of his history; and as it has acquired this character not so much from anything in itself as from its momentous bearing on the race, so it is most natural to understand such an expression as that of the prophet in the passage cited as referring to this. In this interpretation Hitzig, Umbreit, Knobel, and several others, whose conclusions are guided solely by hermeneutical reasons, and are not in the least swayed by doctrinal bias, concur.

Hosea vi. 7 is sometimes also adduced as asserting this: "But they like men have transgressed my covenant." The expression, "like men," is in the original כְּאָדָם, "like Adam;" and hence the passage has been regarded as alluding to the sin of our first progenitor, whom the Israelites are said to have followed in the case referred to. This interpretation is not to be repudiated; at the same time, the fact that Adam is hardly ever used, except in the first chapters of Genesis, as a proper name, and the circumstance that, if the word be taken as a collective, it produces a very good sense—the allusion being to the usual and characteristic waywardness of man in rebelling against God—conspire to render the former interpretation at least doubtful.

In the New Testament there are two classical passages on this head, Rom. v. 12–21, and 1 Cor. xv. 45–47. In the former of these, the fact of a connection between the sin of Adam and the sinfulness of mankind is set forth in the most explicit terms: "By one man sin entered into the world, and death by sin; and so death passed upon all men because all have sinned (1). By the offence of one many are dead. By the offence of one [there came] on all men [something which tended] to condemnation. By one man's disobedience the many were made sinners." In this context Paul also affirms that Adam was the type of Christ, *i.e.*, the official position or relative character of the one bore an analogy to that of the other; and this the apostle still further illustrates by showing that, as the conduct of the one has had results which extend beyond himself to others connected with him, so had the conduct of the other; and that, as the results flowing from Christ's work are for the acquittal and redemption of His people, so those flowing from Adam are for the condemnation and destruction of those connected with him. With this stands closely connected Paul's allusion to this subject in the other of the two passages above referred to, 1 Cor. xv. 45–47. In this passage Paul styles Adam and Christ the *first* and *second* man. Now, as he cannot intend by this that Christ was second to Adam either in order of time or of dignity—for in respect of time many generations intervened between Adam and Christ, and in respect of dignity Christ had ever the pre-eminence over Adam—he must intend to convey the idea that Adam and Christ sustain a character *peculiar* to these two, in which they appeared successively, Adam first and Christ second, and in which they *alone* appeared. Now the character peculiar to Christ, as we know from the whole of the New Testament, was the character of a public head or representative, in virtue of whose obedience those connected with him are constituted righteous. It follows that, if the position of Adam was the same, *mutatis mutandis*, with that of Christ, he must have occupied the place of one through whose sin all connected with him were constituted guilty or under condemnation.

Source of Man's Sinfulness.

1. The words ἐφ' ᾧ πάντες ἥμαρτον, rendered in the authorised version, "because all have sinned," have been variously rendered by different interpreters. Augustine renders them, "in quo omnes peccaverunt," and refers them directly to Adam, the "one" of the preceding clause (*De peccat. mer. et remiss.*, i. 10). Others refer the ᾧ to θανάτος, as the nearer antecedent, and render "unto which all have sinned." In support of this it is argued that ἐπί, when construed with a dative case, often signifies *to* or *unto*. Thus ἐπ' ἐνδοξίᾳ ὁδος, *the way to fame* (Lucian). Κακουργος ἐπι τῳ θανατῳ, *a criminal unto death* (Demosth.) Ἐπι θανατῳ συλλαβειν, *to carry to death or execution* (Isoc.) Ὑμεις ἐπ' ἐλευθερίᾳ ἐκλήθητε, *ye have been called to liberty* (Gal. v. 13). Κτισθεντες ἐν Χριστῳ Ἰησου ἐπι ἐργοις ἀγαθοις, *created in Christ Jesus unto good works* (Eph. ii. 10). See also 1 Thes. iv. 7; 2 Tim. ii. 14; and many other places of the New Testament. Ἐφ' ᾧ has likewise this import, denoting the *terminus ad quem* in Phil. iii. 12, and iv. 10. If this construction be adopted, the meaning of the apostle will be, that death has passed on all men as that whereunto sin reaches as its terminus. Others take ἐφ' ᾧ in the sense of "on condition that, provided:" death has been appointed to all who shall sin. But the vast majority of interpreters, and the best of all schools, take these words, with the authorised version, as equivalent to διοτι, "because," = ἐπι τουτῳ ὁτι. So taken, they may mean either that all die because all have sinned in Adam, or that all die because they sin themselves. The former is favoured by both the context and the use of the aorist ἥμαρτον. "Because, as Adam sinned, all men in and with him, as the representative of all mankind, have sinned. Death, which came into the world through the coming of sin into the world, has, in virtue of this causal *nexus* of sin and death, passed on all." (Meyer, comment. on the passage.)

On these grounds we may set it down as an ascertained truth of Scripture, that the sin of Adam is somehow connected causally with the sin of men universally. We have yet to inquire of *what kind* the connection is; in other words, how it is that Adam's sin has become the source of sin to the race.

To this inquiry different answers have been returned, the chief of which we will endeavour to classify and state. They fall into two great classes, according as the effects of Adam's sin on his posterity are viewed as—1. Natural; or, 2. Penal.

Class A. Those which teach that the consequences of Adam's sin to his posterity are simply *Natural.*

i. *The Pelagian hypothesis.* This, though bearing the name of Pelagius (Morgan?), a British monk of the fifth century, found its most logical expounder and defender in Cœlestius, a pupil and friend of Pelagius. According to this hypothesis, no evil result flows to Adam's posterity from his sin except what is inseparable from their being born into a world in which sin and misery already are; there is no *penalty* to which they are exposed, no *vitium originis* under which they suffer.

In the list of tenets for which Cœlestius was condemned by the Council at Carthage in 412, are the following bearing on the subject before us. He taught "Adamum mortalem factum, qui, sive peccaret sive non peccaret, fuisset moriturus:" that "pec-

Source of Man's Sinfulness.

catum Adæ ipsum solum læsit, et non humanum genus;" that "Infantes, qui nasuntur, in eo statu sunt in quo Adamus fuit ante prævaricationem." It would appear that Pelagius himself thought his disciple went too far when he asserted that no harm had come to the race from Adam's sin: "Ipse dicit non tantum primo homini, sed etiam humano generi primum illud obfuisse peccatum, non propagine sed exemplo" (August. *De Pecc. Orig.*, c. 15; Opp. ed. Erasmus, t. vii. p. 794). He held, however, strenuously, "ut sine virtute ita et sine vitio procreamur, atque ante actionem propriæ voluntatis id solum in homine est quod Deus condidit" (same book, c. 13). See Cardinal Noris' *Histor. Pelagiana*, &c., fol., Padua, 1708; Wiggers, *Versuch ein. Pragmat. Darstellung des Augustinismus und Pelagianismus*, &c., 2 vols., Hamb. 1833, translated into English by Emerson; Neander, *Church Hist.*, iv. 313–322, English Tr. by Torrey.

ii. *The Arminian* or *Remonstrant hypothesis.* According to this, Adam is only the remote source of that natural propensity to sin which all men exhibit; the immediate source being each man's own parents. So that sinfulness is propagated from Adam just as any other disease, defect, or morbid quality might be; the connection of mankind with him being simply that of natural descent. Death also comes on all men from Adam not as a penal infliction, but simply as a natural inheritance.

It is hardly just to Arminius to connect this opinion with his name, for, so far as he has given utterance to his views on the subject, he seems to have held that the consequences of Adam's sin to his posterity were *penal.* "Original sin," says he, "is not that actual sin by which Adam transgressed the law concerning the tree of knowledge of good and evil, and on account of which we have all been constituted sinners, and rendered (*rei*) obnoxious or liable to death and condemnation."—*Works*, by Nichols, ii. 717; see also p. 375. But his followers of the Remonstrant party are very distinct in their announcement of the doctrine above imputed to them. Thus Limborch:—"Mors haec non habet rationem pœnæ proprie dictæ in posteris; sed est naturalis tantum moriendi necessitas, ab Adamo, mortis pœna punito in ipsos derivata." "Effectum peccati Adami in posteris est impuritas quædam naturalis, quæ tamen non est peccatum proprie dictum;" and again, "fatemur infantes nasci minus puros quam Adamus fuit creatus, et cum quadam propensione ad peccandum; illam autem habent non tam ab Adamo quam a proximis parentibus."—*Theol. Christ.* bk. iii. c. 3, sect. 1, 4. See also Whitby, *De imputatione peccati*; and Comment. on Rom. v.; Adam Clarke, Comment. on do. Adam is thus only the remote source of man's natural propensity to sin; to each man his parents are the immediate source, just as some remote ancestor may have introduced a disease into his family but which afflicts each man only through his parents.

Class B. Those which teach that the consequences of Adam's sin to his posterity are *penal.*

These fall into two sub-classes according as they retain or reject the doctrine of imputation. We begin with the latter, viz.—

I. Those which reject the doctrine of imputation.

1. *View of some Socinians.* For the most part the Socinians hold by the doctrine of Pelagius on this subject; but some, and among them F. Socinus himself, hold that in consequence of Adam's sin men are penally liable to death, not from any mortal effect in the sin itself, nor that man was created at first naturally immortal, but that in consequence of Adam's sin his posterity have come penally under the actual power of death, to which naturally they are liable, but from which they would otherwise have been protected.

"Concludimus . . . . ex peccato illo primi parentis nullam labem aut gravitatum universo generis humani necessario ingenitam esse, nec aliud malum ex primo illo delicto ad posteros omnes necessario manasse, quam moriendi omnimodum necessitatem, non quidem ex ipsius delicti vi, sed quia cum jam homo natura mortalis esset, ob delictum illud suae naturali mortalitate a Deo relictus est."—F. Socinus, *Prælect.* c. 4. (Comp. Taylor, *Doct. of Orig. Sin*, part i. pp. 51–55.) "Through his (Adam's) one sin death came upon all mankind, as far as which all men are sufferers through his disobedience. . . . Men are subject to death, not from their own personal sins but from the sin of Adam."—Taylor, Par. on Rom. v. 12.

2. *Identification hypothesis.* According to this, Adam's descendants are held to have been so identified with him that they sinned his sin, are guilty of his guilt, and fell in his fall. By some who use this language, nothing more seems to be intended than that, as the apostle says that Levi paid tithes in Abraham, for he was in the loins of his father when Melchizedek met him, so the race sinned with Adam in the sense that they are involved in the consequences of his sin; and it may be doubted whether any of those who have spoken as if they meant to identify the race with Adam in his act of sinning, really intend their words to be taken for what they express. Their language, however, is such that we feel constrained to assign the opinion it utters a place in this scheme; and for want of a better name have called it the Identification hypothesis.

Source of Man's Sinfulness.

"Manifestum est alia esse propria cuique peccata . . . aliud hoc unum in quo omnes peccaverunt, quando omnes ille unus homo fuerunt."—Augustine *De Pecc. merit. et remiss.* i. 11. "Quia . . . [Adam] . . . per liberum arbitrium Deum deseruit justum judicium Dei expertus est, ut cum tota sua stirpe quæ in illo adhuc posita tota cum illo peccaverunt, damnaretur."—*De Corrept. et gratia*, c. 10. "Ut cum omnes posteri ex primo parente ceu ex radice ortum suum trahunt generis humani universitas cum stirpe non abiter quam unicum aliquod totum, sive unica massa considerari potest, ut non sit aliquid a stirpe diversum, et non aliter ab ea differunt posteri ac rami ab arbore. Exquibus facile patet quo modo stirpe peccante omne illud quod ab ea descendit et cum ea aliquod totum efficit, etiam peccasse judicari possit, cum a stirpe non differat sed cum ea unum sit."—Stapfer, *Theol. Polem.* i. p. 236. "The sin of Adam was ours, as really and truly so as it was the sin of Adam himself, so that every believer is bound to acknowledge and confess that he is guilty of Adam's sin."—Haldane, *Comment. on Rom.* vol. i. p. 440.

3. *Hypothesis of a vitium originis.* In the opinion of many, the effect of Adam's sin on his posterity as a penalty, was to poison, pollute, vitiate their moral nature, or so to injure it that the lower propensities became strengthened against the higher powers, and thus man enters the world not only a fallen but a positively depraved being.

"Ille in quo omnes moriuntur praeter quod eis qui praeceptum Domini voluntate transgrediuntur imitationis exemplum est, occulta etiam tabe carnalis concupiscentiæ suæ tabificavit in se omnes de sua stirpe venientes."—Augustine, *De pecc. mer. et remiss.* i. 9. Some, whilst they repudiate this notion that a positively vitiated nature has been entailed on men by Adam's sin, yet think that an increased susceptibility to evil has thence resulted to the race, or that his descendants have received such dispositions and affections as greatly incline them to yield to those inducements to sin in the midst of which they were placed. (See Moses Stuart, *Comment. on Rom.* v. 19; Ballantyne, *Examination of the Human Mind*, Note i. p. 457.) Some have gone the length of supposing that the forbidden fruit possessed a lethiferous and morally vitiating power, which has been transfused into the race by natural descent, and so has brought all under the power of depravity and death. (See Knapp's *Christian Theology*, p. 239, ff.)

II. Those which involve the doctrine of imputation. Here we have again two subdivisions, according as the imputation is held to be *imputatio ad reatum*, or *culpam*, or *imputatio ad pœnam.*

1. *Imputatio ad reatum.* According to this, men are regarded by God as *culpable*, as *blameworthy*, because of Adam's sin; they are guilty, not merely in the sense of being legally liable to suffer through Adam's fault, but also in the sense of being judicially chargeable with that fault. Here we have to distinguish between a mediate and an immediate imputation.

a. Imputatio mediata. Those who hold this, teach that God has adjudged men to the same penalty as Adam, because they, inheriting from him a fallen and corrupt nature, appropriate, as it were, to themselves the sin of their progenitor; in other words, they sin as he sinned, and so incur the same guilt as he, and the same penalty as came on him.

"Those who hold that imputation is *mediate* admit that men are in a state of condemnation on account of their depravity and their participation in the sin of Adam. This, we say, they do not deny, but they maintain that the ground on which they are punished is, not the sin itself, but their participation in that sin, by reason of their natural corruption. This corruption is the antecedent, and

Source of Man's Sinfulness.

the condemnation is its consequent and not *vice versâ*; so that God, in imputing Adam's sin to his posterity, had respect to the natural depravity which intervened, and in virtue of which they became partakers of his sin and rendered themselves deserving of being visited with the same punishment to which he exposed himself."—Venema, *Instit. of Theol.* p. 579. See also Dwight's *Theology*, Sermon 32. Of this view it may be remembered here, that whether true or false, it is improperly ranked as a form of the doctrine of imputation. If men are treated as sinners simply because they sin through a vice of nature derived from Adam, it is on the ground of their own sin that they are brought under penalty, not because that of Adam is in any sense imputed to them.

b. Imputatio immediata. God, on account of Adam's sin, holds all men as if they had themselves committed that transgression—holds them to be culpably guilty of it, and adjudges them on that ground to be legally condemned, as well as morally corrupt and depraved. This is properly *imputatio ad culpam*, and is the view commonly held by strict Calvinists as well as by many Lutherans.

"Primum peccatum Adami quatemus is ut communis parens, caput, stirps et repræsentator totius generis humani spectatur, omnibus ipsius posteris vere et justo Dei judicio ad culpam et pœnam imputatur."—Hollaz, *Examin. Theol.*, &c. See also Quenstedt, *Theol. Didact.* ii. 53 ff. The doctrine of the older Lutherans on this head is thus summed up by Reinhard (*Dogmatik*, sect. 81):—"Imputatio in reatum est judicium secundum quod orta a peccato primo culpa ad omnes homines pertinet." Of the reformed divines the following testimonies may suffice:—"Sicut enim Adam admisso peccato primum reus factus irae Dei; deinde quia reus erat, pœnam peccati, id est corruptionem illam tum animi tum corporis, subiit; sic quoque in posteros naturam transmisit tum ream in primis tum deinde corruptam. De reatus igitur propagatione proprie agit hoc loco Apostolus, cui opponitur imputatio obedientiæ Christi, quæ obedientia per imputationem cum fidelibus communicata postquam idem Christus morte sua pœnæ reatus persolvit, nos etiam imputata justitia induit."—Beza on Rom. v. 12. "Quæritur an actuale peccatum Adami ita omnibus reipsa imputatur ut propter illud omnes rei censeantur et vel pœnas dent, vel saltem pœnis digni existimentur? Affirmatur."—Turretine, *Instit. Theol.* Loc. ix. qu. 9, sect. 9. "Corruptionis causa est culpa Adami posteris imputata . . . . Justissima est autem haec imputatio cum Adam omnium fuit parens, et praeterea fœderalitur omnes repræsentaverit."—Marck, *Medulla*, ch. xv. sect. 31. "Original sin containeth two things—1. The guilt of eternal damnation for the sin of our first parents; 2. The corruption of our whole nature after the fall."—Ursinus, *Summe of Christian Religion, Englished by H. Parry*, p. 51. "Our first parents being the root of all mankind, the guilt of their sin was imputed, and the same death in sin and corrupted nature conveyed to their posterity, descending from them by ordinary generation."—*Confession of Westminster Assembly of Divines.*

2. Imputatio ad pœnam. According to this view, God does not impute guilt to men on account of Adam's sin, though they enter the world with a positively corrupted nature, derived from Adam; but He treats them penally in consequence of Adam's sin, as legally involved in it, by withholding from them all those covenant or chartered blessings which Adam forfeited immediately and directly by his first sin. Men thus come into the world not only without any positive bias to goodness, but with a positive bias to evil, and so fall under the influence of selfish lusts and passions, stimulated and strengthened by the circumstances in which they find themselves, whereby, in process of time, they not only contract personal guilt before God, but become wholly depraved, as they are wholly without God.

By most of those who hold the doctrine of *imputatio ad pœnam*, it is also held, that man derives from Adam a vitiated nature. This is Edwards' view (see his *Great Christian Doctrine of Original Sin Defended*, &c., especially part i.), and this seems also to have been substantially the view of Calvin:—"Haec itaque duo distincte observanda: nempe quod sic omnibus naturæ nostræ partibus vitiati perversique, jam ob talem duntaxat corruptionem damnati merito convictique coram Deo tenemur, cui nihil est acceptum nisi justitia, innocentia, puritas. Neque ista est alieni delicti obligatio: quod enim dicitur nos per Adæ peccatum obnoxios esse factos Dei judicio, non ita est accipiendum acsi insontes ipsi et immerentes *culpam* delicti ejus sustineremus; sed quia per ejus transgressionem maledictione induti sumus omnes, dicitur ille nos obstrinxisse. *Ab illo tamen non sola in nos pœna grassata est, sed instillata ab ipso lues in nobis residet, cui jure pœna debetur.*"—*Instit. Christ. Rel.*, book ii. c. 1. sect. 8. Between Edwards and Calvin, however, there seems to be this difference of opinion, that whilst the former held that all men are exposed to penalty simply on account of Adam's sin, the latter seems rather to teach that men are exposed to penalty because of the "lues" or corruption which is in their nature derived from Adam. Edwards has here the advantage in point of accuracy of thought; to hold a creature subject to *penalty* for a corruption or vice in his nature, for a connate defect, can never be "jure."

Source of Man's Sinfulness.

Some, while denying that any vitiosity of nature is penally communicated from Adam to his posterity, have maintained that certain supernatural gifts were enjoyed by Adam, which being bestowed by God out of pure sovereignty, and held only on the ground of the constitution under which Adam was placed, were forfeited by his sin, and so lost to his posterity. "Pœna, quæ proprie primo peccato quasi e regione respondet, jactura fuit originalis justitiæ, et supernaturalium donorum, quibus Deus naturam nostram instruxerat. . . . . Corruptio naturæ non ex alicujus doni carentia, neque ex alicujus malæ qualitatis accessu, sed ex sola doni supernaturalis ob Adæ peccatum amissione profluxit."—Bellarmin, *Amiss. Grat.* iii. 1 and 5. "The federal transgression of Adam exposed us, who had been rendered prospective beneficiaries by the gracious charter given to him, to the loss of all the blessings, the permanent enjoyment of which by us was suspended upon his federal obedience—on his fulfilment of the terms of the charter prescribed by the wisdom and goodness of God. It rendered us liable to death in the two senses which stand in direct opposition to those in which, as we have seen, he enjoyed life—to the death of the body and the death of the soul; or, to speak more accurately, to the loss of that sovereign and efficacious influence, without which life, in either sense of the term, has never been known permanently to exist. It rendered us, I may add, legally liable to this loss; for when God offers certain blessings to an individual, which are to be obtained or retained on any specified condition, that offer has the binding force of law; it lays a moral obligation upon the individual to accept the blessing, by the performance of the condition, and renders its rejection an act not only of folly but rebellion. . . . . It must not be forgotten, that the punishment destined to overtake him in his federal relation was merely the loss of chartered blessings; the loss of the life which had been given to him by sovereign favour, and whose continuance was suspended on the condition of abstinence from the forbidden fruit."—Payne *On Original Sin*, p. 110 ff.

In seeking to bring these various opinions to the test of Scripture, two preliminary postulates may be assumed. The one is, that, as by the supposition it was through Adam's sin that evil came on his posterity, the nature and degree of that evil, as affecting them, cannot essentially differ from the evil he brought on himself. The other is, that as what was purely personal to Adam could not in any judicial way descend to his posterity, we must look to something public and legal in his relation to them as the source of the transmission from him to them of legal disabilities. These two positions being assumed, we proceed to observe—

1. The only peculiarity of Adam's position in paradise bearing on our present inquiry, was his being subjected to a positive test of obedience, on his meeting and satisfying which depended his continuance in that state of privilege in which he had been placed. Much is often said of the supernatural endowments and chartered blessings which our first parents enjoyed in paradise, as constituting the peculiarity of their lot; but if by these phrases anything more is intended than that the privileges suspended on Adam's obedience were purely constitutional privileges, which he enjoyed, not in virtue of his creation, but in virtue of his being placed under a certain legal constitution, they are calculated to mislead the inquirer. They certainly do so if they convey the impression that Adam and Eve possessed any supernatural powers of intellect or degrees of moral strength; for the history gives no intimation that anything of this sort was enjoyed by them; on the contrary, the marvellous ease with which they were led into transgression rather impresses with the conviction, that neither in intelligence nor in moral power were they

Source of Man's Sinfulness.

on a par with multitudes of their descendants. They were intelligent, sinless beings, but their intelligence was certainly not supernatural, nor their moral power equal to that which the struggles of life give to the virtuous man, who by resisting overcomes temptation. Besides, intelligence and holiness are purely personal qualities, and could neither be transmitted by a legal act, nor forfeited by a parent for his child; so that whatever was the degree of these possessed by our first parents, it is not of them we can properly speak in such an inquiry as this. According to the history, that on which Adam's continuance in paradise depended, was his observing the one prohibitory injunction regarding the tree of the knowledge of good and evil; and the peculiarity of his position was, that his retaining of privilege hung suspended on this purely legal condition.

2. The privilege which thus was suspended on this condition was "life." This is plain from the threatening appended to the prohibition: "In the day thou eatest thereof thou shalt surely die." The penalty, therefore, which Adam incurred, and which alone he could constitutionally judicially transmit to his posterity, was "death"—a term of wide and varied meaning in Scripture, and which must in each case be interpreted according to the context in which it occurs. As Adam actually incurred this penalty, it cannot refer here to bodily death; for, with whatever latitude the expression "in the day thou eatest thereof" be interpreted, it would be monstrous to affirm that it could be used of the happening of an event which did not take place for nearly a thousand years after. The term "death" is here best explained by seeing what it was that Adam did receive as the penalty of his sin. By the law, that penalty was to come on him surely and instantly on his committing the offence; and, therefore, we have only to ask, What did not come on him? to ascertain how we are to interpret the term "death" here. Now, on turning to the history, we find that what came on Adam directly and immediately in consequence of his sin was the loss of God's favour, the loss of free and immediate access to God as his creator, subjugation to a certain extent to the power of Satan, and exclusion from the ease and blessedness of paradise, and consignment to a life of toil, privation, and sorrow, to be consummated by a return of the body to the dust whence it was taken. These were the direct and immediate consequences that came on Adam because of his transgression—the elements of that curse which he brought on himself, and which alone he could transmit to his posterity. Of *collateral* effects, such as moral obliquity produced by the act itself of sinning, the history says nothing, though such there doubtless were; but such it does not behove us to include in the penalty which Adam's sin brought upon him by legal incidence under the constitution under which he was placed.

3. Acting thus under a constitution which secured to him certain privileges, not necessarily belonging to him as a creature, Adam, of necessity, sustained a representative character. He appeared as the chief of his race, by whom the family honours were to be transmitted if he acted worthily; by whom they were to be forfeited for all coming time if he acted otherwise. In the case of purely personal qualities or possessions, these may or may not be transmitted to a man's posterity; and this may depend, in the latter case, wholly on the man's own will; but in the case of constitutional privileges,—"chartered rights and advantages secured by patent,"—these, if retained by worthy conduct, cannot but be transmitted to the holder's posterity; if forfeited by unworthy conduct, cannot but be withdrawn from them. In all such cases the holder of the privileges for the time being sustains a representative character, and cannot do otherwise; and this, be it observed, is wholly independent of his own will and choice in the matter.

The representative character, which is thus, from the nature of the case ascribed to Adam, the Scripture distinctly assigns to him. Especially instructive on this point is the apostle's reasoning in Rom. v. 12–19. Here it is asserted that "by one man sin entered the world, and death by sin; and so [in this and no other way] death passed on all men, for that [or because] all have sinned;" *i.e.*, sinned in that first sin (see above). The case of infants is then adduced by the apostle, and this must be viewed as an *instantia crucis*, to use Bacon's phraseology, determining the point which he is here asserting. If infants who have not sinned after the similitude of Adam's sin—*i.e.*, by personal transgression—yet suffer that which was part at least of the penalty of Adam's sin, the consequence is irresistible that they have been involved in that sin—that they shared in his ἁμαρτια though innocent and incapable of a παραβασις like his; and consequently were represented by him when he acted and fell; for under an equitable government, penalty can come upon a party who has not done the evil himself, only when it is done in his name and room by another; according to the maxim of the jurists, "quod facit per alium facit per se." Farther, the apostle institutes a comparison or analogy here between Adam and Christ (as also in 1 Cor. xv. 21, 22, 45), the former of whom he says was the type of the latter, and whom he distinguishes as the First and Second Adam. Now it is only in respect of relation to those who are affected by their agency that any resemblance exists between Adam and Christ; and only in respect of their standing out from all other partakers of human nature, as sustaining a peculiar relation to mankind, that they are respectively first and second. "As in Adam all die, so in Christ shall all be made alive;" as death came on all connected with Adam without any demerit of theirs, so righteousness and life come upon all connected with Christ without any merit of theirs. The relation of both to those connected with them was thus a federal one, and the consequences resulting from both are constitutional, not personal or natural. Thus the apostle represents the relation of Adam to his posterity as respects the penal effect on them of his sin. It was not as their natural head that his sin affected them, but as their covenant or constitutional representative. And in perfect accordance with this the apostle represents men not as *becoming* sinners through Adam as if by imitation, nor as *growing* to be sinners as if through the operation of a vitious principle within, but as *constituted* sinners (ἁμαρτωλοι κατεσταθησαν)—*i.e.*, legally held to be under penalty, and treated accordingly.

4. As the representative of the race, Adam brought on his posterity the penalty he had himself incurred, neither more nor less—viz., death in the sense above described. This could not be avoided under a charter or covenant of privilege. His position resembled that of the chief of a noble house whose disloyalty brings attainder on himself and all who descend from him. His personal qualities, good or bad, may or may not be transmitted; that depends on circumstances with which the patent of his nobility has nothing to do. So was it with the head of our race: when he fell he forfeited for himself and all mankind the privileges of paradise, the life which he there enjoyed. Less than this could not flow from his act; more than this could not be legally inflicted. Hence the notion of a positively vitiated nature as also inflicted on his posterity—a notion which no ingenuity can reconcile with the personal freedom and responsibility of every man—must be rejected. If human nature is vitiated, which we do not deny, this is to be traced to some other cause than the penal incidence of Adam's sin. What the apostle says entered by Adam's transgression was ἁμαρτια—*i.e.*, such a legal liability as stands in direct contrast over against the blessing men derive through Christ, which is righteousness or legal absolution, and re-establishment.

Source of Man's Sinfulness.

Consequences of Man's Sinfulness.

On these grounds the view of those who hold the *imputatio ad pœnam* of Adam's sin to his posterity appears to us that most deserving of being adopted. We say, then, that the sin of Adam has been imputed to his posterity of the human race; by which we do not mean that there is any mysterious identity between Adam and his posterity, as if in some inexplicable sense they were included personally in him; nor that the moral blame of his transgression is shared by them; nor that his act of eating the forbidden fruit was in any sense the act of any but himself; nor that the personal consequences of his offence, as experienced by him, descended to them on account of him: but solely and simply that, in consequence of what he did on that memorable occasion, his posterity have universally come under penal disabilities. They do not inhabit paradise. They have no title to heaven. They cannot claim access to God. They are frail, suffering, sorrowing, dying creatures. They have no natural goodness; no internal spring of holiness; no supreme protection against temptation and evil. They are crownless kings, attainted nobles. Earth, with all its sorrows, is the only inheritance they can lay claim to—the outfield of a world that has been cursed for their ancestor's sake. For that offence by their first parent they take no blame, they can feel no remorse. But in consequence of it they come into circumstances which forbid all pride and self-glorying. They are the descendants of a fallen and dishonoured progenitor; and if they are ever recovered out of this fallen estate, it must be by an act of pure grace on the part of their sovereign; an act reversing their ancient attainder, and restoring their forfeited honours.

And thus it is that the universal sinfulness of the race arose. We need not to resort to the violent hypothesis of a vitiated nature to account for man's being in every case a sinner. Every child enters the world under a legal forfeiture, and subject to legal disadvantages. He is destitute of any outward safeguard from evil; he is without any positive bias to what is good; he is surrounded by innumerable incentives to sin. Under such circumstances, with nothing to hinder him from sinning and everything to induce him to sin, how can he help becoming a sinner? The centre of his being is self; he knows nothing better, nothing higher; he is ἄθεος, without God; he has no natural desire to please God; and hence no sooner does God's law come athwart his inclinations, than he rises in actual rebellion against Him. Thus the habit of sin is formed. Thus personal guilt is contracted. And thus the moral nature becomes wholly depraved, so that the man requires to be born again ere he can see the kingdom of God.

Sect. VIII.—*Consequences of Man's Sinfulness.*

The consequences of sin are twofold—guilt and depravity; the former having respect to man's condition as under law, the latter having respect to man as possessed of and acting by means of a moral nature.

That man is guilty—*i. e.*, under legal condemnation—because of his violations of God's holy law, is declared with the utmost plainness in Scripture, and is supported by the principles of natural ethics and the dictates of conscience (Gal. iii. 10; Rom. ii. 5–16, iii. 9, 19, 20, vi. 23; Matt. xxv. 41, 46, &c.)

Through the influence of sin man is also depraved, morally corrupt, vicious (Ps. xiv. 2, 3; Is. liii. 6; Jer. xvii. 9; Rom. vii. 18; Gal. v. 16, 17; Eph. ii. 1–3; James i. 13–15, &c.)

This depravity of man is *total*. By this it is not meant that man's physical or intellectual powers are destroyed or even directly impaired by sin. Nor is it meant that he is not susceptible of many affections which are noble, and lovely, and beneficent. Nor is it meant that he has lost the capacity of discriminating right from wrong, or the tendency to approve the right as right, and to condemn the wrong as wrong. What is meant is, that his will is subject to an unholy bias; that his principle of moral action is ungodly; that, in short, being destitute of love to God as the supreme and all-comprehending principle of moral action in him, he is incapable of doing any moral act without sin.

Jesus of Nazareth the Messiah.

See Chalmers, *Institutes of Theology*, vol. i. p. 370, ff.

PART III.

CHRISTOLOGY, OR THE DOCTRINE CONCERNING THE CHRIST.

Having contemplated man as a sinner, the mind naturally turns to consider that salvation which Christianity announces as provided for him: from considering the disease, one is led to consider the means by which it is to be removed, and the party affected by it is to be cured. But, before we can enter on this, there is an intermediate inquiry to which we must give heed, relating to the person and work of Him by whom salvation has been procured for us. With these the salvation itself stands inseparably connected; and it is impossible to acquire just views of the latter unless we have first just views of the former. We proceed, therefore, to consider the doctrine relating to the person and the work of Christ, as unfolded to us in Scripture.

Sect. I.—*Jesus of Nazareth the Messiah.*

When Jesus appeared on earth, He claimed to be the Messiah promised to the fathers of the Jewish nation, and He substantiated His claim by an appeal to the Old Testament Scriptures, where the criteria of Messiahship are set forth. His apostles followed Him, both in advancing the claim and in the manner of supporting it, "opening and alleging out of the Scriptures that this is the very Christ." It is proper that we should, in the outset, glance at the evidence on which this claim rests, because we shall then be at liberty to combine the Old Testament declarations concerning the Messiah with the New Testament declarations concerning Jesus, and thereby to arrive at a satisfactory view of the entire Christology of the Bible.

The argument here is cumulative; and the entire strength of it becomes manifest only when we have explored the whole body of prediction in the Old Testament concerning Him who was to come, and seen how it finds, in the person, the life, the work, and the reign of our Lord, its fulfilment. For our present object, however, it will suffice to take certain criterial passages relating to the Messiah contained in the Old Testament, and which admit of being compared with facts in the personal history of Jesus of Nazareth. This will serve to establish the fact that He was the person actually promised by God to the Jews; and being satisfied on this point, we shall be free to consider what the Bible generally states concerning the person and work of the Christ.

1. We can determine a time *before* which the Messiah was to come, and *after* which He cannot be looked for.

In Gen. xlix. 10, it is predicted that the Messiah, here denominated Shiloh (שִׁלֹה from שָׁלָה quievit, tranquillus fuit = the Peaceful One, or the Peace-bringer; comp. Eph. ii. 14, where εἰρηνη is applied as a designation of Christ), should appear, while as yet the tribe of Judah retained the power of rule and legislation. In the overthrow and total destruction of the Jewish state, therefore, we can fix upon a *terminus* posterior to which He cannot be expected, and also near to which He must have appeared. If it was to last *until* He came, then, clearly, the date of its ceasing must be nigh to the date of His appearing.

We get the same terminus from the prediction in Haggai

Jesus of Nazareth the Messiah.

ii. 6–9, where the appearance of the Messiah is announced as to take place before the destruction of the temple. In Dan. ix. 24, 25, also, we have a period assigned beyond which the Messiah cannot be expected, and this coincides with the period above determined; for we cannot begin to calculate the seventy weeks which the prophet says are to elapse before the coming of the Messiah much later than the return of the Jews from Babylon; and this, on the principle of taking each week for a period of seven years (see the commentators, and Hengstenberg's *Christology of the Old Testament*, vol. iii. p. 99, Eng. Tr.), will bring us not only within the period above determined, but not far from the date of our Lord's crucifixion.

Now it is undoubted that our Lord did appear in Judea, claiming to be the Messiah, within the period thus determined, and that there was no other who at that time appeared with a similar claim. The probability therefore is, that He was the being to whom these ancient predictions refer.

2. We can ascertain the *family* of which the Messiah was to be born, the *place of His appearance*, and the *manner of His birth*. He was to be of the family of David (Is. xi. 1; Ps. cxxxii. 11; lxxxix. 3, 4; Jer. xxiii. 5). He was to be born at Bethlehem (Mic. v. 2). He was to be son of a virgin (Is. vii. 14). So well known was this among the Jews, that the prophet describes the mother of the Messiah definitely as *the* virgin κατ' ἐξοχην (הָעַלְמָה); and Micah speaks of her as "she which travaileth," without any further specification. These are minute criteria, and in the last case a singular one is adduced; as they all met and were fulfilled in Jesus the son of Mary, who was of the house and lineage of David, and who was by a peculiar concurrence of circumstances at Bethlehem when her son was born, the probability becomes very strong that He was indeed the Christ.

3. We know what the Messiah was to *teach*, to *do*, and to *suffer*. He was to be a Prophet like unto Moses (Deut. xviii. 15, 18), of at least equal authority with Moses, and whose efforts should be directed not so much to uphold the Mosaic Institute, as to establish on an independent basis His own doctrines. He was to perform many notable miracles, many works of marvel and of beneficence (Is. xxxv. 5, 6; xlii. 7; lxi. 1–3). He was to lead a life of suffering, and contempt, and persecution (Is. liii. 3; Ps. xli.; Zech. xi. 12, 13). He was to be betrayed to His enemies by one of His own familiar associates; He was to be sold for thirty pieces of silver; He was to be cruelly handled and insulted, to have gall and vinegar given Him to drink, to have His garments parted and lots cast for His vesture, to have His hands and His feet pierced, and to die amid the mockery and hatred of His enemies (Ps. xxii. 12, 13, 16, 17, 18; lxix. 21; Zech. xi. 12, 13; xii. 10). Yet God was to keep all His bones, so that not one of them should be broken; He was to be with the rich after His death, though His enemies had appointed His grave with the wicked; and He was to be raised again so as not to see corruption, and to be exalted to great glory and honour (Ps. xxxiv. 20; Is. liii. 9; Ps. xvi. 9, 10, &c.) How exactly and literally all these criterial predictions were fulfilled in the life, works, sufferings, death, resurrection, and ascension of our Lord, no reader of the Gospels needs to be told: compare, for instance, Luke vii. 16; xxiv. 19; Matt. xi. 4, 5; iv. 23, 24; xv. 30, 31; Luke ix. 58; Matt. xxvi. 30; xxvii. 30, 39, 41, 42; John xix. 1, 2, 29, 32–34; Matt. xxvii. 38, 57–60; xxviii. 5, 6; Acts i. 9.

This concurrence of evidence is such as to place the claims of Jesus to be the Messiah on irrefragable grounds. The prediction and the fact correspond like two tallies, so that only the most obstinate scepticism can resist the conclusion, "He who was in the world at the time when the Messias was to come, and no other at that time or since pretended; He who was born of the same family, in the same place, after the same manner, which the prophets foretold of the birth of the Messias; He who taught all those truths, wrought all those miracles, suffered all those indignities, received all that glory, which the Messias was to teach, do, suffer, and receive: He was certainly the Messias." Pearson, *Exposition of the Creed*, Art. ii.

Of the Person of Jesus Christ.

See also Barrow's *Sermons on the Creed*, Serm. 17–20; *Works* (Hughes's edit., Lond. 1831), vol. v. p. 388, ff.; Horne's *Introduction*, vol. i. p. 492, ff., edit. 1839.

SECT. II.—*Of the Person of Jesus Christ.*

The dogma universally received in the Christian Church, for many generations, concerning the person of Jesus Christ is, that in that one person were united two natures, the divine and the human. In holding this opinion both Romanists and Protestants are agreed. On a point so familiarly known it is unnecessary to quote from the symbols of either party. Opposed to this dogma is that of the Arians, who deny the existence of a divine nature in Christ, but hold that He had, in union with His human body, a soul possessing an antecedent existence, and a superior nature to that of all other creatures (1); and that of the Socinians or Unitarians, who are *Psilanthropists*, maintaining that Jesus Christ was a mere man, and that His divinity consisted simply in His divine commission, and the superior honour which God conferred upon Him as His servant (2).

1. Ἀρειος σαρκα μονην προς ἀποκρυφην της θεοτητος ὁμολογει· ἀντι δε του ἐσωθεν ἐν ἡμιν ἀνθρωπου, τουτεστι της ψυχης, τον Λογον ἐν τῃ σαρκι λεγει γεγονεναι, την του παθους νοησιν, και την ἐξ ἐδου ἀναστασιν τῃ θεοτητι προσαγειν τολμων. (Athanasius, *Cont. Apollin.* ii. 4.) Arius taught that God being about to create the universe, formed first of all a being like Himself, out of nothing (ἐξ οὐκ ὀντων, not ἐξ οὐσιας αὐτου); by whom, as His Son, the Logos, the universe was to be formed. (Athanasius, *Cont. Arian.* i. § 5; ii. § 24.) A modified Arianism was introduced through the Arminian school in the end of the sixteenth century, according to which the Deity of the Son was acknowledged, but His derivation from the Father, and His consequent essential subordination, was upheld. "Generatio divina est fundamentum subordinationis inter Patrem et Filium. Plus est esse a nullo quam esse ab alio, generare quam generari." (Episcopius, *Instit. Theol.* p. 334.) "Colligimus essentiam divinam et Filio et Spiritui Sancto esse communem. Sed non minus constat inter tres hasce personas subordinationem esse quandam; quatenus Pater naturam divinam a se habet, Filius et Spiritus Sanctus a Patre; qui proinde divinitatis in Filio et Spiritu Sancto fons est et principium." (Limborch, *Theol. Christ.*, p. 102.) By those who held this view, a distinction was taken between θεοτης and αὐτοθεοτης, the latter of which they ascribed to the Father, to whom alone they attributed "aseitas." In England this doctrine found advocates in Samuel Clarke (*Scripture Doctrine of the Trinity*, Lond. 1712), Dr Price, Dr Taylor of Norwich, and others. This school, however, soon retreated under the logical pressure of its opponents into pure Arianism, or emerged into Socinianism.

2. De Christi essentia ita statuo illum esse hominem, in virginis utero, et sic sine viri ope, Divini Spiritus vi conceptum ac formatum indeque genitum, primum quidem patibilem et mortalem, donec scilicet munus sibi a Deo demandatum in terris obivit, deinde vero postquam in cœlum ascendit impatibilem et immortalem factum." (F. Socinus, *Brevis. Instit.* p. 654, a.) "Siquidem naturam seu substantiæ divinæ nomine ipsam Dei essentiam intelligimus, non agnoscimus hoc sensu divinam in Christo naturam: cum id non solum rationi sanæ, verum etiam divinis literis repugnet. Alioquin si naturæ divinæ nomen vel de Spiritu Sancto qui in eo, naturæ ejus humanæ individuo nexu conjunctus habitavit, et mirabilis suæ in eo non vulgaris præsentiæ effectus adidit; vel eo sensu accipias quo Petrus, *Ep.* ii. c. i. 4, nos divinæ naturæ fore participes asserit, *i. e.*, de natura divinitate, divinisque proprietatibus ex Dei gratia prædita, adeo eam in Christo agnoscimus ut secundum Deum nemini eam magis convenire censeamus." (*Cataches, Eccles. Polon.*, p. 25. Staurop. 1680.) Most modern Socinians deny the miraculous conception of Jesus, and refuse to impute to Him any higher nature than that of man. An able defence of Socinian doctrine will be found in the work of Mr Yates, *Vindication of Unitarianism*, 4th ed., Lond. 1850.

In the first promise given by God to our first parents after their fall, the deliverance of the human race is attributed to one who should appear as "the seed of the woman."

Of the Person of Jesus Christ.

On this expression it would not be safe to found anything as to the Person of the promised deliverer beyond the assertion of his true and proper humanity; but the expression itself is a singular one, and in its very form conveys a suggestion at least of something remarkable, if not supernatural, in the condition of the being to whom it is applied. Whether any more precise intimation of his true nature was given to our first parents we are not directly told; but in the exclamation of Eve on the birth of her firstborn, "I have gotten a man, אֵת יְהוָה," many learned divines have found an announcement of her expectation that the promised deliverer, whom she supposed to be now given to her was the Man-Jehovah. The probability is, that this exegesis is just; but as it rests on a supposition which may be denied, and on a point in philology which may be disputed (1), much stress cannot be laid on it. In the book of Genesis repeated references are made to a Being who is styled מַלְאַךְ־יְהוָה, Angel or Messenger of Jehovah, and to whom are ascribed names and qualities which are truly divine. The same person is introduced in several of the other early books, and is mentioned by some of the prophets. The latest of the prophets, Malachi, identifies this Divine Person, manifested to men, with the Messiah, thus completing the testimony of Scripture concerning the Angel of Jehovah, and linking these revelations of the Old Testament with the Jewish belief concerning the Memra Jah, and with the Christian doctrine concerning the Logos. (See Gen. xvi. 7–13, where the Angel is called אֵל רָאִי, God of sight = God Manifest; xviii. 1–33; xxii. 11–19; xxxi. 11–13, compared with xxviii. 13–16; xxxii. 24–30, compared with xii. 4, 5; Ex. iii. 1–6, xxiii. 20, 21; Josh. v. 14; Judg. xiii. 3–23; Zech. i. 12; Mal. iii. 1.) Of the other references which occur in the earlier books of the Bible concerning the promised deliverer, more cannot be said in relation to our present object than that they ascribe to him a dignity, a power, and a stretch of influence not compatible with the ordinary conditions of mere humanity (compare Gen. xxii. 18, xlix. 10; Deut. xviii. 18; 2 Sam. xxiii. 1–7; Job xix. 23–27, xxxiii. 23–28 (2). It is when we come to the poetical and prophetical books of the Old Testament that we find those descriptions of the Messiah which, sustained, illustrated, and defined by the explicit statements of our Lord himself and His Apostles, guide us to the conclusion, that in His Person there was a union of real deity with real humanity.

1. The point in dispute here is whether the אֵת is the mere sign of the accusative, in which case the translation is "I have gotten a Man, Jehovah," or "even Jehovah," or is the particle answering to our "with"—it never means "from," as the authorised version gives it—in which case the meaning is, "I have gotten a man with (*i. e.* with the help of, by aid of) Jehovah." The objection to this latter exegesis is not, as Dr Pye Smith asserts (*Scripture Testimony*, i. 154, 4th edit.), that it gives to אֵת a sense unknown to the earlier Hebrew, though found in the later, for אֵת occurs in the earlier books of the Bible, according to the same usage as in the later (compare *e. g.* Gen. vi. 13; xliii. 16, &c.); but that it gives to אֵת a meaning which it has not at all in either later or earlier usage. For it is to be observed, that in proving that אֵת is used to denote "with," it is not proved that it is used to denote "by the aid of." In both the earlier and later books it is used to convey the idea of being in the company or presence of another; but we desiderate any instance of its being used to denote the deriving of help from another. It is true the Greeks used σὺν θεῷ in the sense of "with the help of God;" but that does not prove that the Hebrews used אֵת יהוה in the same way.

2. See Dr J. Pye Smith's *Scripture Testimony to the Messiah*, vol. i., 4th edit. Hengstenberg's *Christology of the Old Testament*, translated by Meyer, vol. i. Alexander's *Connection and Harmony of the Old and New Testaments*, pp. 75 and 176, 2d edit.

I. The evidence furnished by the sacred writers in support of our Lord's *true and supreme divinity* is usually presented under the following heads:—

1. The *appellations* appropriate to the Divine Being are throughout Scripture applied to the Messiah, and to Jesus as the Christ. He is repeatedly called "God," and He is styled "the mighty God," "the true God," "God over all, blessed for ever," "Emmanuel, God with us." He is called "Jehovah," "Jehovah of Hosts," "Jehovah our Righteousness." He is called "the Lord," "the Lord their God." He, Himself, spoke of Himself as the Son of God in a sense which made Him equal with God; He declared that He and the Father are one; and He allowed one of His disciples, without correction, to address to Him the words, "My Lord and my God." (Compare Ps. ii. 7; xvi. 8–11; Is. vi. 1–3, 5; vii. 14; ix. 5, 6; xl. 3–5; Jer. xxiii. 5, 6; John i. 1–3, 14; x. 24–38; xiv. 9, 10; xx. 28; Rom. ix. 5; 1 Cor. i. 2; Heb. i. 8, 9; 1 John v. 20, &c.) As these are the peculiar and appropriate designations of the Divine Being, the application of them to the Christ plainly indicates, that those who so apply them regarded Him as truly divine. This is the argumentum ὀνομαστικον of the old theologians.

2. *Divine attributes* are ascribed to the Messiah and to Jesus Christ. He is presented to us as an Eternal and Immutable Being; as endowed with Omnipotence; as Omnipresent and Omniscient. Now these four, eternity, omnipotence, omnipresence, and omniscience, are *essential* attributes of God—*i. e.*, they are attributes without which God would not be God, and which no being can possess without being God. From their being thus freely applied to Christ, we are led to infer that the sacred writers intend to represent Him to us as properly God. (Compare John i. 1; viii. 58; Rev. i. 8; xxii. 13; Is. ix. 6; Mic. v. 2; Phil. iii. 21; Matt. xviii. 20, compared with Exod. xx. 24; John ii. 24, 25; xxi. 17; Rev. ii. 23, &c.) This is the argumentum ἰδιωματικον.

II. *Works peculiarly divine* are ascribed to the Messiah and to Jesus Christ in the Bible. He is frequently spoken of as the Creator of all things. He is represented as the Lord of all, the Governor of the Universe, the Lord of the Conscience, and the Supreme Disposer of all events, including life and death. He is repeatedly set forth as the Judge of all, the Lord who shall judge the quick and the dead, and at whose bar all must stand to give account of themselves unto Him. And He is set forth as the Author of Grace, the Supreme Dispenser of Spiritual Blessing, the Giver of the Spirit, and the Author of eternal life to man. Now each of these is a divine work, a work which only God can perform, and the performing of which gives indisputable evidence that he by whom they are done is God. When, therefore, they are ascribed to Jesus Christ, the fair inference is, that the sacred writers meant thereby to teach that Jesus Christ is God. (Compare John i. 3; Col. i. 16, 17; Heb. i. 10, 11; Matt. xxviii. 18; Rom. xiv. 9, 10; Acts x. 42; 2 Tim. iv. 1; Matt. xxv. 31, 36, &c.) This is the argumentum ἐνεργητικον.

III. The *worship due only to God* is represented in Sacred Scripture as to be offered to Jesus Christ. To call upon the name of Jesus is frequently stated in the New Testament as the duty and privilege of men; the apostles join Him with the Father in their prayers; they invoke His blessing as they invoke that of God; they represent the heavenly world as worshipping Him; and they tell us that God has commanded all His angels to worship Him, and that at His name every knee shall bow of things in heaven, and things in earth, and things under the earth, &c. As worship of this sort belongs only to God, we cannot but believe that those who thus direct us to worship Christ must have meant us to view Him as God. (Compare John v. 23; Acts ix. 14; Rom. x. 11–13; 1 Cor. i. 2; 1 Thess. iii. 11–13; 2 Thess. ii. 16, 17; 2 John iii.; Rev. v. 6–14, &c.) This is the argumentum λατρευτικον.

Besides these more direct proofs of the divinity of our Lord, there is a strong body of evidence accruing from the general aspect under which the sacred writers present Him

Of the Person of Jesus Christ.

to their readers. They seem continually to have written with a consciousness of His supernatural claims and perfections; their whole cast of thought, feeling, and representation is in keeping with this assumption; and, indeed, apart from it is not to be accounted for. Deny this, and their language is in many cases absurd, and the lights in which they place Him perplexing and misleading; whilst all becomes plain and natural if we regard this as the belief which regulated their language, and the fact out of which arose the representations they give of Him. We may notice, in illustration of these remarks, the following particulars.

1. The apostles invariably represent the *humanity* of Christ as being in itself a marvellous thing. The simple fact that He should have been a man, that He should have been born, that He should have had a woman for his mother, that He should have grown in wisdom and stature, that He should have lived in circumstances of poverty and toil, that He should have been persecuted, and that He should have died, are all, in the judgment of His followers, so many marvels at which we cannot sufficiently wonder. With them it is not His divine nature and perfections that are the objects of admiration; it is His humanity at which they stand in amaze. Is this to be accounted for otherwise than on the supposition, that they esteemed Him in original and proper nature as divine, and that what filled them with wonder was that He, the Divine, should condescend to become man?

2. The apostles represent the sending of Jesus into the world as an act of *unparalleled* love on the part of God to man—as a *costly* expression of God's benevolence towards His creatures. Now, in what respect did the mission of Christ so differ from the mission of any of the prophets whom God had sent to His people as to be a proof of God's love such as they could not parallel, and as to cost Him (so to speak) what they did not cost Him? Is there any way of accounting for this but by the supposition that Jesus Christ was not only dearer to God than any other of the messengers He had sent, but dearer than any creature can be? that whilst they were but servants, this was his Son, in a sense altogether peculiar, a sense involving a oneness of nature with God?

3. The apostles always speak of Christ's coming into the world as an act of *unexampled condescension and love* on His part. Suppose Him a creature, what meaning can we attach to this? Where was the condescension implied in His being born and coming to dwell as a man among His fellows? Who ever heard of a child condescending to be born? Of a man showing unexampled love by coming to live on the earth with other men? Either the language is absurd, or He of whom it is used was more than man.

4. The apostles represent Jesus Christ's life on earth as a becoming poor, on the part of Him who had been rich, as an emptying Himself of His glory, and such like expressions. Is there any sense in such representations if His pre-existence in a state of glory and majesty be not assumed?

5. The apostles uniformly give utterance to the strongest and warmest expressions of gratitude, admiration, and love when they speak of what they owe to their Master for His interposition on behalf of man. Much may be allowed to the enthusiasm of scholars in celebrating the praises of an honoured and beloved instructor; but the language in which the New Testament writers speak of Christ transcends all reasonable bounds, and becomes absolutely senseless, if not profane, if He was no more than a mere creature. We can account for such men indulging in such language only on the ground that, fully recognising His divinity, they felt that no language could be too strong to express the emotions of reverence, adoration, and gratitude with which the contemplation of His grace towards man inspired them.

Of the Person of Jesus Christ.

6. The sacred writers represent our Lord as speaking of the sublimest things with the ease and familiarity of one to whom such things were native. An apostle, brought to contemplate heavenly things, is prostrated and rendered speechless; Jesus speaks of heavenly things as one whose it is to dwell amidst them as His own—with the ease, simplicity, and naturalness with which the native of a palace might speak of the splendours and majesty of a court. It is easy to see how this falls in with the hypothesis of His original deity; whilst, on the opposite hypothesis, it is, to say the least, singular if not unaccountable.

7. The striking religious solitude of Jesus Christ, as represented by the evangelists, is remarkable in connection with our present inquiry. He alone, of all God's servants, appears capable of sustaining His spiritual life by Himself. He is never found asking counsel of anyone; He never supplicates help from anyone; never asks anyone to pray for Him; never Himself unites in prayer with anyone. Such solitariness in one so gentle, and loving, and companionable is a strange thing, to be fully accounted for only by the fact, that to Him belonged a nature which rendered religious companionship with mere mortals impossible.

8. Jesus Christ is represented as claiming from His followers a homage, a devotion, and a love which no being but God is entitled to claim. To His claims those of parents, of brother and sister, of friend, of life itself, must yield. Who is He that asks such devotion, that asserts such supremacy as this? If He is not God, His language in this case is inexcusable, and His pretensions immoral.

9. As the birth of Jesus was supernatural, so His exaltation after His resurrection was such as no mere creature could have received. To pass into the heavens, and in bodily form sit down on the right hand of the Majesty in the heavens, a partaker of the glory and the authority of God, is an honour such as only a divine being in human nature was capable of receiving.

These considerations not only fall in with the assumption of our Lord's supreme divinity, but it is only on that assumption that the statements and representations referred to can be reconciled with the sobriety and the truthfulness of the sacred writers. When, in connection with this, it is remembered that such modes of speech and representations *pervade* the sacred writings—that they proceed from men who were fully aware of the responsibility of the work in which they were engaged, and of the necessity of taking heed to every word they uttered in teaching their doctrines to men—that such language and representations were calculated to frustrate one main end of their mission, if the being to whom they are applied was not divine, inasmuch as, whilst they were sent forth to denounce idolatry, they might lead men to offer divine honours to a creature—that, though denouncing blasphemy as the most heinous of sins, they constantly attribute to their Master words and attributes which, if He is not divine, involve both Him and them in the guilt of blasphemy—and that the ascription to Jesus Christ of divine names, attributes, and honours is wholly their own act, the very idea having been originated by them, and resting wholly on their mode of speaking concerning Him; so that their uttering it is both a gratuitous and an unaccountable piece of folly or dishonesty on their part, if Jesus Christ was not really divine: it seems to the last degree improbable that the sacred writers did not intend to teach that the Messiah was to be, and that Jesus, as the Christ, was, a divine person in human nature. If Jesus was a mere man, it is impossible to resist the conclusion that never was there a set of writers who more systematically or perseveringly used language calculated to deceive and mislead their readers, and that in a case where error is fatal, and to be misled is to be ruined.

II. The *humanity* of our Lord is no less distinctly, though with less of copiousness, asserted by the sacred writers.

Of the Person of Jesus Christ.

1. He is expressly called a man—the man Christ Jesus (1 Tim. ii. 5), and the designation by which He frequently designates Himself is "the Son of man." It is said of Him that He became flesh (John i. 14); that He was made of a woman (Gal. iv. 4); that He was the first-born son of Mary (Matt. i. 25), &c. He is also spoken of as the Seed of the woman, the Seed of Abraham, the Rod or Sprout from the root of Jesse, and other similar appellations, all of hwich convey the idea of His true and proper humanity.

2. It is expressly said, that when He became flesh He took on Him a nature the same as ours (Heb. ii. 14). He not only partook of flesh and blood as we do, but He partook of these παραπλησιως, that is, really and after the same kind with us—οὐ δοκητως ἀλλ' ἀληθινως, οὐ φανταστικως ἀλλ' ὀντως, as the Fathers explain it.

3. The two constituent parts of our nature, body and soul, are ascribed to Jesus Christ. Luke xxiv. 39 (comp. Ignatius, *ad Smyrnæos*, § 3); Matt. xx. 28; John xii. 27; Col. i. 22; 1 Pet. iv. 1, &c.

4. The affections and qualities of a true man are ascribed to Christ. Luke ii. 40, 51, 52; Matt. iv. 6; xi. 19, 20; xxi. 18, 19; Mark iii. 5; Luke xix. 41; xxiii. 34; John ii. 1–10; iv. 6; xi. 35, 36; xii. 27, &c. He had a moral nature the same as ours, was liable to temptation as well as subject to moral law, and was capable of moral discipline and growth (Heb. ii. 18; iv. 15; v. 8). He possessed also the capacity of dying, a capacity which only a true animal nature has; and in death His soul was separated from His body, as with us.

In the early ages of Christianity, there were few of whom we know certainly that they denied the divinity of our Lord; but there were many who called in question His humanity. Of these, some held His human appearance to be a mere phantasm, whilst others, allowing it to be real, contended that it was of a different kind from ours (1). Even some of the orthodox fathers sought to modify their admission of our Lord's true humanity in various ways. Thus Clement of Alexandria thought that the body of Jesus was not sustained by ordinary means, but by the immediate agency of the Holy Ghost; and Origen ascribed to His humanity qualities which would have essentially removed it from the ordinary nature of man (2). The catholic belief, however, always remained, that He was *verus homo* as well as *verus Deus*.

1. "Erraverunt in ipsa carne ejus; aut nullius veritatis contendentes eam (unde phantasma dicitur) aut propriæ qualitatis." (Tertullian, *De Resurrect. Carnis*, § 2.) The Doketæ held the apparitional or phantasmal character of our Lord's humanity; Marcion held that He suddenly came down from heaven in a body fashioned there, and of a nature different from that of man; and Valentinus maintained that though He was apparently born of the Virgin, He merely made use of her as a channel through which He passed into the world, καθαπερ ὑδωρ δια σωληνος ῥεῖνει. (Theodoret, *Ep.* 145, *Opp.* tom. iv., p. 1248. Tertullian, *adv. Valent.* c. 27.)

2. Clement, Alex., *Strom.* vi. 9, p. 775, ed. Potter; *Pædag.* i. 5; *Cohort. ad Gentes*, p. 68 D. Origen, *c. Cels.* iv. 19; vii. 16; *Comment in Matt.*, p. 906, C., &c.

But though the human side of Christ's person was in all respects consubstantial with the nature of man, yet His humanity had its own peculiarities and properties. These were—

1. His extraordinary conception, sine viri ope vi Spiritus Sancti sola.

2. Impeccability. He was not only without sin, but without liability to sin; He was perfectly free from all sin, original and actual. John viii. 46; 2 Cor. v. 21; Heb. vii. 26; 1 Pet. ii. 22, &c.

3. Singular excellence of body and mind, whereby He surpassed all men in physical beauty, and in intelligence, sagacity, and purity. Col. i. 18; John vii. 46.

Some add to these what they call *Impersonalitas*, or ἀνυποστασια, by which they mean that, as there was but one person in Christ, the human nature lost its personality in the divine. But it is not easy to see how human nature can be perfect without personality; and the difficulty arising from the union of two personal natures, so as to form only one person, is not to be got rid of by so cheap an expedient as that of asserting that the one was absorbed in the other. Absorption is not union. It is better to admit that the whole subject transcends our knowledge.

Christ's Twofold Estate.

III. The divine and human natures are so united in Jesus Christ, that He is truly θεανθρωπος, Godman. To Him, as subject, the properties and qualities of both God and man are ascribed; and He has these in one person, because He, as the subject of these, subsists *per se*, and is one intelligence.

"Siquidem ita conjunctam unitamque humanitati divinitatem asserimus, ut sua utrique naturæ solida proprietas maneat, et tamen ex duabus illis unus Christus constituatur." (Calvin, *Inst.*, ii. 14, 1.) "Two whole and perfect natures, that is, the Godhead and the manhood, were joined together in one person, never to be divided; whereof is one Christ, very God and very man." (Art. 2 of the Church of England.) See also *Westminster Confession of Faith*, ch. viii. § 2.

This union was effected by the Divine nature assuming the human into union with itself. The Logos became flesh; Jesus Christ, being in the form of God, took on Him the form of man; He took part of flesh and blood. It was not an ἀποθεωσις, or deification, but an ἐνανθρωπησις, or man-becoming, an incarnation (ἐνσαρκωσις), an incorporation (ἐνσωματωσις), that was effected. Further, this personal union of the two natures in the one Christ is a union entirely *sui generis*, and which cannot be compared to, or illustrated by, any with which we are familiar. It is not an essential union, as if the two natures, after the manner of a chemical combination, coalesced into one; nor is it, as some of the ancient heretics taught, a simple apposition of the one nature to the other, such as that of objects which are mechanically agglutinated; nor is it a mixing of the two, so that they are confounded the one with the other; nor is it a merely mystical and moral union, in virtue of which the one nature always acts in unison with the other. All we can say of it is, that it is a *personal* union; that it is *real—i. e.*, that the two natures partake of each other, so that each has in common with the other what is proper to it, yet ever so as that the divine shall permeate and appropriate the human, not the human the divine; that it is *supernatural*, and as to the mode of it altogether beyond our comprehension. In fine, in consequence of this union of the Divine nature with the human in Jesus Christ, statements are made concerning the concrete Person, which are strictly true only of one or other of the natures thus combined. This is technically called "communio naturarum," and is in truth inseparable from that reality of union between the two to which we have already referred.

See Augustine, *Ep.* 102 [169]; Calvin, *Inst.*, ii. 4, 1; Burnet, *Exposition of the 39 Articles*, Art. ii. On the Person of our Lord in general, see Gess., *Die Lehre von der Person Christi*, &c., Basle, 1856; Horsley, *Tracts in Controversy with Priestley*, 1812; Jamieson, *Vindication of the Doctrine of Scripture, and of the Primitive Faith concerning the Deity of Christ*, 2 vols., 1794; Wilson, *Illustrations of the New Testament from the early Opinions of Jews and Christians concerning Christ*, 1828; and the works of Wardlaw, Pye Smith, and others on the Socinian controversy.

Sect. III.—*Christ's Twofold Estate.*

I. *State of Humiliation.* When the Divine Being assumed our nature in the person of Jesus Christ, He entered on a state of humiliation, in order to which He emptied Himself of His glory, so as to become poor and to be of no reputation. To this state pertain His being conceived in the womb of the Virgin, His being born, His obedience, His submission to a servile and suffering condition, His death, and His burial; to which some add His descent into Hades.

II. *State of Exaltation.* When the Godman had consummated His suffering and obedience, He retraced the

Offices of Christ.

path by which He had descended, and rose to glory, and honour, and joy everlasting. To this state belong His resurrection from the dead, His ascension into heaven, His exaltation to God's right hand, where He sits as Ruler of the Universe, having all power committed to Him.

Sect. IV.—*Offices of Christ.*

The Son of God came into our world and assumed our nature to effect the reconciliation (καταλλαγη, at-one-ment) of God and man. For this end He sustains certain offices having respect to the three ends which must be attained in order to this result. As man is guilty, his Saviour must be a *priest*, to make propitiation for him; as man is in ignorance and error, his Saviour must be a *prophet*, to teach him the truth; and as he is far from goodness and holiness, his Saviour must be a *king*, to rule over him, and by a wise and gracious discipline to educe the healthy development of his spiritual life, as well as to protect him from those hostile influences by which his spiritual growth and prosperity would be interrupted. It is in respect of these offices that Jesus is the Messiah, or Christ, or Anointed; and these combined constitute his Mediatorial office.

I. *Christ's Priestly office.* The design of this function of the Mediator is to restore peace and amity between God and man. With this view He has come to bring salvation to the sinner, justly exposed to the wrath and curse of God, by turning away from him the Divine displeasure. His office as a Priest has thus a twofold object—a *personal* as it respects mankind, a *material* as it respects the sin which man has committed. Christ saves man by cleansing him from the guilt which sin has brought upon him.

The Priestly office of Christ was typified by that of the priests under the law. They were appointed by God to offer sacrifice and to make intercession for the people. The design of sacrifice was symbolically to set forth the great truth of vicarious propitiation, to proclaim the necessity of an expiation ere sin could be forgiven, and to adumbrate as a type the fact that an all-sufficient expiation would in due time be offered for the sins of men, according to the gracious appointment and provision of God. In fulfilment of the symbolical prediction which had thus been given of Him under the patriarchal and Mosaic dispensations, our Lord appeared as a Priest ordained of God, "to put away sin by the sacrifice of Himself" (Heb. ix. 26). In this capacity He has made peace for us by the blood of His cross, and by that blood hath obtained eternal redemption for us (Col. i. 20; Heb. ix. 12). As the ancient high priests, when they went into the Holiest of all, made intercession for the people of Israel, so Christ, as our High Priest, has entered into heaven, where He appeareth for us and maketh intercession for us. He is thus able to save to the uttermost all that come unto God through Him (δι' ἀυτου, through His medium, through Him as a Mediator). Sinners have thus redemption through His blood, even the forgiveness of sins; their prayers are accepted of God; and the blessing of the Most High descends on them in rich effusions of grace. (Comp. Eph. v. 2; Heb. vii. 25; viii.–x., &c.)

On the Priestly office under the Law, see Bähr, *Symbolik des Mosaischen Cultus*, ii. 11, ff.; Fairbairn, *Typology*, 2 vols.; Litton, *Bampton Lecture for* 1856, p. 75, ff. On Sacrifice, besides the classical work of Outram, *De Sacrificiis*, 4to, Lond. 1677, the following may be consulted:—Davison, *An Inquiry into the Origin and Intent of Primitive Sacrifice*, Lond. 1825; Faber, *Treatise on the Origin of Expiatory Sacrifice*, Lond. 1827; Magee, *Discourses and Dissertations on the Atonement and Sacrifice*, 1832, *Works*, Lond. 1842; J. Pye Smith, *Four Discourses on the Sacrifice and Priesthood of Christ*, &c., 2d ed., Lond. 1842; Tholuck, *Das Alte Test. im Neuen*, p. 64, ff.; Delitsch, *Comment. zum Br. an die Hebräer*, in loc.; Thomson, *Bampton Lecture for* 1853, lect. 2, 3; Macdonnell, *Donellan Lecture for* 1857, lect. 1, 2, 3; and the works of Bähr, Fairbairn, and Litton above referred to. On the Priesthood of Christ, besides the above, see the comprehensive and conclusive dissertation of Owen which forms the fourth of his Exercitations on the Epistle to the Hebrews.

Offices of Christ.

That Jesus Christ in some sense acted on behalf of mankind whilst on earth, and that it is in some way through His obedience and sufferings that men are saved, is so manifestly taught by the sacred writers, that none who profess to receive the Scriptures as their guide to religious truth venture to call this in question. To most they appear to teach much more than this. The *names* given to our Lord, such as Saviour, Captain of Salvation, the Sanctifier, the Mediator, the Shepherd, connected as these are with His sufferings and His death (see Eph. v. 2, 3, 25, 26; Heb. vii. 25; ii. 10; Acts iii. 15; Heb. xii. 2; Heb. ii. 11; viii. 6; ix. 15; 1 Tim. ii. 5; John x. 11, 15; Heb. xiii. 20); the phrases used to describe Him in relation to His work, such as Lamb of God (*i. e.* Lamb, provided by God for sacrifice,) who taketh away the sins of the world, Ransom, or Ransom-price given for us (λυτρον, ἀντιλυτρον), He who was made a curse for us, so as to redeem us (John i. 29; Rev. v. 6–14; Matt. xx. 28; 1 Tim. ii. 6; Gal. iii. 13); the language used to describe the design and effects of Christ's work in relation to us, such as that it was "for us" (in our place, ἀντι; in several instances ὑπερ, for our benefit; ὑπερ, on our account, δια); "for sins" (περι or ὑπερ ἁμαρτιων), that it was to take away sins (αἰρειν, ἀνοφερειν ἁμαρτιας), and that by the sacrifice of Himself (Matt. xx. 28; John x. 11; 1 Cor. viii. 11; Rom. v. 6, 8; 1 Pet. iii. 18; John i. 29; 1 John iii. 5.; Heb. ix. 26, 28; Is. liii. 12; 1 Pet. ii. 24, &c.); and the expressions employed to describe the benefits we derive from His work, especially His death, such as acceptance with God, redemption, ransom, reconciliation, the turning from us of God's wrath; all combine to produce a conviction that it is in consequence of the *propitiatory* efficacy of His work that benefit accrues to us through Christ. That this is what the sacred writers *meant* to teach is admitted not only by all evangelical Christians, but even by many who reject the peculiar doctrines of Christianity from their religious system.

"I could almost wish that we might meet with a man that had never heard anything of these matters before, one who knew nothing of the apostles, who or what they were, and had no concern whether the doctrines they taught were reasonable or unreasonable; that we might only propose it to him, and that he might give us a free, unprejudiced answer, what notion he would conceive that these writers had and designed to convey to us concerning Christ's mediation, and His death and sufferings." (Tomkins, *Jesus Christ the Mediator between God and Man*, p. 31.) Such an unsophisticated and earnest inquirer we can hardly hope to find in the present state of society; but the next best to such an one is an inquirer who, not intending to submit his reason to the teaching of the apostles, but merely for the satisfaction of a literary curiosity, candidly and learnedly interprets their words for the purpose of determining what they really taught. Such may be found among the German rationalists, and to the verdict which some of them have returned on this matter it may be worth while to listen. "Ab omnibus fere scriptoribus sacris," says Wegscheider, the Coryphæus of the old Rationalist party, "maxime a Paulo ita exposita est [sententia] ut mortem Jesu Christi ostenderent tanquam expiatoriam eandemque vicariam, velut poenam peccatorum hominum omnium ab ipso susceptum, et Jesum ipsum tanquam agnum purum atque immaculatum, a patre ipso morti quasi victimam piacularem traditum sanguine suo peccata mundi abluentem." (*Instit. Theol.*, p. 437, 6th ed.) With the same distinctness another eminent rationalist, Dr Von Ammon, speaks on this subject (see his *Summa Theologiæ*, p. 282, 4th ed.); though he goes on to apologise for the apostles in teaching such doctrines, on the ground that they had to accommodate themselves to Jewish prejudices and modes of thought. Another eminent rationalist, Dr Hase, says, "In the New Testament Christ is set forth as sent by God to save the world, ruined by sin. . . . The condition of God's giving salvation or pardoning sin is the whole life of Christ on earth in its separate moments; above all, His death as a ransom-price for our sins, as a sin-offering in our stead, in virtue of which we are redeemed from the bondage of sin, and obtain forgiveness of sins, eternal life, and peace with God." (*Hutterus Redivivus*, p. 243, 7th ed.) "Christ hath saved men," says De Wette, "principally by what He did and suffered.

Offices of Christ.

. . . The death of Jesus is the central point of apostolic doctrine, and especially of that of Paul. . . . This death Jesus, the blameless and sinless, endured for the sins of men, accomplishing thereby, as the self-offering High Priest in the higher sense, what the sin-offerings of the Old Testament were intended to accomplish, as a voluntary sin-offering well-pleasing unto God." (*Biblische Dogmatik*, p. 256, ff., 3d ed.)

Resting on the biblical statements above considered, theologians have arrived at the conclusion that a satisfaction for sin is that to which the priestly work of Christ had respect. He is regarded as having made atonement for the sins of men, and thereby reconciled them to God. As to the nature of this atonement and the extent of it, great diversity of opinion has arisen among evangelical divines. Some of the more important of these views we shall now state.

I. Some hold that Christ died only for the elect, and that His atonement was of the nature of a price paid down for their redemption, an exact equivalent in the Saviour's sufferings for what they had deserved to suffer for their sins, so that He has merited for them grace and glory.

"Christ paid the same thing that was in the obligation, as if in things real a friend should pay twenty pounds for him that owed so much, and not anything in another kind; and I affirm that He paid *idem*, that is the *same thing* that was in the obligation, and not *tantundem*, something equivalent thereto in another kind." (Owen, *Of the Death of Christ*, ch. ii.) "We, according to the Scriptures, plainly believe that Christ hath, by His righteousness, merited for us grace and glory." (The same, *Display of Arminianism*, ch. ix.) See also Edwards, *Essay concerning the Necessity and Reasonableness of the Christian Doctrine of Satisfaction for Sin.*

II. Some hold that Christ died for all men alike, that His atonement was rendered to the public justice of God, and that its effect was not to secure or merit blessing for any, but to open a channel along which blessing might flow freely to all, on their repentance and faith.

"Immediata mortis Christi effectio et passionis, illa est non actualis peccatorum ab his aut illis ablatio, non actualis remissio, non justificatio, non actualis horum aut illorum redemptio. . . . . Remissionis, justificationis, et redemptionis apud Deum impetratio, qua factum est ut Deus jam possit, utpote justitia cui satisfactum est non obstante, hominibus peccatoribus peccata remittere." (Arminius, *Antiperkins.* p. 76.) "Christus, ex decreto et intentione Patris, mortuus pro omnibus et singulis hominibus, ut iis gratiam et remissionem peccatorum impetret, nemine speciatim excepto." "Pœnam eandem quam nos peccatis meriti eramus, Dominus noster non tulit; non enim tulit mortem æternam. Sed tulit miseriam gravem et mortem cruentam nostro loco; quæ fuit vice pœnæ a nobis juste sustinendæ." "Dices: si Christus eo tantum modo pro nobis satisfecit, non meritus est nobis fidem et regenerationem. Resp. ita est; meritus est, hoc est impetravit et effecit ut Deus iram suam suspenderit, gratiæ tempus nobis concesserit, ad fidem et regenerationem nos vocaverit, omniaque gratiæ auxilia quibus vocationi divinæ parere possimus largitus est; ipsam autem fidem et regenerationem nobis non meruit." (Limborch, *Theol. Christ.* bk. iv. c. 3, sect. 2; bk. iii. c. 22, sect. 2, 3.) In accordance with these views, divines of this school speak of a double reconciliation effected by Christ—the one, a potential and conditional; the other, an actual and real: in virtue of the former, God may forgive the sins of any; in virtue of the latter, He does forgive the sins of those that believe. (See Corvinus, *ad Molin.* c. 28, sect. 11; Limborch, bk. iii. c. 23, sect. 3, 4.) From the frequent use of the verb "impetrare," and the noun "impetratio," by divines of this school in enunciating their views, this has been called the "impetration scheme" of the atonement.

III. Some hold that the death of Christ was a satisfaction rendered to the Divine justice with a view to reconcile the exercise of mercy towards sinners with the claims of the Divine administration; that it was of infinite value, sufficient for the salvation of all men; but that God, having from all eternity determined that only some men should be saved, the efficacy of the atonement thus made is limited by God's electing purpose.

Of those who hold this view there are again two subdivisions, according as the salvation of the elect is held to have been the *design* and *purpose* of the atonement (1), or as the purpose to save the elect is held to have been consequent, in the order of nature, on the appointment of the atonement (2).

Offices of Christ.

1. Christum, ex mera εὐδοκίᾳ Patris, destinatum et datum fuisse redemptorem et caput non omnibus sed certo hominum numero, corpus ipsius mysticum ex Dei electione constituentium; et pro illis Christum, vocationis suæ optime conscium, ad exequendum decretum electionis et consilium Patris voluisse et decrevisse mori, et pretio mortis infinito addere efficacissimam et singularem voluntatis pro illis sese substituendi et fidem ac salutem illis acquirendi intentionem." (Turretine, *Inst. Theol. Elenc.*, loc. xiv. qu. 14, sect. 8. See also Witsius, *Oecon. Foed.*, bk. ii. c. 5, sect. 2.) Divines of this school maintain that, strictly speaking, "Christ died, satisfied Divine justice, and made atonement only for such as are saved;" that "the death of Christ is a legal satisfaction to the law and justice of God on behalf of elect sinners;" but they, at the same time, hold that "the sufferings of Christ are to be regarded in the light of a moral satisfaction to the law and justice of God, which would have been requisite had there been but one sinner to be saved, and had that sinner had but one sin; and which would have been adequate had the number to be saved been to any conceivable extent greater than it is." (See Dr Symington, *Essay on the Atonement.*)

2. "According to this scheme, the atonement was designed as a vindication, manifestation, or display of the righteousness of God, such as to render forgiveness and salvation consistent with the honour of that perfection of the Divine character; leaving the Supreme Ruler and Judge in the free and sovereign exercise of the mercy in which He delights to dispense these blessings more or less extensively, 'according to the good pleasure of His will.'" . . . . "We might conceive the *desire* of Divine mercy as bent on saving sinners; but in order to this desire becoming a *purpose* in the mind of the Godhead, there must of necessity be the discernment of a way in which the salvation may be effected in consistency with the full honour of every attribute of His character, and every principle of His government. To suppose God to propose salvation, and to ordain sinners to the possession of it, previously to such discernment (speaking, as we necessarily must, after the manner of men) and independently of it, is to suppose Him doing what it is morally impossible for Him to do." (Wardlaw, *Discourses on the Nature and Extent of the Atonement of Christ*, pp. 61, 77.

IV. An opinion has of late come into considerable favour in certain quarters, according to which the effect of Christ's obedience unto death is wholly moral; that is to say, it is such an exhibition of love, benevolence, and obedience, that it subdues the enmity of the human heart to God, draws men to Him in childlike love, and gives at once the pattern of, and stimulus to, a self-sacrificing submission to all God's will.

Maurice, *Theological Essays*, ess. vii.; *Essay on Sacrifice*, passim.

Without attempting to criticise these different opinions, or pretending in this outline to discuss the subject exhaustively, we would submit the following hints as a contribution towards a just theory of the atonement as made known to us in Scripture.

1. God, as the infinitely perfect Being, and as moral Governor of the universe, must always act in perfect accordance with Himself, and with that government which is but an expression of Himself.

2. God having denounced sin as not only utterly abhorrent from His nature, but as positively forbidden under His government, must ever act towards sinners so as to manifest His abhorrence of sin, and to uphold the stability of His government under which it is forbidden.

3. While God is thus under an obligation, arising out of His own essential nature, to denounce sin, and as a governor to pronounce sentence of punishment on those who, by committing sin, have incurred the penalty He has attached to the law prohibiting it; He is also under an obligation arising out of His own nature to pity and compassionate the sinner.

4. Though the knowledge of this latter may lead to the indulgence of a hope, that *some* way may be devised by which sin may be forgiven, it is impossible, anterior to experience, for man to determine by *what* means this is to be brought about.

5. But whilst unable to determine a plan by which the

Offices of Christ.

exercise of the Divine mercy in the forgiveness of sin may be harmonized with the Divine abhorrence of sin and God's rectoral obligation to uphold the penal sanctions of His own law, and the stability of His government as therein involved, it is possible to ascertain two conditions without which such a harmony cannot be effected. These are, 1st, that in whatever way the Divine mercy may find access to the sinner, it must be on the ground that a sufficient compensation has been offered to the law of which sin is a breach—a compensation, that is, sufficient to manifest forth God's unchanging abhorrence of sin, and His unchanging regard to the honour and stability of His administration and law; and, 2d, that if such a compensation is to be made for man's sin, it cannot be by man himself (who can never do more than as God's creature and subject he is bound to do) that this is to be effected, but it must be effected by some other being vicariously in man's stead, and for his behoof.

6. Having determined that it is only through a mediator or vicarious representative that the requisite compensation for sin can be offered, we may also determine the qualifications, without which such a mediator cannot adequately accomplish his office. 1. Our natural reason teaches us that it must be with the consent, if not by the appointment, of God himself, that he acts. 2. We can see also that he must do or suffer something that shall have the effect of demonstrating God's utter hatred of sin, and His fixed determination to treat it as an offence against His law. 3. What he does, also, must be something that shall be *final*, something of a nature not to be repeated, something of such peculiarity and preciousness that it may never be expected again; for a cheap, or easy, or common-place work would obviously fail of meeting the requirements of the case. 4. There appears a fitness, moreover, if not necessity, in requiring that the substitute shall be of the same nature with those for whom he acts; for, in order to a valid substitution, the substitute must be able to enter with a full sympathy into the case of those for whom he acts, and must be himself subject to the laws under which they are placed. 5. Further, as possessing the nature and under the same laws as those for whom he acts, he must himself be perfectly free from all blame; for he who has failed to keep the law himself can never satisfy for the failure of others. 6. It is requisite that his becoming a substitute for others shall be his own free, voluntary act; for not only without this would his acting be destitute of merit, but an act of injustice and tyranny would be committed against him, such as would render the transaction void as a vindication of a moral government; and, 7. With this stands closely associated as another condition, that whatever may be required of him, or laid on him, in order to the accomplishment of his expiatory work, no permanent or irreparable injury shall accrue to him; for it would be obviously unrighteous that, in order to exempt the guilty from the penalty they had deserved, an irreparable evil should fall upon one who was innocent.

The reader will find these conditions of valid substitution admirably illustrated in R. Hall's *Works*, vol. i. p. 483; and still more fully by Mr Gilbert in his *Congregational Lecture*, "The Christian Atonement," &c., lect. vii.

7. The conditions, which may be thus *à priori* determined, are found to be fully met and satisfied in Jesus Christ, who is made known to us in Scripture as the propitiatory substitute for sinners. He came forth voluntarily, yet in accordance with the Divine appointment, to make satisfaction for sinners; in His submission to sufferings so awful that no finite mind can adequately conceive them, He gave indubitable evidence of the Divine abhorrence of sin, and the impossibility of its being committed with impunity; for if God gave up his Son to endure such agony ere sin could be forgiven, who can doubt that in the estimation of God sin is most hateful, and His law not to be broken with impunity? In the union of the Divine nature with the human in the person of Jesus, moreover, we have, on the one hand, that rare and unrepeatable character of the transaction, and, on the other, that identity of nature with those for whom He appeared, both of which we have seen to be conditions of a valid substitution; while in His perfectly sinless humanity we have another of these conditions satisfied. In fine, we see Him in the end victorious over all the evil to which He submitted, and exalted to glory and honour as the reward of his obedience. In Him, therefore, are all the conditions of a valid substitute for man found. He fulfilled all righteousness, and accomplished by His submission to death the great end of a propitiatory redemption for sinners—the reconciling of the exercise of the mercy of God in forgiving sin with the righteousness of God as a moral governor, and the perfection of God as a being who cannot look upon sin.

Offices of Christ.

8. This great end being secured, salvation is placed within the reach of all men to whom the gospel comes. The nature of the transaction accomplished by Christ was such that, to be of service for any, it must be sufficient and available for all. What reconciles the exercise of mercy with righteousness in the forgiveness of one sin, must be sufficient to reconcile these in the forgiveness of all sin. A door which is sufficient to admit the passing through it of one person, must be sufficient to admit the passing through of any person not naturally differing from the other. If any are in any way kept from passing through, it must be from some other cause than the nature of the opening through which this passage is to be made.

9. As all men *are* kept from accepting the benefits of Christ's death by their wilful obduracy, it is only as God moves them to avail themselves of His propitiation that any are saved; and as God is not pleased thus to move all, the remedy, though of universal sufficiency, becomes of limited efficiency.

10. As this limitation rests on the eternal purpose and choice of God, and as our Saviour could not but know, as an omniscient being, who of the human race were included in that gracious purpose, He must be viewed as having had for the elect a special regard in what He did for the salvation of man, and consequently to have died for them in a sense in which He did not die for all men. If this be conceded, it seems superfluous to inquire whether the appointment of the atonement, in the order of things, preceded the purpose of God in election, or the purpose of God in election preceded the appointment of the atonement. If we allow that the work was done with a special regard to the salvation of the elect, why seek to ascend the dizzy heights of speculation as to the order of the purposes in the infinite mind which determined the doing of it?

11. Hitherto we have looked at the propitiatory work of Christ only in its relation to God. As its design, however, is satisfactorily to effect a reconciliation between God and man, it must have an aspect also to the latter, and a fitness to move him to such reconciliation. It must be in accordance with man's moral constitution; it must commend itself to his sense of rectitude; it must present God to him in a light calculated at once to impress and to attract him; it must address itself powerfully to the best and highest affections of his heart; and it must be fitted to exert a constant constraining influence over his active nature, which shall continue to operate during his subsequent existence in the way of drawing him in trustful, loving obedience towards God. These conditions are fully met in the work of Christ; in connection with which God appears as a just God and a Saviour, and the salvation of man is secured in a way that at once commands the approval of his moral judgment, and captivates and controls the affections of his heart.

Edwards, *Remarks on Theol. Controversies*, ch. vi. Magee, *Discourses and Dissertations on Atonement and Sacrifice*, 3 vols. 1832.

Doctrine concerning Salvation.

or in his collected *Works;* Wardlaw, *Discourses on the Socinian Controversy*, disc. vii.-ix.; *Essays on Assurance of Faith and on the Extent of the Atonement*, &c.; *Discourses on the Nature and Extent of the Atonement of Christ;* J. Pye Smith, *Four Discourses*, &c., disc. iii., iv.; Gilbert, *The Christian Atonement*, Congregational Lecture for 1835; Thomson, *The Atoning Work of Christ*, Bampton Lecture for 1853; Macdonnell, *The Doctrine of Atonement deduced from Scripture*, Donellan Lecture for 1857; Symington, *Atonement and Intercession of Jesus Christ;* Jenkyn, *Extent of the Atonement;* Barnes, *The Atonement in its Relations to Law and Moral Government.*

II. *Christ's Prophetic Office.*—Our Lord was appointed to communicate the mind of God to man. According to God's gracious and eternal purpose, the truth whereby men are to be restored and sanctified was to be made known to them through the Mediator. This function our Lord discharged *mediately* and *immediately;* the former as He was the source of knowledge and authority to the prophets and apostles, in whom spake "the spirit of Christ;" the latter as He himself appeared and taught men the will of God. In regard to this, He spoke of Himself as the Light of the world (John viii. 12), and forbade His disciples to be called rabbi or master, seeing one was their Teacher and Master, even Christ (Matt. xxiii. 8, 10; comp. Deut. xviii. 18; Luke xxiv. 19; Heb. i. 1). Jesus as a teacher did not propagate the doctrines of any sect or school; nor did He utter speculations of His own; He came to make known to men the doctrine of God (John vii. 16). "Doctor doctorum Christus, cujus schola in terra et cathedra in coelo est," says Augustine. The divinity of His mission, and, by implication, the truth of His doctrine, our Lord proved by His miracles and prophecies.

See Neander, *Life of Jesus*, bk. iv. part ii.; Reinhard, *Versuch über den Plan Jesu*, &c., 5th ed., Wittenberg, 1830; translated into French (*Essai sur le Plan*, &c.), by J. L. A. Dumas, Valence, 1842; Alexander, *Christ and Christianity*, part ii. ch. 4.

III. *Christ's Kingly Office.*—As seated on the mediatorial throne, Jesus Christ governs all things in heaven and and on earth, and makes all tend to the furtherance of that cause which is His own. He is Lord of the created universe, Sovereign in the kingdom of grace, Head over all things for the Church, and King of glory, by whom the honours of heaven are sustained, and the rewards of heaven shall be dispensed.

See Ps. ii. 6; Ps. lxxii.; Is. xxxii. 1; Dan. vii. 13, 14; Matt. xxviii. 19, 20; Mark xvi. 15; John xviii. 33–37; Rom. xiv. 9; 1 Cor. xv. 23–28; Col. ii. 10, 15; Phil. ii. 10, 11; Heb. ii. 14; 1 Pet. iii. 22; Rev. xi. 15, &c. See Symington, *Messiah the Prince, or the Mediatorial Dominion of Jesus Christ*, 2d. edit., Edin. 1842. Comp. Ernesti, *De Officio triplici Christi*, in his *Opuscula Theologica*, p. 371.

PART IV.

SOTERIOLOGY, OR DOCTRINE CONCERNING SALVATION.

God is the sole author of salvation to man. It is of His benevolence, compassion, and free grace alone, that there is any salvation for sinners at all; and the scheme of redemption in all its parts, and from its first device to its final consummation, is wholly of God. "All things," says the apostle, "are of God, who hath reconciled us unto Himself by Jesus Christ," 2 Cor. v. 18.

The benevolence of God towards mankind has a twofold aspect, according as it respects the race at large, and as it respects those who are saved through Christ; the former is the *Divina benevolentia universalis*, the latter the *Divina benevolentia specialis*. Of the former we have manifestations in such facts as—1. God's sparing the race notwithstanding its sinfulness; His showing kindness to men, and doing them good; His bearing long with them, and giving them opportunities and means and motives to repentance. 2. His not willing that any should perish, but that all should come unto Him and live (Ezek. xviii. 32; xxxiii. 11; 1 Tim. ii. 4, &c.) 3. His sending His Son into the world, not to condemn the world, but that the world should be saved—that whosoever believeth on Him should not perish, but have eternal life (John iii. 16, 17); and, 4. His appointing Christ to accomplish a work of propitiation of infinite value, so that it is sufficient for the redemption of all, and lays a ground on which salvation may be offered to all. Of the special benevolence of God we have manifestations in all that He does for the actual and final redemption of His own people—those who in effect are saved.

Of Election.

Of what God does in relation to them, there are three kinds: 1. What He does *for* them; 2. What He does *upon* and *in* them; 3. What He enables them *to do for themselves.*

I. What God does for His people. 1. Election to salvation; 2. The mission and gift of the Holy Spirit; 3. The institution of means of grace.

II. What God does upon and in His people. 1. Effectual calling; 2. Regeneration, including renewal and justification; 3. Sanctification; 4. Perseverance to the end.

III. What God aids His people to do for themselves. 1. To believe in the Saviour; 2. To repent; 3. To resist evil, &c.; 4. To use the means of grace, and the discipline of life, so as to advance in meetness for heaven; and, 5. To triumph over death.

Our limits do not admit of our doing more than to touch on a few points in this wide field.

SECT. I.—*Of Election.*

Following the guidance of Scripture, and seeking to receive on this high theme only what Scripture teaches, and all that Scripture teaches, we would lay down the following positions, with their Scriptural evidence, as embracing the sum of this doctrine.

1. Believers stand in a peculiar and endeared relation to God. They are His special treasure, His peculiar people, a people for His possession (comp. Ex. xix. 5, Deut. vii. 6, with Mal. iii. 17, Tit. ii. 14, and 1 Pet. ii. 9).

2. This special relation into which the people of God have been brought is the result of a choice or election of them by Him. They are called the elect or chosen of God, an elect or chosen generation or race, the election. God is said to have chosen them; and they are exhorted to know their election of God, and to make their calling and election sure (Rom. xi. 5–7; 1 Cor. i. 27, 28; Eph. i. 4; 1 Thess. i. 4; 2 Thess. ii. 13, 14; Tit. i. 1; 1 Pet. i. 1, 2; ii. 9; 2 Pet. i. 10).

3. God's choice of His people is from all eternity. This follows of necessity from the preceding position; for if God elect at all, it must be from eternity, seeing all His purposes are according to the counsel of His unchanging will. Hence believers are said to be called of God according to purpose (κατα προθεσιν), to be known of God, and to be chosen before the foundation of the world (Rom. viii. 28; Gal. iv. 9; Eph. i. 4–6, 11).

4. This choice is a choice of them in Christ Jesus (comp. Eph. i. 4–6; 1 Thess. v. 9; 2 Tim. i. 9; 1 Pet. i. 2). But in what sense is this true? in the sense that Christ is the meritorious ground of their election, or in the sense that they were chosen to be saved in and through Christ? Looking at this question as one of exegesis, the latter seems to be the view authorised by the language of the apostles in the passages above cited. When it is said that believers have been predestinated *through* (δια) Jesus Christ, and that they have been appointed to obtain salvation *through* Him, it seems clear that the meaning is, that the respect which God is said to have had to Christ in the election and predestination of the saved, is respect to Him as the me-

Of Election.

dium or procuring cause of their salvation, not as the ground of their election. In other passages where they are said to have been elected *in* Christ, the meaning *may* be that it is in Christ that the primary reason of their election is found; but the meaning may also be, that it was with a view to their being in Christ by belief in Him that they were chosen of God; and that this is the apostle's meaning seems clear from his tracing election to the mere εὐδοκιὰ of God, which could not be if there was a meritorious cause of it, and from his stating that the design of their election was that they might be holy, &c., thereby indicating that at the time of their election they were not contemplated as in Christ actually, and therefore holy. We conclude, then, that (in the language of theologians) in election respect was had to the merit of Christ not *antecedenter*, as the cause on account of which God destined believers to be saved, but *consequenter*, as the primary medium through which the gracious purpose was to take effect.

5. The purpose of God in election is sovereign; that is, not without reasons, and these the highest, but determined by reasons of His own, of which we are wholly ignorant, and which do not lie in the parties themselves who are the objects of His choice. Whilst Scripture explicitly ascribes this choice to the wisdom (σοφια), the mind (νους), and the counsel (βουλη) of God (Rom. xi. 33, 34; Eph. i. 11), it not less explicitly pronounces it wholly of grace, resolves it into the good pleasure of His will (εὐδοκια του θεληματος), and asserts it to have been "according to His good pleasure, which He hath purposed in Himself"—"according to the purpose of Him who worketh all things after the counsel of His own will" (Rom. ix. 16; xi. 5–6; Eph. i. 5, 11; 2 Tim. i. 9).

An attempt is made to get rid of the sovereignty of God in election, asserted by these passages, by maintaining, that though the reason of the choice is not, and cannot be in the actual faith and piety of the saints, seeing it is like all God's purposes from eternity, yet, as it proceeds out of the Divine foreknowledge, it finds its reason in the foreseen faith and piety of the saved. Strangely enough this was the original opinion of Augustine (see his *Expositio quarundam propositionum ex Ep. ad Rom.* c. 60, and his *Retractationes*, book i. c. 23). Traces of it may be found in the Greek fathers, and in Jerome; and among the schoolmen it found advocates in Duns Scotus and Bonaventura. It is a favourite doctrine of the Remonstrant party (see Grotius on Eph. i. 5; and *Art. Remonstr.* Art. I.; see also Bishop Tomline's *Elements of Theology*, and Watson's *Institutes*, vol. iii. p. 78). Of this opinion, a recent German expositor, in no wise attached to Calvinistic views, but whose philological and exegetical merits are of the highest order, says that it is "destitute of exegetical validity" (*ohne exegetisches recht*, Meyer on Eph. i. 5). This is true; there is not a passage in the New Testament in which such a doctrine is either directly or implicitly taught, or which has even the appearance of teaching it; whilst there is much that is distinctly against it. It is irreconcileable with the strong and decided terms in which the perfect *gratuitousness* of election is asserted; and it is irreconcileable with those passages in which faith and piety are represented as *ends* contemplated in the election of the people of God (compare, especially, Acts xiii. 48; Rom. viii. 29, 30; Eph. i. 4; 1 Pet. i. 2). It may be added, that if election be nothing more than a choosing of men on the ground of their foreseen piety, it is by no means such a mysterious, or to human pride offensive, doctrine, as St Paul represents it to be; nor is it possible to see how, if we deny the pure grace and sovereignty of God in election, we can preserve ourselves from attributing to the believer a meritorious making of himself to differ, as the Pelagians teach, but in direct contradiction to what the Apostle says, 1 Cor. iv. 7 (see Turretine, *Instit. Theol. Elenc.* i. p. 398). We may fairly ask also, if men are elected on the ground of foreseen faith and piety, to *what* is it that they are elected? Is it to salvation? Then is God's election nugatory; it is an election of a man to the enjoyment of a blessing which the man has already received by that which forms the ground of election, viz. faith and goodness. Is it to the *means of salvation?* Then God must have purposed to furnish to certain persons the means of salvation, because He foresaw that they would of their own accord, and without aid from above, use them aright; that is to say, because He foresaw that something would happen which He has expressly told us never does happen! Besides, what is to be said of those to whom the means of salvation are sent but who do not use them? In what do the elect in virtue of their election differ from them on this hypothesis?

Of Election.

6. The Divine purpose in election has respect to the actual salvation of those who are its objects (Acts xiii. 48; Rom. viii. 28, 29; ix. 23; Eph. i. 4, 11; 1 Thess. v. 9; 2 Thess. ii. 13, 14; 1 Pet. i. 1, 2). This is opposed to the doctrine of those who teach, that it is only to the *offer* of salvation, and not to salvation itself, that men are elected; a doctrine which is not only groundless, so far as Scripture is concerned, but which is irreconcileable with many express teachings of Scripture—such as that salvation is an evidence of election (1 Thess. i. 4, 5), and that heaven is a place prepared from eternity for the people of God (Matt. xxv. 34). Besides, what advantage is gained by this hypothesis? There still remains on it an election as arbitrary as on the hypothesis it is meant to supersede. If it be inconsistent with the Divine equity to elect individuals to salvation, on what ground does it become consistent with the Divine equity to elect individuals or communities to the possession of the means of salvation, while these are withheld from others? If, on the one hypothesis, there is the appearance of partiality on the part of God, there is no less the appearance of this on the other, and along with that the appearance of feebleness or indifference, in merely providing the means without in any way securing the end.

7. The Divine election is an election of persons and not of communities (Acts xiii. 48, ὁσοι; Rom. viii. 28; ix. 14–16; 1 Thess. i. 4; v. 9; 2 Thess. ii. 14; 1 Pet. i. 1, 2; 2 Pet. i. 10). Those who oppose this view appeal to the case of the Jewish nation, which was chosen as a nation; but the analogue to the Jewish nation is not any of the nations of the earth, but the Christian Church, the "holy nation," of which it was the type; and how the Church as a spiritual body can be chosen, except by the choice of its members individually, it is impossible to conceive. "The personality of election," as has been well observed, "seems to arise out of its very nature. It is difficult to conceive of any purpose or determination existing in the Divine mind, without being specific and definite in all its arrangements." (Fletcher, *Discourse on Spiritual Blessings*, p. 30).

8. In election, God had respect to men not simply as creatures, but as fallen creatures. This is a middle position between two extremes; the one of which is occupied by those who maintain that in predestination God had respect to man simply as a creature, and anterior to his fall; the other of which is occupied by those who suppose that God in predestinating had respect to man not merely as a fallen being, but specifically as either also redeemed through union with Christ, or as condemned through final impenitence. The former is the scheme of the supralapsarians; the latter that of the sub or infralapsarians. The difference between those two systems, though depreciated by some, is real and important; it is nothing less than the distinction between the assertion that God decrees men to suffer wrath irrespective of their guilt; and the assertion that He decrees them to suffer wrath on the ground of their foreseen guilt. Neither doctrine, however, appears exactly to express the truth on this head. God, in the decree of election,

Divine Personality of the Holy Spirit.

has not respect to men merely as creatures; for believers are chosen in Christ as vessels of mercy, and therefore as fallen and guilty creatures who alone need mercy, and for whom alone Christ has provided salvation. On the other hand, we have already seen, that it is not on the ground of foreseen faith and obedience that believers are elected, and Scripture says nothing of a damnatory decree predestinating the finally impenitent to destruction on the ground of their foreseen impenitency. Abstracting from the wicked, who are left to themselves, the purpose of God in election had respect only to the saved, as those whom God of His free grace would bring out of the mass of fallen humanity to the enjoyment of eternal life through his Son. Scripture, justly interpreted, knows nothing of an unconditional reprobation, as held by some divines of the Gomarist or ultra-Calvinistic school. God nowhere appears in his Word as creating men simply with the sovereign *purpose* of damning them eternally. Nor does there seem any good ground for holding the modified view on this subject of the Preteritionists, who, while rejecting the doctrine that God, in the exercise of his free sovereignty, elects any but to blessing, nevertheless contend for a decree of preterition, in virtue of which God has determined to pass by those who are not saved. On the principle that God decrees what He does, but not what He does not do, we conclude that He decreed, by an absolute decree, to save the saved, but did not decree not to save the lost.

See Williams, *Essay on the Equity of Divine Government, and the Sovereignty of Divine Grace; Defence of Modern Calvinism*, ch. 3; Fletcher, *Spiritual Blessings, a Discourse on Election and Sovereignty*, 5th ed., 1850. Payne, *Lectures on Divine Sovereignty*, &c., lect. i.–vii.; Wardlaw, *System. Theol.*, ii. pp. 485–549; Turretine, *Instit. Theol.*, loc. iv. qu. 6–18.

Sect. II.—*Divine Personality of the Holy Spirit.*

The term "Spirit" (רוּחַ, πνευμα) is used in Scripture in many applications, both physical and mental. It is used to designate breath, air in motion, or wind, animal life, the human soul, the intelligent and emotive nature of man, any immaterial object, such as a ghost, or an angel, in which sense also it is applied to God. From denoting the inner nature of man, it came to denote the source of impulsive power, animating force, or vivifying energy. (See Judges xv. 19; Is. xxxi. 3). Hence the phrase, "Spirit of God," in many places denotes the Divine energy or power (Job xxiii. 13; Ps. xxxiii. 6; 2 Thess. ii. 8); and from this, combined with the usage of the term to designate what is immaterial and invisible, the phrase came to be used as an appellation of the Holy Spirit, the invisible but mighty agent in man's salvation.

Besides the appellation Holy Spirit, we have the appellations, Spirit of God, Spirit of Christ, and Spirit of Holiness, used in such a way as to be appropriate only to a personal agent. The Spirit of God *moves, strives, speaks, sends*, or *is sent, is vexed, dwells in man*, &c. (Gen. i. 3, vi. 3; 2 Sam. xxiii. 2; Is. xlviii. 16, lxiii. 10; 1 Cor. iii. 16, &c.) The Spirit of Christ (*i.e.*, whom Christ sends) *is in men, aids men, suffers* or *permits* (Rom. viii. 9; Phil. i. 19; Acts xvi. 7). The Holy Spirit is sent by Christ as a παρακλητος, to act the part of a *guide, director*, and *helper* of believers; the Holy Spirit *speaks* and *commands* (Acts xiii. 2); the Holy Spirit *judges* and *determines* (Acts xv. 28); *wills*, and *acts accordingly* (1 Cor. xii. 11); is capable of being *grieved, resisted, lied unto, tempted, blasphemed*, &c. In speaking of the Spirit, also, the terms ἐκεινος, αὐτος, and ὁς are used, which can be accounted for, or grammatically excused, only on the assumption of His personality. On these grounds it is concluded that the Holy Spirit is a person; in fact, they supply to us exactly the same reasons for believing in the personality of the Spirit as we have for believing in the personality of God.

But some of these passages do more than this, they also convey to us the impression of the *divine* personality of the Spirit. The very expressions, Spirit of God and Holy Spirit, contain in them something divine; and if they designate a person, that person must be God. Further, though the Holy Spirit is nowhere especially called God, yet in repeated instances this phrase is used interchangeably with the term God, and the same things are ascribed to both (Acts v. 4, 9; 1 Cor. iii. 16, compare with vi. 19). Again, certain divine attributes are ascribed to the Holy Spirit. Thus, He is presented to us as *omniscient* (1 Cor. ii. 9, 11; comp. Ps. cxxxix. 7; Rom. viii. 26); as *omnipotent* (Acts ii. 4; Rom. xv. 19; 1 Cor. xii. 11); as *revealing the mind of God to men* (Luke ii. 26; Mark xiii. 11; 1 Cor. ii. 9, 10; 2 Peter i. 21); as *eternal* (Heb. ix. 14). The Holy Spirit, in fine, is joined with the Father and the Son in such a way as to indicate that an equality of dignity and power belongs to Him with them (Matt. xxviii. 19; 2 Cor. xiii. 14). A being to whom such qualities are ascribed, and such a position assigned by the sacred writers, must be divine.

Work of the Holy Spirit.

See Owen, *Pneumatologia, or a Discourse concerning the Holy Spirit*, ch. iii.; Wardlaw, *Discourses on the Socinian Controversy*, disc. x.; Smith, *Personality and Divinity of the Holy Spirit*, Lond. 1831; *Script. Testimony*, ii. 446.

Sect. III.—*Work of the Holy Spirit.*

The special office of the Holy Spirit in redemption is to glorify Christ, by taking of the things of Christ and showing them unto men (John xvi. 14). In fulfilling this office, He specially dwelt in the apostles, and some of those who were associated with them in the first promulgation of Christianity, so as to qualify them for declaring with perfect accuracy the truth concerning Christ to men; He inspired the authors of the Bible, so that their writings are the word of God; and He dwells in believers, so as to cause them to understand, receive, and believe the truth thus revealed and recorded for their own salvation.

It is customary to distinguish these operations of the Holy Spirit into two classes, under the heads of *extraordinary* and *ordinary*—the former embracing the Spirit's agency in inspiration and miraculous endowments; the latter having reference to his agency in the conversion and sanctification of men through the truth. So far as respects effects and ends, this distinction is valid; inspiration is not regeneration, nor is the end contemplated in the one case the same as that contemplated in the other. But, ignorant as we are of the mode of the Divine operation on the mind of man, we are not entitled to say that it differs in nature in the one case from what it is in the other; and there are many points of analogy between the two, the consideration of which is calculated to facilitate the just apprehension of the whole subject. These points of analogy may be thus stated:—

1. In both cases the influence exercised on the mind is *sovereign* in its source; that is, it is dispensed by God, not on the ground of desert on the part of any who receive it, but on the ground solely of His own free grace. As it was entirely of favour that the apostles were put into the ministry, and endowed with the faculty of communicating God's will to the world; so it is equally of grace that the Spirit of God is given to any to work in them moral and spiritual life. In both cases it is by the grace of God alon that His servants are what they are.

2. In both cases the influence bestowed is *special* in its destination; that is, it is bestowed on individuals a such, and it is bestowed for a given end or purpose. As there was not a given quantity of inspiration bestowed on the Church, of which each member might avail himself if he willed, but certain persons were selected by God, on

Effects of the Holy Spirit's work in Man.

whom He sent his Spirit to fit them for teaching His will to men; so in the spiritual life it is not by a gift of common grace conveyed to the Church, of which each individual is to make what use he can, but by a special gift to individuals of the Spirit, for the purpose of bringing them to God and fitting them for His service and inheritance, that the work of regeneration and sanctification is carried on.

3. In both cases the inference is *direct* and *irresistible*; that is, it is exercised at once and immediately by the Spirit on the mind of man; and wherever it is so exerted, it invariably secures the end it was designed to effect. In inspiration, it was through no medium, but by direct action on the mind, that the Holy Spirit moved the prophets and apostles to speak and to write; nor did this action ever fail of effecting this result. In like manner the agency of the Spirit on the soul, in conversion and sanctification, is immediate and direct, nor is it ever put forth without actually effecting the result it was designed to effect, for we cannot conceive that God can be frustrated in any purpose for which He puts forth the efficient energy.

4. In both cases the influence is such, and is so exerted, as not to interfere with the ordinary laws and operations of the human mind and will. As the sacred writings manifest that, though under the afflatus of the Spirit, each writer retained his idiosyncracy of thought and expression; so in the other department the influence is altogether occult, and operates through the faculties of the individual, suspending none, strengthening none, adding none, but using all according to their own laws, for the realization of the purposed end. In conversion, God does not make known to us new truth, nor does He make the truth more potent in its action on us than it was, nor does He increase our natural faculties in any way: He simply opens the heart to *attend* to the truth, and Himself shines into the hearts of men to "give the light of the knowledge of the glory of God in the face of Jesus Christ" (Acts xvi. 14; 2 Cor. iv. 6).

See Owen, *Pneumatologia*, bk. ii. and iii.

Sect. IV.—*Effects of the Holy Spirit's work in Man.*

The older divines have set forth with considerable elaboration what they call the *ordo salutis*, by which they mean the different stages through which a sinner passes to the attainment of full and final salvation. These, according to them, are vocation, illumination, justification, regeneration, and mystical union with God; to which some add conversion, contrition, conservation, and glorification. These all are classed under the general head of *gratia Spiritus sancti applicatrix*, and they are referred to different offices, which the Holy Spirit is represented as discharging, viz.:—1. His *officium elenchticum* (John xvi. 8), or *epanorthoticum* (2 Tim. iii. 16); 2. His *officium didascalicum* (John xvi. 13–15); 3. His *officium pædeuticum* (2 Tim. iii. 16; Rom. viii. 14); and, 4. His *officium paracleticum* (Rom. viii. 16, 26). In this there is perhaps a needless minuteness, and an artificiality which enforces upon Scripture what does not naturally flow out of it. We think it unnecessary to set forth more than the following effects of the Spirit's grace.

1. *Vocation* or *Calling*. This is not the outward invitation of the gospel, which is common to all men to whom Christianity comes, but the inward call or effectual power by which men who hear the gospel are brought to accept the blessings therein announced and offered. Of this calling the properties are—1. It is of God (Rom. xi. 29; 1 Cor. vii. 17; Phil. iii. 14; 1 Thess. ii. 12; 2 Thess. ii. 14; 1 Pet. v. 10). 2. It is of grace (Gal. i. 15; 2 Tim. i. 9; 1 Pet. v. 10). 3. It is sovereign (Rom. viii. 28; 1 Cor. i. 27, 28). 4. It is predestinated (Rom. viii. 29). 5. It is effectual (Rom. viii. 30). 6. It has its foundation in the work of Christ (Rom. i. 6; 2 Tim. i. 9; 1 Pet. v. 10). 7. It is irrevocable (Rom. xi. 29). 8. It is effected through the instrumentality of the gospel (2 Thess. ii. 14). 9. It is high and heavenly (Phil. iii. 4; Heb. iii. 1). And, 10. It is holy (2 Tim. i. 9; Rom. i. 7; 1 Tim. vi. 12; 2 Pet. i. 3). It thus appears that calling is the counterpart and complement of election, being the actual realisation of that of which election is the purpose. It will be apparent, also, that under vocation, as above explained, fall two of the other steps in the *ordo salutis* of divines—viz., illumination and conversion; for in effectually calling a man to Himself by the gospel, God both sheds light into his mind and turns him to Himself and to heaven.

2. *Regeneration*. Through the operation of the Spirit, the sinner, naturally the enemy of God, is brought to become the child of God, and that not by adoption merely, but by a new birth or new creation. In this are involved two things: the one of which is the removal of the legal attainder and personal guilt under which the sinner lies; the other is the renewal of the spirit of the mind, by the implantation of a godly principle, a principle of love to God, which shall become the ruling principle of the soul and life. Both these are essential to a man's becoming a child of God; both, therefore, are properly included in regeneration; and both are brought about by that Spirit of sonship (υἱοθεσια) which God, in the fulfilling of His electing purpose, gives to those that are saved (comp. Tit. iii. 4–7).

Thus viewed, Regeneration includes both Renewal and Justification, though it is commonly restricted to the former. In renewal, the Holy Spirit acts directly on the mind of man, restoring to him right moral dispositions, changing his prevailing bias from evil to good, and bringing him under a godly influence, whereby he is inclined to the things of God. It includes in it, therefore, repentance or change of mind. In justification, the Holy Spirit acts by operating faith in Christ in the sinner's mind, and thereby uniting him with Christ; faith being "that whereby" (to use the words of Owen) "the Lord Christ and believers actually coalesce into one mystical Person." Being thus one with Christ, what He did and secured in His public character becomes theirs by God's gracious donation; and as He, having been put to death in the flesh, has been justified in the spirit, they too are held to have died in His death, and to be justified in His justification. The justification of believers, then, whereby they acquire a right to be the sons of God (John i. 12), is their legal acquittal and absolution from guilt, on the ground, not of any transfer of Christ's righteousness to them, nor on the ground of their being held as if they had not been guilty, but on the ground of a free grant being made to them by God of the benefits of Christ's meritorious work. As it is their faith which so unites them to Christ as to make them partakers of Him and of His work, so it is said in Scripture that they are justified by faith, and faith is counted to them for righteousness (Rom. iv. 5; v. 1).

See Owen, *Doctrine of Justification by Faith through Imputation*, &c.; Fuller, *Works*, vol. iv. pp. 223, 229, v. p. 586, &c.; Pictet, *Theologie Chretienne*, ii. 109, ff.; Payne, *Lectures on Divine Sovereignty*, &c., lect. xiv.–xx.; Wardlaw, *System. Theology*, ii. pp. 678–727.

3. *Sanctification*. The renewal of the mind is the first step in a process which, conducted under the immediate agency of the Divine Spirit, by whom it was commenced, gradually advances until the mind is wholly delivered from sin and all its evil effects, and he who had borne the image of the earthly is brought to bear the image of the heavenly. The consummation of this result is not to be expected on earth, but is assured to the believer in heaven, and constitutes the main element of his glorification (John xvii. 17; Rom. vi. 4, 6, 11, 12, 19, 22; 1 Cor. vi. 11; 2 Cor. vii. 1; 1 Thess. v. 23, &c.) Under this head may be ranked the *unio mystica* of theologians, for they intend by this "the

Means of Grace.

state of a sanctified man, who embraces God with sincere love, and enjoys the blessedness of such love" (Hase, *Hutterus Redivivus*, p. 287).

4. *Perseverance.* Wherever God has bestowed saving grace on a sinner, it has been with a view to his final salvation; therefore, all such will be kept so as that they shall never wholly nor finally fall from a state of grace, but will continue, with Divine assistance, to the end, so as finally and for ever to be saved (John iv. 14; vi. 37, 39; x. 28; Rom. viii. 28–30, 35–39; Phil. i. 6; 2 Tim. iv. 8; 1 Pet. i. 4, 5).

See Owen, *The Doctrine of the Saints' Perseverance explained and confirmed*, 1654, and in collected *Works*; Dwight, *Theology*, Serm. 87.

Sect. V.—*Means of Grace.*

The Holy Spirit is the agent in the salvation of all who are saved; but His agency is conducted in connection with the use of means. It is not meant by this that the Holy Spirit either adds force to these means, which would be to impeach their intrinsic worth as divine provisions; or that the Holy Spirit uses them as instruments by which He operates, a position to which it is impossible to attach any meaning. What is intended is, that the Spirit, operating directly on a man's mind, enables him to use these means so as that they shall effect for him the ends to which they are inherently and perfectly adapted. It is on account of this that the same effects are ascribed in Scripture to the Spirit and to the means of grace, as if they were co-ordinate causes. They are not really so; but as they cooperate to the same result, and contribute each an independent part to it, they are virtually so.

The means which the Spirit thus enables men to use for their salvation are these:—

1. *The written Word.* This is given by inspiration of God, and as such is a perfect and infallible expression of His will to men. It is divinely adapted to enlighten, to guide, to reprove, and to stimulate in religious matters. By it men are called, convinced, quickened, comforted, and sanctified (Ps. xix. 7–9; John v. 39; Rom. xv. 4; 2 Tim. iii. 16, 17; Heb. iv. 12, 13; James i. 21; 1 Pet. i. 24, 25).

2. *The preaching of the Truth.* The design of this is to expound, apply, and enforce the written Word by means of oral addresses. As this instrument is admirably adapted to promote the ends which revelation is intended to effect, it has always formed an important part of the means employed for the edification of the Church (2 Chron. xvii. 7–9; Neh. viii. 1–8; Is. vi. 9, 10; Jer. xxv. 4 ff.; xxxv. 15; Mark xvi. 15, 20; Luke iii. 18; iv. 18, 19; viii. 1; 1 Cor. iv. 5; 1 Tim. iv. 13).

3. *Worship.* This consists of praise and prayer offered to God. In praise, we adore and celebrate the Divine perfections, acknowledge the Divine bounty, and give thanks for special mercies received by ourselves. In prayer, we offer up our desires to God for things agreeable to His will. Both these are to be presented in the name of Christ, through whom alone we can approach unto God; both are to be presented in the Spirit; and both are to be united in the same service, if not in the same act. Worship, in both its parts, may be either private or social (Ps. lxv. 1, 2; lxvi. 4; lxvii. 3; xcii. 1–3; xcvi. 1–9; cvii. 22; cxlvii. 1; Is. xlii. 10–12; Matt. vi. 7–12; vii. 1–3; Luke xviii. 1; Eph. v. 19; Phil. iv. 6; 1 Tim. ii. 11; Heb. iv. 14–16; x. 19–25; Eph. ii. 18; vi. 18).

4. *The Sacraments.* Truth may be presented either in words or by means of symbols. It is presented in the latter way in the sacraments, which are symbols or outward signs of spiritual truths; and the observance of them is an expression of a certain relation to the truths thus symbolised, as well as a pledge of adherence to the religion of which they are part. They are two in number, *Baptism* and the *Lord's Supper*. The former symbolises, by means of the application to the person of water, the purifying tendency of Christian truth when applied to the soul through the outpouring on it of the Holy Ghost (which is also called a baptism); and the observance of it is an expression of allegiance to Christ as the Lord of the conscience, and an engagement that the party receiving it shall become a disciple or learner in Christ's school. The Lord's Supper symbolises by means of bread broken and wine poured forth the propitiatory work of Christ for sinners, and the observance of it is in commemoration of this, as the crowning manifestation of Christ's love to His people, and in pledge of their continual dependence on Him, and devotedness to Him.

The Last Things.

The ordinances of Christianity become means of grace to the sinner, by bringing before him those truths by the knowledge of which alone he can be saved, and reminding him of the obligations under which he lies to receive them in the love of them; and to the believer, by bringing before him the truth as the aliment of the soul, and drawing forth into lively exercise those habits of mind and states of feeling which constitute true piety. They thus advance his sanctification and preparation for heaven.

Sect. VI.—*The Last Things.*

As death has been introduced into our world by sin, and as every member of the race has sinned, the lives of all are forfeited, and must in due time be yielded as Providence may appoint. When this takes place, the soul is separated from the body, and the latter speedily decomposes into kindred dust. The former, however, still retains possession of all its peculiar faculties, and passes at once into a state of separate existence, the character of which is determined by the conduct of the individual during life. To those who have availed themselves of the gracious provision made by Christ for their redemption, death brings an immediate entrance into the enjoyment of heaven; while for those who have neglected or despised that provision, there remains only the endurance of the punishment which the Great Judge of all shall see necessary to inflict. (Compare Rom. v. 12; Matt. x. 28; Luke xvi. 22–31; Phil. i. 23; Rom. xiv. 13, &c.)

This state of separate existence is destined to continue only for a time. Christ has himself arisen from the dead as "the first-fruits of them that sleep;" and we are assured, that as He arose, so must all the dead who possess that nature of which He partook be raised at the last day. When that period arrives, the Saviour shall again, in person, revisit this world, summon from their grave the bodies of all mankind who have died, change in a moment the bodies of those who shall then be alive, and afterwards proceed to a solemn trial of the whole, each one by himself, according to their deeds done in the body. At the close, the eternal destiny of each will be announced, and the mediatorial reign of Christ terminated by the introduction of the righteous into the fulness of that celestial enjoyment to which our race was originally destined, and the banishment of the wicked into that place which was prepared for the devil and his angels. (Compare 1 Cor. xv.; John xi. 23–26; Matt. xxv. 31–46; Rom. xiv. 9, 10; 2 Thess. i. 5–10, &c.)

(W. L. A.)

Theophrastus.

THEOPHRASTUS, a philosopher of Greece, was a native of Eresus, a maritime town in the island of Lesbos, and is supposed to have been born about the year 392 before the Christian era. His father was by trade a fuller. The original name of the son, we are informed, was Tyrtamus; but on account of his conspicuous eloquence, he was called Euphrastus, and afterwards Theophrastus. At an early age he repaired to Athens, where he successively became the disciple of Plato and of Aristotle. On the retirement of the latter, he became the head of the Peripatetic school; and so high was his reputation as a teacher of philosophy, that at one period the number of his scholars amounted to two thousand. He appears to have reached a very advanced age. If the preface to his *Characters* is genuine, and if one passage which it contains is correct in the reading, he undertook that work at the age of ninety-nine. This statement however cannot be received without the utmost suspicion. He succeeded Aristotle in 322, and was himself succeeded by Strato in 287 B.C. He had thus presided in the Lycæum for about thirty-five years (Clinton's *Fasti Hellenici*, vol. ii. p. 183.) His works, according to the catalogue of Diogenes Laertius, were very numerous; and several of them have been preserved in a state more or less perfect. To the stock of natural knowledge he made some important contributions. The largest of his works are two which relate to the history and to the causes of plants; and by these he has established a claim to be regarded as the father of botanical science. His *Characters* form one of the most remarkable compositions which ancient Greece has bequeathed to our times.

The works of Theophrastus were first printed by Aldus, in two volumes of his edition of Aristotle, Venet. 1497–8, fol. A separate edition was long afterwards produced by Heinsius, Lugd. Bat. 1613, fol. This only contains the text, and a Latin version, without annotations. A more elaborate edition was at length published by Schneider, Lipsiæ, 1818–21, 5 tom. 8vo. The text is comprised in the first volume; the others are occupied with a Latin version, annotations, various readings, and an index. Of the *Historia Plantarum* an elaborate edition was published by Bodæus, Amst. 1644, fol. A separate volume had formerly appeared under the title of *Julii Cæsaris Scaligeri Animadversiones in Historias Theophrasti*, Lugduni, 1584, 8vo. The same learned man had likewise published *Commentarii et Animadversiones in sex libros de Causis Plantarum Theophrasti*, Lugd. 1566, fol. The octavo volume is a book of rare occurrence. An English translation of the *Treatise on Stones*, accompanying the original, was published by Sir John Hill, M.D., Lond. 1746, 8vo.

Of the *Characters* of Theophrastus, the separate editions are very numerous. The earliest, which only includes fifteen characters, is that of Pirckheymher, Norembergae, 1527, 8vo. But for the most able and conspicuous edition we are indebted to Casaubon, Lugd. 1592, 8vo. This edition, which has often been reprinted, is accompanied with a most learned and elaborate commentary. Here we ought not perhaps to overlook the edition of Needham, Cantab. 1712, 8vo. He has published the prelections of Duport, professor of Greek at Cambridge, on thirteen of the characters, and has reprinted the commentary of Casaubon. The editions by Fischer in 1763, and Schneider in 1799, likewise deserve to be specified. The number of characters Casaubon had augmented to twenty-eight. Other two were long afterwards brought to light by Amaduzzi, who published them in a splendid volume printed by Bodoni: *Characterum Ethicorum Theophrasti Eresii Capita duo hactenus anecdota, quæ ex cod. MS. Vaticano sæculi XI. Græce edidit, Latine vertit, præfatione et adnotationibus illustravit Johannes Christophorus Amadutius*, Parmæ, 1786, 4to. Here the Greek text occupies six pages, but the volume extends to nearly 140. The *Characters* of Theophrastus have been translated into many languages. The version of La Bruyere, with additional characters by the translator, ranks among the most conspicuous books in the French language. His version was transferred into English in 1699; Budgell's translation of the original followed in 1713, and Gally's in 1725. A more recent version has appeared under the subsequent title: *The Characters of Theophrastus, translated from the Greek, and illustrated by physiognomical sketches; to which are subjoined the Greek text, with notes and hints on the individual varieties of human nature*, by Francis Howell, Lond. 1824, 8vo.

Theopompus || Thermometer.

THEOPOMPUS, a celebrated Greek orator and historian, was born in the island of Chios, probably about 378 B.C., and flourished in the reign of Alexander the Great. He was one of the most famous of all the disciples of Isocrates, and won the prize from all the panegyrists whom Artemisia invited to Halicarnassus, to praise Mausolus. He wrote several works, which are lost. The fragments of this writer which remain have been published by Wichers and Müller.

THEOREM (*θεώρημα*), in geometry is a truth to be proved, whereas a problem is something to be done. It is likewise applied to a discovered law which is believed to hold in the particular science or branch of a science in which it is discovered, as the *Binomial Theorem*, and *Taylor's Theorem* in algebra.

THEORY (*θεωρία*), a word used by men of science to denote the real or hypothetical approaches which are made to the discovery of some law of nature real or supposed. When the hypothesis is without verification it does not deserve the name of theory, and when a number of well-established theories have been arrived at, the particular branch of knowledge is then in the fair way of becoming a science. There is, besides, a popular use of the word *theory* as contrasted with *practice*, in which the frequent misapplications of the word theory to merely hypothetical knowledge is ridiculed and contrasted sharply with the slow but secure knowledge which experience brings. Any subject which is supposed to be tainted with suppository knowledge, is, on this view of it, held up to scorn, as the dupe of "mere theory."

THEOSOPHISTS. See MYSTICISM.

THERAPEUTÆ (*Θεραπευταὶ, worshippers*), a species of Egyptian ascetics mentioned by Philo Judæus. Some writers (and among others Scaliger, Mosheim, &c.), identify this sect with the Essenes, while Eusebius regards them as Christians who dwelt in the neighbourhood of Alexandria, and who were converted by Mark. But these views are by no means satisfactory. (See Dr Burton's *Lectures on the Eccl. Hist. of the First Century*, 2 vols., 1831.)

THERESIENSTADT, or MARIA THERESIOPEL (Hung. *Szabadka*), a town of the Austrian Empire, Hungary, 25 miles S.W. of Szegedin. It has a town-hall, numerous churches, a college, large barracks, and manufactures of linen, leather, and tobacco. Dyeing is also carried on; and there is an extensive trade in horses, cattle, sheep, and wool. Pop. (1854) 48,126.

THERMOMETER (from *θερμός* hot, and *μέτρον* a measure). The various thermometric instruments admit of being arranged in classes according to the various phenomena they are intended to illustrate, an account of which will be found under HEAT, together with the precautions necessary to the estimation of *temperature*, as distinguished from the absolute quantities of heat contained in a body. Our business in the present article is to describe the thermometer, properly so called, under its most useful and important forms, referring to PYROMETER for those instruments which measure temperatures above the boiling-point of mercury. There is, however, a class of instruments named *Calorimeters*, the function of which is to compare the quantities of sensible heat evolved by different actions.

Thermometer.

or contained by different bodies. There is another set of instruments by which the effects of different radiations or heating rays are compared; and as the indications of such instruments depend on the *difference* of temperature between their different parts, they have been named *differential* thermometers. Small quantities of radiant heat can also be measured by means of very feeble thermo-electric currents, as in the instrument called the *thermo-multiplier*.

The first thermometer dates from the beginning of the seventeenth century. It consisted of a tube open at one end, with a glass bulb at the other; and the open end being inserted into a cup of coloured liquid, and heat applied to the bulb, a portion of the air was expelled, and on cooling, a quantity of liquid rose by atmospheric pressure into the stem, equal to the quantity of air that had been expelled by the heat. Now, as air is sensitive to changes in temperature, any variation in that of the surrounding air would communicate its influence to the air imprisoned in the bulb, causing it to expand, and so depress the liquid in the stem when it became warmer, and to contract and cause the liquid to rise under the influence of cold. An instrument of this kind was formerly called a *weather-glass*, from its indicating warm and cold weather, but more commonly an *air thermometer*. It was improved by Boyle, who got rid of the bulb, and employed a tube open at both ends, and cemented into the neck of a bottle containing a coloured liquid, so as to confine a portion of air. By dipping the bottle into different liquids, their temperatures could be compared by the expanding or contracting air of the bottle, causing the ascent or depression of the liquid in the stem. The liquid, however, being open to the atmosphere, was liable to evaporation and contamination. A notable improvement in the instrument was made by the Florentine academicians, who removed the registering fluid from the action of the atmosphere; and instead of the ordinary scale of equal parts, constructed arbitrarily, employed fixed points such as should be applicable to all thermometers, and thus make one instrument comparable with another. The instrument consisted of a bulb and a stem of moderately fine bore, containing spirits of wine, which, being boiled to expel the air, the tube was hermetically sealed. The fixed points were, the cold of ice and snow for the lower limit, and the greatest summer heat of Florence for the upper one. But as these points are subject to variation, the instrument was still wanting in one of its essential characters. When the instrument was brought to England, Boyle substituted coloured for colourless spirit, which was an improvement. There was considerable discussion about the standard minimum of temperature, based on the erroneous notion that the freezing point of water varied in different climates. It was proposed to fix one point of the scale by noting the height of the liquid in the stem, when the bulb was placed in thawing oil of aniseed. Hooke is said to have preferred the temperature of freezing water; Halley proposed the boiling point of spirits as another fixed point; but Newton seems to have been the first to take advantage of the fact, if he did not discover it, that whenever a thermometer is placed in melting snow or ice, the liquid always stands at the same point in the tube, while the boiling point of water is almost equally constant. It was easy, then, to take these two points, and divide the interval between them into a certain number of equal parts or degrees, and continue the division above and below, and thus convert the instrument from a mere toy into an artificial organ of sense, whose observations at different times and in different places would not only be comparable with each other, but also with those of other instruments constructed under the same circumstances. As, however, the boiling point of water is higher than that of spirit, it was necessary to select as the registering liquid one that would not pass off into vapour on being immersed in boiling water. Newton suggested oil, but this was found to be sluggish in its motions, to vary in fluidity with the temperature, and to adhere strongly to the tube. Halley suggested the use of mercury, but rejected it from some mistaken notion of its small amount of expansibility; but Römer adopted mercury, and is said to have constructed the scale attributed to Fahrenheit, an instrument-maker, a native of Dantzic, resident in Amsterdam. His thermometers were so highly appreciated, that they were known all over Europe early in the eighteenth century.

Thermometer.

The advantages of mercury as the thermometric fluid are, that it enlarges in bulk more equally for equal increments of heat than most other liquids, although in common with all other substances, an equal amount of expansion is not produced by equal increments of heat at different temperatures. According to Regnault, the total expansion of mercury for each of three progressive intervals of 180° is as follows:—between 32° and 212°, mercury expands one part in 55·08; between 212° and 392°, the expansion is one in 54·61; and between 392° and 572°, it is one in 54·01. A second advantage of mercury is, that it is more easily purged of air than alcohol or oil; in the third place, it has a range of more than 700°, while oil becomes viscid at low temperatures, and water begins to expand below 39½°, and both it and alcohol boil before they attain a high temperature. Another advantage of mercury is the rapidity with which it accommodates itself to the temperature of surrounding bodies. The thermometers used by Mr Glaisher in his experiments on nocturnal radiation (*Phil. Trans.* 1847), were so sensitive that when taken from a room at the temperature of 60° into the open air at 37°, the latter temperature was indicated in about two minutes.

In order that mercurial thermometers shall be comparable with each other, or have any scientific value, numerous precautions are necessary in constructing and using them. In order to allow a considerable range, the bore of the tube should be capillary, and of equal diameter throughout. But from the mode of manufacturing such tubes, they are usually frusta of very elongated hollow cones. By drawing a drop of mercury into the tube, so as to form a silver line of a definite length, and moving it through different portions of the tube, and measuring it in each position, the accuracy of the bore can be tested, and those tubes selected which are most equable in bore. Tubes are sometimes made with an elliptical bore, so as to spread out the mercury and make it more apparent. The mercury can be moved along the bore by tying a bag of India-rubber containing dry air to one end of the tube, and compressing it. The same method must be adopted in blowing a bulb at the end of the tube, after having made the glass soft in the flame of a table-blowpipe. Air from the mouth would introduce moisture, which would be injurious. The precautions adopted at the Meteorological Observatory at Kew will be noticed hereafter, our present object being to show the ordinary method of constructing the instrument. The size of the bulb must depend on circumstances; if it be large in proportion to the stem, the instrument will be sensitive, but if too large, there is the danger of the great mass of mercury affecting the temperature of a small amount of matter into which the bulb may have to be placed. A spherical bulb is to be preferred to a cylindrical or a pyriform one, on account of the more equal pressure of the atmosphere on a spherical body, a point of some importance, as will presently be explained. In filling in the mercury, which of course should be quite pure, the tube should be placed nearly horizontal with its open end below the surface of the metal, and the bulb be heated by means of a spirit-lamp. A good deal of the air will thus be expelled, and as the bulb cools, a portion of the metal will enter the tube and bulb, but the bulb must be again heated, so as to boil the mercury, when vapour of the metal will expel all

Thermometer. the air, and on again cooling, the whole of the tube and bulb will become filled with the fluid metal. Some makers fill the instrument by tying a little paper cone round the end of the tube, putting mercury into it, and holding the bulb over a spirit-lamp. Another plan is to blow a second bulb on the tube near the open end, and on heating this bulb while the open end is immersed in mercury, a portion of the metal will pass into that bulb as the glass cools. The tube is then held upright, the lower bulb is heated, and the air escapes through the mercury in the upper bulb. The cooling and heating are repeated until the lower bulb is quite filled, and a little mercury remains in the upper bulb. The tube is next held over a charcoal fire, so as to vapourise a portion of the mercury, and expel all the air and moisture; before the tube is removed from the fire, the open end is stopped with wax for the purpose of excluding the air; and when the tube is cool, it can be inclined so as to allow a portion of mercury from the upper bulb to fall into the stem to any required height. When the quantity of mercury has been properly adjusted, a blow-pipe flame is applied a little below the upper bulb, and the tube is hermetically sealed, and at the same time detached from the upper bulb. Another method, when there is only one bulb, is to heat the mercury until it rises to the point where the tube is finally sealed. The excess of mercury is thus driven out of the tube, and when the contents have cooled down to the temperature of the air, a sufficient range is still left in the tube for all ordinary purposes. The space thus left between the top of the mercury and the sealed end of the tube should be a perfect vacuum, so that when the tube is inverted, the mercury should entirely fill it, and fall with a metallic click to the end of the tube.

A number of tubes having been thus prepared, the first step, preparatory to graduation, is to determine the fixed point—namely, that of *freezing* for thermometers of atmospheric range, and also the *boiling* point for chemical thermometers. To determine the first point, the tubes are placed in a vessel containing melting snow or ice, when the mercury will sink in each stem down to a certain point, and remain steady while the liquefaction is going on. The amount of depression in each case will depend on the temperature of melting ice or snow, which is constant; also on the relative sizes of the bulb and stem, and on the quantity of mercury inclosed in them. A scratch is made with a file on each tube, at the point where the column of mercury terminates; and this is the *freezing-point* of the instrument, or the temperature of melting ice, which is the same in every part of the world, and at all seasons of the year. The boiling-point, however, varies with the height of the barometer; but supposing this to represent mean pressure, or 30 inches, the boiling-point of pure water would always be 212°. The bulb should be placed just over boiling water contained in a metallic vessel, so that both the bulb and stem may be enveloped in the steam. A portion of the stem may pass out through a perforated cork in the top of the vessel, and a file-mark be made on the glass opposite the point where the mercury remains stationary.

About the middle of the last century, the Royal Society of London appointed a committee to inquire into the best method of constructing the thermometer. They recommended that the boiling-point should be fixed at a pressure of 29·80 inches; that the bulb be not immersed in the water, because the steam, under such circumstances, being slightly under pressure, indicated a somewhat higher temperature; that the boiler be of tinned iron, with an easily-fitting cover, made steam-tight by a ring of woollen cloth; that the cover have two apertures, one to serve as a chimney, not less than half a square inch in area, and about 3 inches high, for conveying away the steam, and the other hole for a cork through which the thermometer-stem was to pass, so that the bulb and stem should be completely surrounded by steam, and no more of the stem be exposed above the cork than was sufficient to show the height of the mercury when the water was boiling briskly. When the barometer was not standing at 29·80, a table of corrections was furnished, in which the interval between the freezing and the boiling points was divided into 1000 parts, a certain number of which was to be added to or taken from the interval, according as the observed height of the barometer was above or below the assigned mean. Thermometer.

After the bulb has been blown at the end of the tube, the mercury filled in, and the vacuum produced, some molecular change takes place in the glass, either in consequence of the unbalanced atmospheric pressure on the outside, or the disturbance in the particles occasioned by the blowing and the filling; but whatever the cause, the effect is, that the fixed points become changed, if the graduation be made immediately after the filling of the instrument. It was noticed by Professor Daniell, in the case of two thermometers constructed with much care by the Hon. Henry Cavendish, where the degrees were very large, and distinctly divided into 10ths; that on immersing the bulbs into pounded ice, and leaving them there for half an hour, the freezing-point on the scale of one instrument was 0·4° too low, and in that of the other 0·35°. Hence it is recommended to allow 10 or 12 months to elapse between the sealing and the graduation of a thermometer, since it is found that the contraction of the tube takes place for the most part soon after it has been sealed.

The portion of the tube between the two fixed points corresponds to the expansion of the mercury between the freezing and the boiling-points of water, and this amounts to $\frac{1}{6}\frac{1}{0}\frac{1}{8}$th part of the volume which it occupies at the temperature of melting ice; so that the capacity of the tube between the two fixed points must always be equal to $\frac{1}{6}\frac{1}{0}\frac{1}{8}$th of the capacity of the bulb, and that portion of the stem which is below the freezing-point. In Fahrenheit's scale, the interval between the two fixed points is divided into 180 equal parts or degrees, either on the tube itself or on a stick of hard, dry wood, such as box, or a frame of ivory, glass, or metal. The tube being properly fixed to the wood, &c., a line is engraved opposite to the fixed points, the interval divided into 180 equal parts, which are continued above and below the two fixed points, beginning with 32° below the freezing-point as the zero of the scale; so that the boiling-point of water is 212°. Fahrenheit fixed his zero by immersing the bulb in a mixture of salt and snow; and erroneously supposing this to be the greatest amount of cold that could be produced, he made it the commencement of his scale. When, however, temperatures below zero are noted, the scale is continued below zero with the negative sign affixed. Fahrenheit's scale was not used in France; but up to the time of the Revolution Réaumur's was in use, in which the zero of the scale commenced from the freezing-point, and the interval between it and the boiling-point was divided into 80 parts; so that a degree on this scale was larger than one on Fahrenheit's in the proportion of $2\frac{1}{4}$ to 1. Thus, to convert an observation on Réaumur's scale into a corresponding one on Fahrenheit's, we must multiply Réaumur's degrees by $2\frac{1}{4}$, and add to the product 32, to allow for the distance of the points at which the scale commences. In 1742 Celsius, the Swedish astronomer, contrived a thermometer, the scale of which also commenced at the freezing-point of water, while the interval between it and the boiling-point was divided into 100°. This instrument was adopted by the French at the time of the Revolution under the name of *Thermomètre Centigrade*, because it harmonised with their decimal system of weights and measures. Each of

Thermometer.

its degrees is equal to 1⅘ths of a degree of Fahrenheit; so that to convert a centigrade temperature into a corresponding one of Fahrenheit, the number of degrees must be increased in the proportion of 5:9, and 32 added to the result. The following formulæ represent all the cases that can occur:—

Fahrenheit to Centigrade ..... $\frac{5}{9}(F^\circ - 32) = C^\circ$

Centigrade to Fahrenheit ..... $\frac{9}{5}\ C^\circ + 32 = F^\circ$

Réaumur to Fahrenheit ..... $\frac{9}{4}\ R^\circ + 32 = F^\circ$

Fahrenheit to Réaumur ..... $\frac{4}{9}(F^\circ - 32) = R^\circ$

As mercury freezes at −39° Fahr., thermometers intended to register temperatures lower than that point must have spirits of wine or alcohol substituted for mercury as the registering fluid. The method of graduating spirit thermometers will be referred to presently.

Mercurial thermometers exposed to high temperatures and great changes of temperature, especially when made of different kinds of glass, are not strictly comparable; and even the same thermometer is not always uniform in its indications, apart from the shifting of the freezing-point, as already noticed, and which will be again referred to. Professor Dixon, in his *Treatise on Heat*, says, "Different glasses have different co-efficients of expansion, and also vary in the law of their dilatation at high temperatures; and as the amount of absolute dilatation of mercury is small, this variation in the expansion of the glass envelope produces irregularities of considerable magnitude in the apparent dilatation of mercury. As the real expansibility of air is much greater, its apparent expansion in glass is not affected to the same extent by these variations in the rate of expansion of the latter; and accordingly, in an air thermometer, the rate of expansion of the glass may be considered as sensibly uniform. When corrected, therefore, for the expansion of its envelope, such an instrument forms the most perfect thermometer with which we are acquainted in the present state of science." An air thermometer, corrected for the expansion of its envelope, compared with a mercurial thermometer constructed with the peculiar description of glass employed by M. Regnault in his experiments, the agreement between the two instruments was perfect up to 200° C; whereas in a mercurial thermometer made of ordinary tube, compared with an instrument in which the tube was of crystal glass, although they agreed from 0° to 100°C, yet at high temperature the discrepancies were as follows:—

1st Thermometer.	2d Thermometer.	Difference
190·51	191·66	1·15
246·68	249·36	2·68
251·87	254·57	2·70
279·08	282·50	3·42
310·69	315·28	4·59
333·72	340·07	6·35

The Meteorological Observatory at Kew, established and supported by the British Association for the advancement of Science, has devoted considerable attention to the construction and comparison of Meteorological instruments. The late Mr Welsh, in his valuable Report on the thermometer, has adopted the plan of operations recommended by M. Regnault, which may be arranged under the following heads:—1*st*, The calibration of the tube; 2*d*, The graduation of the scale; 3*d*, The determination of the scale co-efficients. We will give a few details under each of these heads, referring the reader who is desirous of more minute information to the Report itself. 1. In the calibration of the tube, a short column of mercury having been introduced into it, the tube is attached to the frame of Perreaux's dividing engine, and, by means of flexible tubing, is connected at both ends with India-rubber air-bags, the pressure on which is regulated by screws. The mercury is brought to that part of the tube where the graduation is to be commenced. The cutting frame of the engine carries a small microscope, with cross wires in its focus; on turning the dividing screw, the microscope wire is made to coincide with the first extremity of the mercury, and the screw is then turned forward until the wire reaches the second extremity; the length of the column is thus given in revolutions of the screw. The mercury is then made to move along the tube by pressing on one of the India-rubber bags, until the first end again coincides with the microscope wire, when the length of the column is again measured, and the mercury again moved forward: this process is repeated until the column has been measured for each length of itself through the whole extent of the proposed scale. Permanent marks are made on the glass at the points of commencement, and ending of calibration. If the progress of the numbers shows any considerable irregularity in the tube, and as a verification of the first set of measures, the calibration may be repeated, commencing at a point one-half the length of the column in advance of the original starting point. A series of measures, interpolated from the two sets, may then be adopted. 2. With respect to the graduation, the measured lengths of the column of mercury, in its successive steps along the tube, correspond to equal volumes, so that, assuming the calibre of the tube not to vary throughout the small length of the calibrating column, it is evident that, by dividing the spaces occupied successively by the mercury into an equal number of parts, the divisions will represent the same capacity, although they may be of different lengths. Before making the tube into a thermometer, the divisions of the scale may be verified by introducing a longer column of mercury, and examining whether the column occupies an equal number of divisions in equal parts of the scale. Should there be any irregularity, a table of corrections is to be formed, but this is seldom necessary The divisions are cut with a fine needle-point upon a coating of engraver's varnish, and are afterwards etched with fluoric acid. The required dimensions of the bulb may be found approximately by weighing a measured length of the mercurial column, and from the known expansion of mercury and its specific gravity, computing the capacity of the bulb. 3. The thermometer having been filled with mercury, we have an instrument in which the divisions of the scale represent equal increments of the volume of the fluid, but have an entirely arbitrary value. The chief object in graduating the tube with an arbitrary scale, is the convenience it affords of testing the divisions before it is converted into a thermometer. The instruments are kept sufficiently long to allow of the settlement of the freezing-point, and this is determined by placing the thermometer in finely pounded ice, from which the water is drained off as it melts. The boiling-point is taken at the temperature of steam of the same elasticity as that of the atmosphere. The steam is generated from distilled water. The height of the barometer is observed at the time, and the correction to a uniform height of 30 inches (reduced to 32°) is found from Regnault's table. In determining the fixed points, the stems of the thermometers are kept vertical. But if the thermometers are to be used in any other position, the fixed points must be determined in that position. The tendency of the freezing-point to rise if the graduation take place immediately after the filling, has already been noticed; but Mr Welsh points out another peculiarity in this respect:—After a thermometer has been exposed for some weeks to the ordinary temperature of the air, if its freezing-point be ascertained, and it be suddenly exposed for a short time to the temperature of boiling water, and again immediately placed in ice, the latter determination of the freezing-point

Thermometer.

Thermometer.

will be lower than the former by as much as from 0·1° to 0·2°, and the freezing-point does not recover its former position for some time, probably two or three weeks.

The apparatus used for comparing the indications of different thermometers consists of a cylindrical glass vessel 15 inches deep and 8½ inches diameter, together with a stand for supporting the thermometers, and an agitator or flat ring of tinned iron, fitting easily within the vase for agitating the water, so as to preserve an equable temperature throughout. The stand is a vertical rod supported by a small tripod, resting on the bottom of the vessel. Hooks sliding on this rod serve for suspending the thermometers, which are arranged with their bulbs at the same height in a circle of 3 inches diameter round the rod, and are kept fixed by being strapped with elastic bands against a projecting six-rayed frame, attached to the supporting rod. In this way, six thermometers can be compared at once. The whole apparatus is placed on a wooden revolving stand, and in taking the observations, the observer first agitates the water briskly for some time, turns the revolving stand until each thermometer is brought in turn opposite to his eye, and reads off the scales as quickly as possible to an assistant who takes down the numbers. The six thermometers can be read off and recorded in twenty seconds. It is desirable to make more than one set of readings for each temperature, and also to reverse the order of observing the instruments, in order to avoid as much as possible the changes which may occur during the reading off.

In graduating mercurial thermometers, the practice is to consider the increments of volume as proportional to increments of temperature. This cannot be assumed to be the case in spirit thermometers. In testing some spirit thermometers graduated for low temperatures intended for the Arctic Expedition under Sir Edward Belcher, Mr Welsh proceeded to determine the rate of expansion of alcohol in glass as compared with that of mercury. The alcohol had been carefully prepared by Dr Miller, and its specific gravity at 60° was 0·796. A tube was calibrated and divided with an arbitrary scale, and its divisions were found, upon verification, to be of exactly equal capacity throughout. The tube was then furnished with a bulb, of the same dimensions as those intended to be supplied to the Admiralty, and was filled with alcohol. Comparisons were then made between the readings of this instrument and those of a standard mercurial thermometer, through as wide a range as was found practicable. The comparisons above the freezing point were taken in water: those below 32° were taken in freezing mixtures of ice and salt, or chloride of calcium. From these comparisons the law of expansion was deduced, for the details of which we must refer to Mr Welsh's Report.

Registering Thermometers, or those which show the maximum and minimum of temperature between the taking of one observation and the setting of the instrument previous to another, are numerous. Many of them are very complicated and liable to get out of order; hence they have gradually gone out of use in the presence of simpler and more modern contrivances: the practice of photographic registration adopted in observatories, is still more fatal to their existence. For a long time the best known register thermometer was that by Mr Six of Canterbury. It consists of a long cylindrical bulb and a tube, in the form of a siphon, with parallel legs, the shorter leg proceeding from the bulb, and the longer leg terminating in a small cavity. A portion of the two legs of the siphon is filled with mercury, and the bulb and the rest of the tube with spirits of wine. This double column of mercury gives motion to two indices, each consisting of a piece of iron wire capped with enamel at both ends, and pressing with a little friction against the tube by means of a thread of glass or a bristle, so as to remain stationary at the place where it is left by the retreating mercury. To prepare the instrument for an observation, the indices are brought down by means of a magnet, so as to touch the mercurial column. After this, should the temperature rise, the spirit expands, depresses the mercury in one leg, and causes it to rise in the other leg, and in doing so, drives the index before it until the maximum temperature has been attained. Then, as the temperature declines, this second index does not follow the retreating mercury, but remains fixed in the tube, to indicate the maximum temperature. When, on the contrary, the spirit contracts by cold, the mercury follows it, and pushes up the other index until the contraction ceases, when, the temperature rising, the spirit begins to expand, and forces back the mercury, but leaves the index fixed in the tube as a record of the minimum temperature which has been obtained. If the instrument be read every twenty-four hours it will give the greatest and least temperatures during the day. This instrument cannot be trusted for accurate observations, as it is apt to get out of order; and the use of two liquids of different degrees of expansibility is also an objection. The glass spring of the index is also liable to break, or the bristle to lose its elasticity, so as to render the indices useless; and if this were not so, the vertical position of the tubes renders any little agitation from wind, &c., liable to start the indices. Rutherford's maximum and minimum thermometers are free from some of these defects. Two thermometers, one a spirit and the other a mercurial, each furnished with a distinct scale, are mounted on the same frame with the stems horizontal. The mercurial thermometer contains a small piece of steel wire, which is pushed forward as the mercury expands by heat, and remains to mark the highest temperature, when the mercury begins again to contract. The minimum thermometer contains a bead of glass with a small enamelled knob at each end; it rests in the tube, and the expanding spirit passes it freely; but as the spirit contracts by cold, there is sufficient adhesion between the last film of spirit and the glass bead to enable the spirit to drag it to its utmost limit of contraction, where it will remain to note the minimum temperature. The instruments are set for a new observation by gently inclining the frame, but this must be carefully done or the indices will get entangled with the liquids. This has been to a certain extent remedied by placing a piece of iron wire within the axis of the bead; so that this, as well as the other index, may be set by means of a small magnet. Messrs Negretti and Zambra have an ingenious maximum thermometer, in which the tube placed horizontally is contracted near the bulb, so that, although the expanding mercury passes freely through the contraction, yet when the temperature declines, the mercury cannot return through the contracted part; so that the maximum temperature is indicated by the extremity of the detached mercurial column. In setting the instrument for a new observation, all that is necessary is to place the tube in a vertical position, when the detached column, assisted by a gentle swing, will unite itself with the rest of the mercury. Professor Phillips has constructed a maximum thermometer, in which a portion of the mercurial column is separated from the rest by means of a small bubble of air. When the mercury begins to contract, the portion above the air-bubble remains fixed, while that below it retreats towards the bulb. Walferdin's maximum thermometer has at the top of the tube a small reservoir to receive the mercury which overflows by expansion. In preparing the instrument for an observation it is inverted, so that the end of the tube is immersed in the mercury of the reservoir. In this position the instrument is exposed to a temperature lower than any that it will meet with in the observations that are about to be made. The instrument is then brought back to its proper position when the tube is full to the top. As the temperature rises, the mercury expands and is forced out of the tube into

Thermometer.

the reservoir, and continues to be so until the maximum temperature has been attained, after which the mercury contracts and the column falls in the tube. To determine the highest temperature that the instrument has been exposed to, it must be immersed, together with the standards instrument, in water made gradually warm, until the column rises to the top of the tube. The temperature, as indicated by the standard thermometer, will be the maximum temperature to which the instrument had been exposed. M. Walferdin has also constructed a minimum thermometer, in which two liquids are employed.

For the important services rendered by the thermometer to science, we may refer to the articles, METEOROLOGY, HEAT, CHEMISTRY, and, indeed, to the varied operations of chemical manufactures, physiology, horticulture, domestic economy, and every process in which we are interested in noting variations of temperature. The present article, therefore, may be deemed sufficiently complete (so far at least as our limited space will permit), if we conclude with a few remarks, by way of precaution, in the use of the thermometer as a meteorological instrument.

The same cause which produces the expansion of the mercury in the thermometer exerts itself also on the glass which contains it; but the expansion of glass is so exceedingly small, compared with that of mercury, that it need scarcely be noticed, especially when it is considered that, in the case of crown-glass, the increased capacity of the bulb arising from heat is about compensated by the increasing rate of expansion in mercury above 200°. When the thermometer is intended to record the external temperature, it must be placed in the shade, away from the reflected and radiated heat of walls and buildings; the bulb must be kept perfectly dry, or the indicated temperature will be too low in consequence of evaporation. A convenient position is a few feet from the north wall of the house, where a post should be driven into the ground for supporting a bracket and a hood, against the back of which the thermometer may be fixed; or it may be enclosed in a sort of polygonal pigeon-house, with louvre openings for the sides, and covered by a roof. The register thermometers require equal care in the fixing. The thermometer used for ascertaining the temperature of the ground should have the scale engraved on the tube, and be placed away from trees so as to be quite open to the sky. The wet and dry-bulb thermometers must also be sheltered from the sun, from reflected heat, and from rain; and in frosty weather the covered bulb should be wetted a quarter of an hour before the instrument is read off. The best hours for hygrometric observations are 9 A.M., 3 P.M., and 9 P.M.; at which hours the standard thermometer should also be read off. The register thermometers should be read off early, and their indices re-set. The observations should be read off rapidly, especially in cold weather, and the observer should not approach the instruments too closely, nor touch nor breathe upon them. (C. T.)

THERMOPYLÆ. See SPARTA.

THESEUS, a famous hero of antiquity, ranked among the demigods, whose history is fabulous. He was the reputed son of Ægeus King of Athens. He threw Sciron, a cruel robber, down a precipice; fastened Procrustes, tyrant of Attica, to a bending pine, which being let loose, tore him asunder; killed the Minotaur kept in the labyrinth by King Minos, in Crete; and by the assistance of that prince's daughter, Ariadne, who gave him a clue, escaped out of that labyrinth, and sailed with his deliverer to the Isle of Naxos, where he had the ingratitude to leave her. Theseus afterwards overcame the centaurs, subdued the Thebans, and defeated the Amazons. He assisted his friend Pirithous in his expedition to the infernal regions to carry off Proserpine; but was imprisoned by Pluto, till he was released by Hercules. He is also said to have established the Isthmian games, in honour of Neptune; to have united the twelve cities of Attica; and to have founded a republic there, 1236 B.C. Some time after, taking a voyage into Epirus, he was seized by Aidonus, King of the Molossians; and in the meantime Menestheus rendered himself master of Athens. But at length Theseus being released from prison, retired to Scyros, where King Lycomedes caused him to be thrown from the top of a rock. Theseus had several wives, the first of whom was Helena, the daughter of Tyndarus; the second, Hippolyte, Queen of the Amazons; and the last, Phædra, sister to Ariadne, who punished him for his infidelity to her sister by her incestuous passion for his son Hippolytus.

THESPIS, a famous Greek tragic poet, and the first representer of tragedy at Athens. He is said to have carried his troop from village to village in a waggon. (See DRAMA.)

THESSALONIANS, EPISTLES TO THE, *First Epistle.*—The authenticity and canonical authority of this epistle have been from the earliest ages admitted by all who have received any of Paul's epistles. Besides two probable quotations from it by Polycarp (Lardner, ii. 96, 8vo ed.), it is certainly cited, as the production of the Apostle Paul, by Irenæus (v. 6, § 1), by Clement of Alexandria (*Paed* i. § 19, p. 109, ed. Potter), by Tertullian (*De Resur. Carnis*, c. 24), by Caius (ap. Euseb. *Hist. Eccles.* vi. 20), by Origen (*Cont. Cels.* lib. iii.), and by others of the ecclesiastical writers (Lardner, ii. *pl. locc.*) This epistle has generally been regarded as the first written by Paul of those now extant. It seems indisputable that this epistle was not written until Paul met Timothy and Silas at Corinth. The ancient subscription, indeed, testifies that it was written at Athens; but that this could not be the case is clear from the epistle itself. The design of this epistle is to comfort the Thessalonians under trial, and to encourage them to the patient and consistent profession of Christianity. The epistle may be conveniently divided into two parts. The former of these, which comprises the first three chapters, is occupied with statements chiefly of a retrospective character: it details the apostle's experience among the Thessalonians, his confidence in them, his deep regard for them, and his efforts and prayers on their behalf. The latter part of the epistle (iv. v.) is, for the most part, of a hortatory character: it contains the apostle's admonitions to the Thessalonians to walk according to their profession; to avoid sensuality, dishonesty, and pride; to cultivate brotherly love; to attend diligently to the duties of life; to take the comfort which the prospect of Christ's second coming was calculated to convey, but not to allow that to seduce them into indolence or idle speculations; to render due respect to their spiritual superiors; and, by attention to a number of duties which the apostle specifies, to prove themselves worthy of the good opinion he entertained of them.

Second Epistle.—The apostle's allusion in his former epistle to the second coming of Christ, appears to have been misunderstood by the Thessalonians, or wilfully perverted by some among them, so as to favour the notion that that event was near at hand. On receiving intelligence of this, Paul wrote to them this second epistle, in which he beseechingly adjures them by the very fact that Christ is to come a second time, not to be shaken in mind or troubled, as if that event were near at hand. He informs them that much was to happen before that should take place, and especially predicts a great apostacy from the purity and simplicity of the Christian faith (ii. 5–12). He then exhorts them to hold fast by the traditions they had received, whether by word or epistle, and commends them to the consoling and sustaining grace of God (ver. 15–17). The rest of the epistle consists of expressions of affection to the Thessalonians, and of confidence in them; of prayers on their behalf, and of exhortations and direc-

Thessalonica.

tions suited to the circumstances in which they were placed. As regards the disposition and arrangement of these materials, the epistle naturally divides itself into three parts. In the first (i. 1–12), the apostle mingles commendations of the faith and piety of the Thessalonians, with prayers on their behalf. In the second (ii. 1–17), he dilates upon the subject of the trouble which had been occasioned to the Thessalonians by the anticipation of the near approach of the day of the Lord. And in the third (iii. 1–16), he accumulates exhortations, encouragements, and directions, to the Thessalonians, respecting chiefly the peaceable, quiet, and orderly conduct of their lives, which he follows up with a prayer on their behalf to the God of peace. The epistle concludes with a salutation from the apostle's own hand, and the usual benediction (ver. 17, 18). There is the strongest reason for believing that this second epistle was written very soon after the first, and at the same place, viz., Corinth. At what period, however, of the apostle's abode at Corinth this epistle was written, we are not in circumstances accurately to determine.

The internal evidence in favour of the genuineness of this epistle is equally strong with that which attests the first. Polycarp (*Ep. ad Philip.* § 11) appears to allude to ch. iii. 15. Justin Martyr, in his *Dialogue with Trypho* (p. 193, 32, ed. Sylburg, 1593), speaks of the reigning of the Man of Sin (τὸν τῆς ἀνομίας ἄνθρωπον), which seems to be an evident allusion to ch. ii. 3; and in a passage, quoted by Lardner (vol. ii. p. 125), he uses the phrase ὁ τῆς ἀποστασίας ἄνθρωπος. The eighth verse of this second chapter is formally cited by Irenæus (iii. c. 7, § 2), as from the pen of an apostle; Clement of Alexandria specially adduces ch. iii. 2 as the words of Paul (*Strom.* lib. v., p. 554, ed. Sylb.); and Tertullian also quotes this epistle as one of Paul's (*De Resurrec. Carnis.* c. 24). The scepticism of the German critics is most fully replied to by Guericke (*Beiträge zur Hist. Krit. Einl. ins. N. T.* s. 92–99, Halle, 1828), by Reiche (*Authentiæ Post. ad Thess. Epist. Vindiciæ*, Gött., 1829), and by Pelt in the *Prolegomena* to his *Commentary on the Epistles to the Thessalonians* (p. xxvii.)

Besides the exposition of this epistle found in numerous commentaries, the reader is referred to Jewell, Bp., *An Exposition upon the two Epistles of the Apostle Saint Paul to the Thessalonians*, London, 1583, 12mo, 1811, 8vo; Conybeare and Howson, *Life and Letters of St Paul;* Jowett, *The Epistles of St Paul to the Thessalonians, Galatians, and Romans;* Davidson, *An Introduction to the New Testament.*

THESSALONICA, the ancient name of Salonica, an important city of Macedonia. Its present condition and the principal ancient remains are described in the article SALONICA; so that it is only necessary here to give a brief sketch of its ancient history. It was originally called Therma, and received its better known name after Thessalonica, the daughter of Philip of Macedon, and wife of Cassander, who rebuilt the city about 315 B.C. It began to rise into importance after this event; although even before it is mentioned on several occasions by the Greek historians. It was the principal naval station in Macedonia, and on its conquest by the Romans after the battle of Pydna, was made the capital of one of the divisions of the country. At a later period it became the capital of the whole province, and was raised to the rank of a free city, governed by its own magistrates called *politarchæ*. A Christian church was established here by St Paul, and the city was long distinguished in the annals of religion as much as in those of the political affairs of the East. In 390 A.D., on the occasion of a riot in the city, a dreadful massacre was perpetrated by order of the Emperor Theodosius; but Thessalonica seems to have soon recovered from this blow, and did good service to the empire in the Slavonian and Gothic wars. It was captured by the Saracens in 904, by the Latins under Tancred in 1185, and finally by the Turks in 1430.

Thessaly ‖ Thetis.

THESSALY, a division formerly of Greece, and now of the Ottoman empire, lying between N. Lat. 39. and 40. 30., E. Long. 21. 30. and 23. 25.; bounded on the N. by Macedonia, E. by the Gulfs of Salonica and Volo (anc. those of Therma and Pagasæ), S. by the modern kingdom of Greece, the ancient states of Ætolia, Doris, Phocis, and Locris; and W. by Albania, the ancient Epirus. Length from N. to S. 98 miles, extreme breadth 70; area, 5500 square miles. It consists of a rich and well cultivated plain, enclosed on all sides by mountain-ridges; that of Pindus bounding it on the west, the Cambunian Mountains, which terminate in the lofty summit of Olympus, on the north, the parallel ranges of Othrys and Œta on the south, and those of Pelion and Ossa on the east, a short distance from the sea. The only break in these mountain barriers is the Vale of Tempe in the north-east, through which the Peneus flows into the sea; this river, with its affluents, watering nearly the whole country. The principal productions are corn, rice, wine, silk, olives, tobacco and wool. Thessaly is said to have been originally inhabited by the Bœotians; who, 60 years after the Trojan war, were expelled by a body of Thessalians from Epirus. This account is probably true in substance; for in later times we find in Thessaly, besides the Thessalians proper, a number of other tribes, such as the Perrhæbi on the slopes of Olympus, the Magnetes on those of Ossa and Pelion, the Achæans between Pindus and the Gulf of Pagasæ, and the Malians between Othrys and Œta; and there were also a class of serfs, called Penestæ, similar to the Helots at Sparta. The country was anciently divided into four districts called Thessaliotis, Pelasgiotis, Histiæotis, and Phthiotis; which were all united under a magistrate called a Tagus; but his authority does not seem to have been very great, and the country was rarely united in counsel or action. Hence there is little in its history that is worth recording; and we most frequently hear of Thessaly only in connection with the dissensions and civil wars of the different cities. Along with the rest of Greece, Thessaly fell under the power of Macedon; and after the Roman conquest, it was made a part of that province. The battle of Pharsalia, between Cæsar and Pompey was fought in this country. The principal modern towns are Larissa, Trikhala, Volo, and Ambelakia. Pop. estimated at 500,000.

THETFORD, a market-town, parliamentary and municipal borough of England, Norfolkshire, on the borders of Suffolkshire, on the Little Ouse, 28 miles W.S.W. of Norwich, and 80 N.N.E. of London. It is a straggling, irregular town, but neat and generally well built. St Peter's Church is an ancient building partly of flint, with a nave, aisles, chancel, and tower; that of St Mary is a mean-looking structure. The other places of worship belong to Wesleyans, Independents, Quakers, and Roman Catholics. There are several schools, a fine old guild-hall, a market-house, and several charitable institutions. A good deal of malting is carried on, and there is an active trade, as the river is navigable up to the town. The place is ancient, and seems to have been formerly of much more importance than now; as it had once twenty churches and many religious houses, some ruins of which still remain. It is governed by four aldermen and twelve councillors, and returns two members to Parliament. Pop. 4075.

THETIS, in Grecian mythology, was, according to the common account, the wife of Oceanus, and the mother of Nereus and Doris, who were married to each other; and from this marriage sprung the Nereids. Among those was one named Thetis, the younger, who excelled all the rest in beauty, and for whom Jupiter conceived such a passion that he resolved to espouse her; but being informed by

the Destinies that she would bring forth a son who would rise above his father, he married her to Peleus. To their nuptials all the gods and goddesses were invited except Discord, who, to be revenged for this contempt, threw a golden apple into the assembly, on which was engraven, *For the Fairest.* Juno, Pallas, and Venus, disputed for this apple; but Paris being chosen to decide the difference, adjudged it to Venus. From this marriage of Thetis and Peleus sprung Achilles. Various modifications of this fable occur in ancient mythology, but the narratives all agree in the main outlines of the legend.

THEURGY. See MYSTICISM.

THIAN-SHAN, or CELESTIAL MOUNTAINS, a range in Central Asia, stretching from W. to E. along the N. boundary of the great tableland, and separating Thian-Shan-Nan-loo, or Turkestan proper, on the S. from Thian-Shan-Pe-loo, or Dzoungaria, on the N. The length of the range is estimated by Humboldt at upwards of 2000 miles; and many of the summits rise to the height of 16,000 or 17,000 feet, far above the snow-line. These mountains exhibit many traces of volcanic agency; and eruptions are recorded by the Chinese as having occurred in comparatively recent times.

THIBAUT, ANTON FRIEDRICH JUSTUS, an eminent German jurist, was born at Hameln in Hanover, on the 4th of January 1772. After studying law successively at Gottingen, Königsberg, and Kiel, he took his doctor's degree, and was appointed professor of civil law in the latter university in 1799. From Kiel he removed in 1802 to Jena, and in 1805 to Heidelberg, where he was made justizrath or counsellor of justice. In this university he remained till his death; and in connexion with this place he was successively made a privy councillor in 1826, a knight in 1830, a judge for the grand duchy in 1834, and a corresponding member of the Académie des Sciences Morales et Politiques in 1837. Thibaut died on the 28th of March 1840, with the reputation of being one of the foremost lawyers that Germany had produced. His great work, the *System des Pandektenrechts*, Jena, 1803, which has gone through numerous editions, and possesses the original merit of being written in the German language, is a book of the highest value to all lawyers. Besides writing some half-dozen other works of more or less merit, chiefly on legal subjects, one of his last books was *On the Necessity of a Common Code of Laws for Germany*, Heidelberg, 1814, which Savigny pronounced excellent as to the idea the work aimed at carrying out, but premature in the supposition that Germany was yet ripe for such a legal reform.

THIELT, a town of Belgium, in the province of W. Flanders, 14 miles S.S.E. of Bruges. It has a town-hall with a Gothic spire, a college, school of design, and other schools, several benevolent institutions, and manufactures of woollen and linen cloth, gloves, hats, leather, starch, beer, tobacco, &c. A considerable trade is carried on in corn and linen. Thielt was formerly a very flourishing town, but was almost entirely burned in 1383, and it has never wholly recovered from that calamity. Pop. 11,142.

THIERRY, JACQUES NICHOLAS AUGUSTIN, a celebrated French historian, was born of poor parents at Blois, on the 10th of May 1795. He received his elementary instructions in his native town, and entered the normal school in 1811, where he gained considerable distinction as a student. He became a teacher in a provincial school in 1813, but resigning his charge next year, he came to Paris, and enlisted himself in the small but enthusiastic band which were then gathering round the author of Saint Simonianism. Thierry remained with St Simon for three years, during which time he had, as his assistant, aided him in the publication of various works, among others *Des Nations et des Leurs rapports mutuels* in 1816. Having had enough of Saint Simon, Thierry, in 1817, joined Comte and Dunoyer, as editors of *Censeur Européan*, where he wrote articles on literature, politics, and history. On the suppression of this journal in 1820, he became a contributor to the *Courrier Français*, where he published a series of letters on the history of France, which gave high offence to the authorities. He gave up journalism, and took to his historical studies with increased zeal. The *Histoire de la Conquête d'Angleterre par les Normands*, 3 vols., appeared in 1825; and two years afterwards his contributions to the *Courrier Français* were published in a collected form. Thierry had not mistaken his *rôle*, notwithstanding a number of mistaken ideas which he persists in making historical, such as his grand distinction of the Norman and Anglo-Saxon, that the one was born to rule, while the other was born merely to serve. His histories possess very varied merits. He is acute, imaginative, picturesque; and the style of his writings possess all those qualities often in a high degree. If he is less profound than Guizot, and less eloquent than Michelet, he surpasses both in his power of grouping details, although inferior to both in the graces of his style.

The works which Thierry had already published had met with great success; but this success had been purchased at much too high a price. The diligent historian had now become quite blind, and he had to trust, henceforward, to the aid of foreign eyes to decipher the musty records over which the annalist must pore. He was ordered to Hyères, on the Mediterranean, in 1830, for the benefit of his health, and next year he met Julie Quérangel, author of a number of clever essays in the *Revue des Deux Mondes*, and of *Scènes des Mœurs aux* 18 *me et* 19 *me Siècles.*

Thierry married this lady in 1831, and she watched him with the most assiduous care in his state of total blindness, till she was removed by death in 1844. Between 1831 and 1835 he spent his time partly at Luxeuil, and partly at Haut-Saône, engaged on revising his *Dix ans d'Etudes Historiques*, which, with a very elegant introduction, he republished in 1834. He continued, besides, to contribute periodically to the pages of the *Revue des Deux Mondes*, and commenced the *Recits des Temps Mérovigniens*, when M. Guizot called him to Paris in 1835. He engaged in editing some *Recueils* and *Collections* connected with French history, and published the above *Recits* in 2 vols. in 1840. The academy awarded to this work their great Gobert prize. The last work of Thierry was entitled, *Essai sur l'Histoire de la formation et du progrès du tiers état*, 1853; and the author, worn out with labour and suffering, died on the 28th of May 1856. A collected edition of Thierry's works was published in 1853.

THIERS, a town of France, capital of an arrondissement, in the department of Puy-de-Dôme, 23 miles E.N.E. of Clermont. Its elevated position gives it a very picturesque aspect from a distance, but on a nearer approach it is found to be irregularly built, with narrow steep streets, and houses which, though solid, have a gloomy appearance. It has two old churches, the ruins of a castle, manufactures of hardware, embroidery, woollen cloth, leather, paper, and playing cards, and an active trade in manufactured articles, mill-stones, and pottery. Pop. (1856) 15,120.

THIONVILLE, a fortified town of France, on the left bank of the Moselle, capital of an arrondissement, in the department of Moselle, 17 miles north of Metz. It is for the most part well built, with broad but irregular streets; and it has a parish church, market-house, theatre, barracks, college, and hospital; hosiery, oil, brandy, leather, &c., are made here; and there is a considerable trade in corn, hemp, and flax. Pop. (1856) 5316.

THIRSK, a market-town and parliamentary borough of England, in the North Riding of Yorkshire, 23 miles N.N.W. of York, and 213 N. by W. of London. It

Thistle, Order of the || Thomas of Erceldoune

stands on both sides of the Codbeck, an affluent of the Swale, which is here crossed by two stone-bridges. There are a large old Gothic church, places of worship for Wesleyans, Independents, and Quakers, several schools, and manufactures of coarse linen and saddlery. A considerable trade is carried on in corn, fruit, and provisions, markets and fairs being held here. Thirsk returns a member to the House of Commons. Pop. of the parish, 4754; of the borough, 5193.

THISTLE, ORDER OF THE. See KNIGHTS and KNIGHTHOOD.

THOMAS OF ERCELDOUNE, sometimes called Learmont, and sometimes the Rhymer, has long been recognised in the venerable character of a prophet and poet; but the history of his life and writings is involved in that degree of obscurity which may well be supposed to attend so remote an era of our literary annals. His very name is not ascertained beyond all doubt or controversy. According to Macpherson, the accurate editor of Winton, he received his surname of Learmont from Hector Boyce: but it seems unnecessary to suppose that the inventive faculties of this historian were so unprofitably exercised; and if credit is due to an excellent genealogist, his family name is sufficiently established by its occurrence in authentic documents. In one charter, says Nisbet, he is called Thomas Rymor, but in others of an earlier date, Thomas Learmount of Ercildoun. Certain, however, it is that no writer who preceded Boyce has yet been found to describe him by the surname of Learmont: by Robert of Brunne, Barbour, Winton, Bower, and Mair, he is named Erceldoune, while Henry, the blind poet, designates him Thomas the Rhymer. In a charter granted to the Trinity House of Soltra, the poet's son describes himself as Thomas of Ercildoun, the son and heir of Thomas *Rymour* of Ercildoun; but whether this addition is to be considered as an ordinary surname, or as an epithet commonly applied in allusion to the father's poetical character, cannot be positively determined. It must at least be recollected that Rymer is a surname in both parts of the island, and that it has been traced to the poet's own age, and to the particular district in which he resided. Thomas the Rhymer is the name by which he continues to be best known among the common people of Scotland. Erceldoune, from which he derived his other appellation, is a village situate in the county of Berwick, at a small distance from Melrose; and the western extremity of this village still exhibits the ruins of a tower which was once honoured by his residence. His estate was afterwards acquired by the Earl of March, who at the opposite end of the village possessed another place of strength, called the Earl's Tower; and hence the ancient name of Erceldoune is supposed to have been gradually corrupted into Earlstoun.

The period of his birth it seems impossible to ascertain; but it is evident that he must have reached the height of his reputation about the year 1286, the date of his famous prophecy respecting the death of Alexander the Third; and in the year 1299, his son and heir conveyed the estate of Erceldoune to the convent of Soltra. It is therefore obvious that his father must have died during the interval. Patrick Gordon refers his death to the year 1307, but this cannot be considered as any competent authority. An individual who enjoyed the reputation of a prophet may naturally be supposed to have attained a venerable age. Whether he himself aspired to the character of a prophet, it must now be fruitless to inquire; but it is at least certain, that such a character was long attached to his name. Barbour, who wrote about the year 1370, makes a distinct allusion to "Thomas prophecy of Hersildoune." Walter Bower, the continuator of Fordun's *Scotichronicon*, who flourished about the year 1430, has furnished us with a circumstantial detail respecting Thomas's prediction of the king's premature death. Winton and Henry have likewise represented him as endowed with the spirit of divination; and they are equally dubious as to the origin of the power which they acknowledge him to have possessed. Mair and Boyce have inserted in their respective histories the tale so circumstantially related by Walter Bower; but with his usual good sense, the former subjoins, "To this Thomas our countrymen have ascribed many predictions, and the common people of Britain yield no slight degree of credit to stories of this nature; which I for the most part am accustomed to treat with ridicule." Lesley commemorates Michael Scott and Thomas Learmont as personages of an extraordinary character; and he also hints at the famous prediction of the king's death. But the period of the union of the crowns seems to have been the crisis of his reputation as a prophet; for, as we learn from Robert Birrel, "at this time all the haill comons of Scotland that had red or understanding, wer daylie speiking and exponeing of Thomas Rhymer his prophesie, and of uther prophesies quhilk wer prophesied in auld tymes." Of the collection which includes the prophecies ascribed to Thomas, the earliest edition that has hitherto been traced was printed by Robert Waldegrave in the year 1603. It was reprinted by Andrew Hart in 1615; and the subsequent editions are very numerous, the collection being frequently printed for the Worshipful Company of Flying Stationers.

Thomas, St

The claims of Thomas of Erceldoune to the character of a prophet do not seem to require any further investigation; but his claims to the character of a poet may perhaps be considered as more legitimate. That he was admired for his poetical talents, is supposed to be established by the testimony of a writer who approached very near his own age: Robert of Brunne, who flourished about the year 1303, is believed to commemorate the same Thomas of Erceldoune as the author of an incomparable romance on the story of Sir Tristrem. A romance of this description, and doubtless of a very early date, was discovered in the Auchinleck MS. belonging to the Advocates' Library; and of this very curious relique of British literature, an elaborate and valuable edition, including all the necessary illustrations, was published by Sir Walter Scott in the year 1804. The distinguished editor entertained no doubt of its being the genuine production of Thomas of Erceldoune; but the supposition, we must confess, appears liable to many doubts and difficulties. This metrical romance, to whatever author it may be attributed, is deservedly regarded as a precious relique of early British, we do not venture to say Scottish, poetry. It is highly curious as a specimen of language, and not less curious as a specimen of composition. The verses are short, and the stanzas somewhat artificial in their structure; and amid the quaint simplicity of the author's style, we often distinguish a forcible brevity of expression. But his narrative, which has always a certain air of originality, is sometimes so abrupt as to seem obscure, and even enigmatical. *Sir Tristrem; a Metrical Romance of the thirteenth century, by Thomas of Erceldoune, called the Rhymer*, edited from the Auchinleck MS. by Walter Scott, Esq.; the third edition, Edinb. 1811, 8vo. *Tristan: Recueil de ce qui reste des Poëmes relatifs à ses Aventures:* composés en François, en Anglo-Normand, et en Grec, dans les XII. et XIII. siècles; publie par Francisque Michel, Londres, 1835, 2 tom. 16mo. Wharton's *History of English Poetry*, vol. i., p. 184, Price's edit. Guest's *History of English Rhythms*, vol. ii., p. 173, Lond. 1838, 2 vols. 8vo. Madden's *Notes on Syr Gawayne*, p. 304. Lond. 1839, 4to. *Foreign Review*, vol. iv. p. 141. (D. I.)

THOMAS, *St*, one of the Virgin islands in the West Indies, belonging to Denmark, N. Lat. (of the W. end) 18. 20., W. Long. 64. 55. Area, 43 square miles. The outline is irregular, and the surface rugged and hilly, de-

Thomas, St ‖ Thomastown.

scending gradually from a height about the centre to the shore. The forests with which it was formerly covered have been cut down; and the soil is sandy, barren, and destitute of water. But a small portion of the area is cultivated, and sugar and cotton are the principal crops raised. Pop. 12,800, of whom 4300 are slaves. The capital, St Thomas, is a free port, much frequented by European ships.

THOMAS, *St*, an island belonging to Portugal, in the Gulf of Guinea, almost under the equator, in E. Long. 6. 3. Area, 145 square miles. It is of volcanic formation, and has a peak in the centre 7020 feet high. The valleys are fertile, and the vegetation luxuriant; but the climate is very hot and unhealthy. Maze, dates, sugar, indigo, cotton, &c., are produced here. Pop. from 15,000 to 20,000, mostly slaves. St Thomas, the capital, on the N.E. coast, is defended by a fort. Pop. 4000.

THOMASIUS, or THOMAS, CHRISTIAN, the son of a professor of philosophy at Leipzig, was born there on the 12th of January 1655. After going through his curriculum of study at the university, he early displayed a disrelish for the pompous and pedantic teaching which was then current in the German universities. In 1675 he began his career as a university reformer at Frankfort-on-the-Oder. Not meeting with much encouragement there, he left in 1679, with the degree of Doctor of Laws, and returned to Leipzig. Here he continued to lecture for the next five or six years, till his father's death, in 1684, removed the only barrier between him and the violent dislike of all the older professors. These men had lectured and talked officially all their days in Latin, and they were resolved to adhere to the glorious language of Cæsar and of Cicero to their latest breath. Thomasius, again, was equally keen in behalf of his native German, as in all respects as fit a language, if not quite so refined as Latin, in which to educate the youth of the country. The philosophers attacked him; the lawyers jeered him; the philologists hated him; and the theologians unmasked all their subtle malice against him, and caused some of his publications to be burned in the market-place by the hands of the common hangman. He fled to Berlin, and was ultimately permitted to settle in Halle by the orders of Frederic I. In 1694 the king created the University of Halle, of which the students collected there to hear the lectures of Thomasius formed the nucleus. This ardent reformer was made professor, and subsequently dean of the faculty of jurisprudence; he was besides made a privy counsellor, and was, before his death, which occurred on the 23d September 1728, elected rector of the University of Halle, of which he was properly the founder.

As a philosopher, Thomasius does not stand high. He sympathised with the views of Grotius and of Puffendorf regarding natural right, and applied practical sagacity to the criticism of Aristotle. The Stagyrite offered hard material for his blade; and any success which his easy eloquence gave him in this field, was gained entirely at the expense of what should have been his better judgment. As a reformer of the teaching of the German universities, his name must always rank high. His intellect, though not profound or searching, was keen and sagacious. The elocution which he wielded was generally easy, and sometimes graceful. He sent home his arguments on the wings of wit and satire, from the effects of which few of his opponents altogether escaped. His works, which are now very little read, are tolerably numerous. A complete list of them will be found in Luden's *Life of Thomasius*, Berlin, 1805, or in Jörden's *Lexicon*.

THOMASTOWN, a market-town of Ireland, in the county and 11 miles S.S.E. of Kilkenny, on the Nore. It consists of three broad streets, and has many good houses, a parish church, Roman Catholic chapel, court-house, jail, workhouse and school. Some trade is carried on in corn, flour, and provisions. Pop. 1843.

Thompson.

THOMPSON, SIR BENJAMIN, *Count Rumford*, a well-known natural philosopher and political economist, was born on the 26th of March 1753, at Woburn, in the colony of Massachusetts. His father died while he was very young, and his mother marrying a second time, he was removed at an early age to the house of a stranger. He inherited only a small pittance from an uncle, who died soon after his father. A clergyman named Bernard showed him great kindness, and taught him some of the higher mathematics at an early age, so that at fourteen he was able to calculate and delineate an eclipse of the sun. He had been intended for some commercial employment, but he preferred the pursuit of literature in any form: he attended the lectures of Dr Williams, and afterwards those of Dr Winthrop the astronomer, at Harvard College; and while he was still a stripling, he was established in the temporary occupation of a village schoolmaster, hoping, however, for an early opportunity to engage in some more agreeable employment; and at nineteen, he was fortunate enough to obtain the hand of Mrs Rolfe of Rumford, now Concord, daughter of Mr Walker, a clergyman who had been employed with considerable credit in conducting some public business. For a year or two he lived retired and happy; but having obtained a commission of major in the militia from the governor of the province, together with some other distinctions of a civil nature, he was consequently led to adhere to the party of the Royalists; and he was soon obliged, by the success of the Independent forces, to take refuge at Boston, then occupied by the English troops. It was in November 1774 that he secretly quitted his residence, leaving his wife, whom he never saw again, and his infant daughter, who joined him twenty years after in Europe. He was employed to raise a regiment for the king's service; but when Boston was evacuated in 1776, he was sent with some important despatches to England. Here he soon acquired the confidence of Lord George Germaine, then colonial secretary of state, and was appointed secretary of the province of Georgia, though he never exercised the office; but he remained attached to that department of the public service.

In 1777 he commenced his career as an experimental philosopher, by employing his leisure hours, during a visit to Bath, in making some experiments on the cohesive strength of different substances; and upon his return to London, he communicated them to Sir Joseph Banks, with whom he formed an intimate acquaintance, which he kept up throughout the remainder of his life. In 1778 he was admitted a fellow of the Royal Society, and he made in that year his first experiments on gunpowder. In order to pursue these experiments, he went, in 1779, on board of the Victory, of 110 guns, commanded by his friend Sir Charles Hardy. He passed the whole campaign on board the fleet; and the results of the observations which he then made furnished the materials of a chapter which he contributed to Stalkart's *Treatise on Naval Architecture*. He added to it a code of signals for the navy, which was not published. In 1780 he was appointed under-secretary of state, and he was constantly employed, for some little time, in the office on the business of the war. He succeeded, by means of his American friends and agents, in raising a regiment of cavalry, called the King's American Dragoons, of which he was appointed lieutenant-colonel commandant; and this success induced him to go to America to serve with it. At Charleston he was intrusted with the command of the remains of the cavalry of the British army. He speedily restored the discipline of the corps, and gained its confidence and attachment: he often led it against the enemy, and frequently with considerable success. He proceeded, in 1782, to New York, where he assumed the command of his own regiment, having received the colours from the hand of Prince William Henry. In the autumn, Gene-

Thompson. ral Clinton was succeeded by Sir Guy Carlton, whose friendship and confidence he speedily obtained. His regiment was recruited from the fragments of several others, and he was sent for the winter to Huntingdon in Long Island. In 1783 he was chosen to conduct the defence of Jamaica, which was then threatened by the enemy; but the general peace superseded the necessity of the intended expedition.

After his return to England, he made great efforts in the cause of the Royalist officers, and he was successful in persuading the ministry to make a proper provision for them. He was himself raised to the rank of colonel, upon the recommendation of General Carlton, only two years after his appointment as lieutenant-colonel. He had acquired a strong predilection for a military life, and was desirous of being sent with his regiment to the East Indies; and, when the regiment was reduced, he wished to serve with the Austrians in a war which was then meditated against the Turks. With this view he left England in September 1783, and, on his passage to Boulogne, he had an agreeable shipmate in the person of Gibbon the historian, who did justice to his merits as a "soldier, philosopher, and statesman." At Strasburg, his appearance on the parade in his uniform excited the attention of the late king of Bavaria, then Prince Maximilian of Deux Ponts, who invited him to his table, and being delighted with the accuracy and extent of his military knowledge, gave him a strong recommendation to his uncle, then elector; and instead of a day or two, as he had intended, he stayed a fortnight at Munich. He was also very cordially received at Vienna, and passed a part of the winter there; but the war against the Turks not taking place, he returned by Venice and the Tyrol to Munich, where he arrived in the winter of 1784; and being formally invited by the elector to enter his service, he went to London to ask leave to accept the proposal; and it was granted him, together with the honour of knighthood. On his return to Bavaria, he was made a colonel of cavalry, and aide-de-camp-general to the elector. The first four years of his residence at Munich were principally employed in acquiring information, and in preparing his plans of reform; and in the meantime he continued his physical researches. He made his first experiments on heat in 1786, during a journey to Mannheim. In 1785 he was made chamberlain to the elector, and member of the academies of Munich and of Mannheim; in 1786 he received from the King of Poland the order of St Stanislas; in 1787 he took a journey to Berlin, and was made a member of the Academy of Sciences of that city; in 1788 he was appointed major-general of the Bavarian cavalry, and privy counsellor of state; and he was placed at the head of the war department, in order to pursue his plans for the improvement of the army. The Elector Leopold likewise conferred upon him the title of count of the holy Roman empire. Sir Benjamin Thompson was accordingly henceforth known as Count Rumford, the original title of the residence of his wife in America.

It was in 1789 that he established the House of Industry at Mannheim. He founded also the Military Academy of Munich; he improved the military police of the country; he formed schools of industry for the wives and children of the soldiers; and he embellished the city by a new arrangement of the public gardens. The House of Industry at Munich, which he has described at large in his *Essays*, was founded in 1790; and from this period may be dated the total abolition of mendicity in Bavaria. His exertions were rewarded by the rank of lieutenant-general of the Bavarian armies, and by a regiment of artillery. His health having suffered from constant application, he obtained permission to take a journey into Switzerland and Italy, and he returned to Bavaria in 1794. He had a severe illness at Naples, and he was not sufficiently recovered, upon his return, to resume his active duties; but he employed himself in writing the first five of his *Essays*. In 1795 he came to England in order to publish the *Essays*, and in hopes of exciting the public attention to the importance of attempting a similar reform among the lowest orders in Great Britain. He went to Dublin in 1796, to pay a visit to Lord Pelham, afterwards Earl of Chichester, then secretary of state for Ireland; and he was of essential service in the arrangement of several of the public institutions of that country. He was made a member of the Royal Irish Academy, and of the Society for the Encouragement of Arts; and, after having left the country, he received the public thanks of the grand jury of the county of Dublin, and of the lord mayor of that city, as well as of the lord-lieutenant at the head of the government. Upon his return to London, he superintended some improvements at the Foundling Hospital, and presented several models of machines and implements to the Board of Agriculture; and he established two prizes, for discoveries relating to heat and light, by placing two sums of L.1000 in the British and in the American funds, to be adjudged biennially, for Europe by the Royal Society of London, and for America by the American Academy of Sciences. Thompson.

He was recalled to Bavaria by the exigencies of the moment, which were such as to cause the elector to take refuge in Saxony, General Moreau having advanced with his army to the confines of Bavaria. After the battle of Friedberg, Count Rumford was left in command of the Bavarian army, with instructions to act according to his discretion under the circumstances that might occur; and his firmness was such as to prevent either the Austrians or the French from entering Munich. On the elector's return, he was placed at the head of the department of the general police of Bavaria. His exertions in this office were such as to impair the state of his health, and, by way of an honourable retirement, he was sent to London in the capacity of envoy-extraordinary and minister-plenipotentiary; but being a subject of the king of Britain, he was judged incapable of being received as the diplomatic agent of a foreign court, and he therefore continued to live in England as a private individual. He was very active about this period in projecting and superintending the establishment of the Royal Institution of Great Britain, which was more particularly intended for the application of science to the conveniences and comforts of civil and domestic life, but which has been no less successful in giving opportunity and facility to some of the most refined researches in chemistry and natural philosophy that have distinguished the age, than in serving as a medium for making the treasures of science accessible to the less studious part of the public, and as a model for a variety of other similar undertakings in different parts of the world.

Count Rumford was soon afterwards officially invited to America by the government of the United States, with an offer of an honourable establishment in a public situation; but he considered it as inconsistent with his engagements in Europe to accept the proposal. In the autumn of 1800, when he went to Scotland, a visit of ceremony was paid to him by the magistrates of Edinburgh. He was consulted respecting the abolition of mendicity, and the measures which he recommended were speedily executed with complete success. He was made an honorary member of the Royal Society and of the Royal College of Physicians of Edinburgh; and he received a gold snuff-box as a compliment for his assistance in reforming the culinary establishment of Heriot's Hospital.

After so active and diversified a career, it was not to be expected that he would be satisfied with the monotony of a permanent residence in London. He was so accustomed to labour for the attainment of some object, that when the

Thompson. object itself was completely within his reach, and the labour was ended, the prospect, which ought to have been uniformly bright, became spontaneously clouded, or the serenity even became unenjoyable for want of some clouds to afford a contrast. He had fitted up a small house at Brompton, with every contrivance for comfort and convenience that could render it fit for the abode of hospitality and of luxury; and the arrangements are fully described in the *Bibliothèque Britannique* of his friend Professor Pictet; but, after all, he never was known to give a single entertainment in it. The enthusiasm excited by the novelty of some of his inventions had subsided; and he was even mortified by becoming, in common with the most elevated personages of the country, the object of the impertinent attacks of a popular satirist. It was partly, however, if not entirely, the superiority of the climate of France that determined him to remove to Paris in the spring of 1802. He went in the summer to Munich, and the following year he made a tour in Switzerland and in Bavaria, accompanied by Madame Lavoisier (the widow of Lavoisier the distinguished chemist), whom he married soon after their return; but their habits were incompatible with matrimonial comfort, and they separated soon after; Count Rumford retiring to Auteuil, about four miles from Paris, where he occupied a house which had formerly belonged to Helvetius and to Cabanis, while his lady continued to live in the metropolis. His latter years were passed almost wholly in solitude; he saw only his neighbour Mr Caneleux, Mr Underwood, and a Mr Parker, an American. He did not even attend the sittings of the Institute, though he had been made one of its eight foreign associates some time before, and always retained a high esteem for its secretary Cuvier, and for some others of its members. His income was abundantly sufficient for his own expenses; for he had obtained from the gratitude of the king of Bavaria a pension of L.1200 a year; and he was allowed by Bonaparte to remain unmolested, though a British subject, when it was found that he had no intercourse with society, amusing himself principally in walking about his garden, and in a solitary game of billiards. In the latter part of his life he had so completely persuaded himself of the great superiority of broad wheels above narrow ones, that he drove about the streets of Paris in a broad-wheeled chariot; and having rediscovered, after Professor Leslie, that black bodies radiate more heat than others, he wore, in the winter, a white hat and a white coat, in order to economise the heat of his person. "These peculiarities, and a peremptory unyielding disposition," says one of his biographers, "were the causes that set him apart from social intercourse, and in all his connexions in life seem to have rendered him less the object of personal attachment than of esteem for his talents and activity." He was about to return to England when he died, on the 21st of August 1814, leaving only one daughter, who afterwards resided in his house at Brompton.

Count Rumford certainly possessed considerable facility of invention, and there was a very laudable spirit of originality in his views and modes of reasoning, although he had never leisure to acquire profound learning in any department of study. "In person he was above the middle size, with a dignified and pleasing expression of countenance, and a mildness in his manner and his tone of voice. He was ambitious of fame and distinction, and had too great a propensity to dictate," without sufficiently regarding the opinions of others who were of equal authority with himself. His mode of life was abstemious, and his health was even supposed to have suffered from too great abstinence, though his regimen was much more the result of medical opinions respecting his health than of his own peculiar taste for temperance. (See DISSERTATION SIXTH, sec. 632; also Pictet, *Bibliothèque Britannique;* Baldwin's *Literary Journal; Gentleman's Magazine*, vol. lxxxiv.; Aikin's *General Biography*, vol. x.; Chalmers's *Biographical Dictionary*, vol. xxix.; and Spark's *American Biography*, vol. xv.) Thompson.

Count Rumford's first publication appears to have been the chapter on "Marine Artillery" which he furnished to Stalkart's *Treatise on Naval Architecture*, 1780. *New Experiments on Gunpowder, with the Description of an Eprouvette, Phil. Trans.* 1781, p. 230. The effect of the powder on the ball was measured by the recoil of the piece, with a correction deduced from the recoil when the piece was empty. It was observed to be sooner heated when fired without ball than with it. The force of the powder is made at least 1300 atmospheres, upon Robins's principles. *New Experiments on Heat, Phil. Trans.* 1786, p. 273. These experiments relate principally to the conducting powers of various mediums for heat; but the results are unavoidably complicated with the effects of radiation, in consequence of which a vacuum is supposed to possess a conducting power more than half as great as that of common air. *Experiments on the Production of Dephlogisticated Air from Water with various Substances, Phil. Trans.* 1787, p. 84. These experiments tend to show that the air obtained by Priestley and Ingenhousz, from plants under water, was derived rather from the water itself than from the substances immersed in it. *Experiments made to determine the Positive and Relative Quantities of Moisture absorbed from the Atmosphere by various Substances*, p. 240. He finds that wool is more absorbent of moisture than any other substance compared with it; and hence explains the supposed advantage of woollen worn next the skin. *Experiments on Heat, Phil. Trans.* 1792, p. 48. The author attributes the effects of loose substances in obstructing the passage of heat to their attraction for air, and to their impeding its circulation; and he supposes this to be the only manner in which elastic fluids communicate heat. *Account of a Method of Measuring the Comparative Intensity of Light emitted by Luminous Bodies, Phil. Trans.* 1794, p. 67. *Letter announcing a Donation for a Prize Medal, Phil. Trans.* 1797, p. 215. *Experiments to determine the Force of Fired Gunpowder*, p. 272. This force he supposes to amount to between 20,000 and 50,000 atmospheres, instead of 10,000, as Bernoulli computed it; but he makes a great mistake in supposing that the whole of the water which can possibly be contained in the gunpowder would be sufficient to furnish as much steam as would be required, since steam, under a pressure of 20,000 atmospheres, must be considerably more dense than water itself. *Inquiry concerning the Source of the Heat excited by Friction, Phil. Trans.* 1798, p. 80. The capacity of the chips of iron afforded by friction in boring a cannon was found not to differ from that of the iron in its original state; hence it is inferred that the heat could not have been furnished by them, and that it must probably have been generated. Mr Haldalt afterwards repeated the experiment under circumstances still more decisive; and Sir Humphry Davy showed that two pieces of ice rubbed together, in a room below the freezing temperature, would melt each other. *Inquiry concerning the Chemical Properties that have been attributed to Light*, p. 449. He attributes these properties to the effect of an intense heat confined to a small space; but the latter experiments on the chemical effects of the spectrum are sufficient to supercede this opinion. *An Account of a Curious Phenomenon observed on the Glaciers of Chamouny, with some observations on the Propagation of Heat in Fluids, Phil. Trans.* 1804, p. 23. An effect depending on the expansion of water in cooling near the freezing-point. *Concerning the Nature of Heat, and the Mode of its Communication*, p. 77. He conjectures that cold is a positive quality, capable of being propagated by radiation. Several of these memoirs were reprinted under the title of *Philosophical Papers*, vol. i., Lond. 1802, 8vo. The *Essays* constitute four vols. 8vo, Lond. 1795–1800; reprinted 1800, in French, 2 vols. 8vo, Genev. 1799. *Recueil de Rapports ... sur les Soupes*, Par. 1801. They are eighteen in number. 1. "Account of an Establishment for the Poor at Munich," in Ital., 8vo, Venice, 1798. 2. "On Establishments for the Poor in general." 3. "Of Food, and of Feeding the Poor." 4. "Of Chimney Fire-places." 5. "Account of several Public Institutions formed in Bavaria." 6. "On the Management of Fire, and the Economy of Fuel." 7. "On the Propagation of Heat in Fluids, extending to Liquids the Doctrine which he had before advanced respecting Elastic Fluids." 8. "On the Propagation of Heat in various Substances," *Phil. Trans.* 9. "Experimental Inquiry concerning the Source of Heat excited by Friction." 10. "On Kitchen Fire-places and Kitchen Utensils." 11. "On Chimney Fire-places." 12. "On the Salubrity of Warm Rooms in Cold Weather." 13. "On the Salubrity of Bathing, and the Construction of Warm Baths." 14. "Supplementary Observations on the Management of Fires." 15. "On the Use of Steam for Transporting Heat." 16. "On the Management of Light in Illumination, with an Account of a new Portable Lamp." 17. "On the Source of the Light manifested in the Combustion of Inflammable Bodies." 18. "On the excellent Qualities of Coffee, and the Art of

Thompson, William || Thomson, Andrew.

making it in Perfection." There are several little papers on Steam Kitchens, on the Strength of Soft Materials, and on some other similar subjects, in the first numbers of the Journals of the Royal Institution, 8vo, Lond. 1800. The series of investigations relating to Heat and Light, which Count Rumford began to communicate to the Royal Society, were continued, and rather more fully detailed, in several of the volumes of the *Memoirs of the Institute*, Mathematical Class,—into which they were, of course, admitted as the productions of a foreign associate. The first of these is in the sixth volume (4to, Par. 1806, p. 71), containing a "Description of a new Instrument—a Thermoscope, or a Differential Thermometer, resembling that of Leslie." The 2d, p. 74, "Researches on Heat; showing the Effect of the Difference of Surface on Radiation." 3d, p. 88, "Further Experiments; on the Effect of blackening the Surface." 4th, p. 97, "Researches continued; on the different Properties of Bodies with respect to Radiation and to Conducting Power." 5th, p. 106, "Further Researches; some good Experiments on the Passage of Heat through Solids." 6th, p. 123, "Experiments on the Heat of the Solar Rays; which was found not to be affected by their convergence or divergence, or by their having met in a focus and crossed each other." 7th, vol. vii. i., 1806, p. 78, "Remarks on the Temperature of Water at the Maximum of Density, making it 41° of Fahrenheit, or 5° centigrade;" *Phil. Trans.*, 1804. 8th, vol. viii. i., 1807, p. 223, "On the Dispersion of the Light of Lamps by Screens of Ground Glass, Silk, and so forth, with a Description of a new Lamp." 9th, p. 249, "On the Cooling of Liquids in Vases of Porcelain, gilt and not gilt; showing the utility of gilding them externally, with some good reasoning on the nature of heat." He was latterly engaged in composing a work on the Nature and Effects of Order, which he never completed, although no person was better qualified to write on the subject. (T. Y.)

THOMPSON, *William*, a very industrious Irish naturalist, was born at Belfast on the 2d of November 1805. He first joined his father as a linen-merchant; but gradually acquiring a taste for natural history, he gave up this business in 1832, and devoted himself henceforward to his favourite study. The minerals, plants, and animals of Ireland, all received his attentive observation. After contributing numerous small papers to the Zoological Society of London, he, in 1840, gave a very excellent "Report on the Fauna of Ireland—Division Vertebrata." Many of his papers are likewise published in the Ray Society's *Bibliography* and the *Annals of Natural History*. He published his great work on the *Natural History of the Birds of Ireland*, in 3 vols., 1849–51. After his death, which occurred in 1852, his *Natural History of Ireland* was published in 1856. Thompson was a member of all the notable societies of his native country, as well as of many of foreign nations. Although a man of no pre-eminent ability, his devotion to his peculiar subject, and his quick sagacity in detecting the more superficial characteristics of nature, rendered him eminent in the walk which he chose.

THOMSON, ANDREW, D.D., an eminent divine of the Church of Scotland, was born 11th July 1779, in the parish of Sanquhar, Dumfriesshire, of which his father, Dr John Thomson, was then minister. Early in his teens he entered the University of Edinburgh, where he went through the usual literary and theological course of study. The most distinguished professors in the university then were Dalzell, Playfair, and Dugald Stewart; and among its students were Henry Grey, Robert Lundie, John Leyden, Thomas Brown, Francis Horner, Henry Cockburn, and Henry Brougham; the most illustrious of whom has recently, on assuming the headship of their *Alma Mater*, recalled with regret the name of Andrew Thomson. In 1802, the presbytery of Kelso licensed him as a preacher, and shortly after ordained him minister of Sprouston in Roxburghshire, where he laboured for six years with diligence and acceptance as a country pastor. Soon after his settlement here, he married Miss Carmichael, by whom he had ten children, seven of them surviving him. A wider sphere of usefulness was opened up to Mr Thomson by his translation to the East Church of Perth, from which he was removed, in 1810, to that of New Greyfriars in Edinburgh. At that time the Moderate party was all-powerful in the Church and the Tories in the State; and even then, Thomson had declared himself a supporter of the Evangelical party, and a Whig in his political principles. These were days, too, when Whig and Tory meant something more than they do now—when, indeed, a Whig was considered little better than a Jacobin. Hence his appointment to a city church met with the most vehement opposition; and would probably never have been carried had not the Town Council been actuated by extraneous motives. But, as Lord Cockburn says,

Thomson, Andrew.

> "It was necessary to fill the churches for the sake of the seat rents, and churches could only be filled by putting in ministers for whom congregations would pay. This business principle operated seriously in Edinburgh, where the magistrates had laid out large sums in building and repairing kirks. This brought Andrew Thomson into this city, which was the opening of his career. His Whig reputation was so odious, that it seemed at one time as if civic beggary would be preferred to it; and most vehemently was his entrance into our untroubled fold opposed. But at length, after as much plotting as if it had been for the popedom, he got in; and in a few years rewarded his electors by drawing about L.1800 a year for them."

Once established in a metropolitan pulpit, Thomson did not fail to make his influence most powerfully felt; and it was an influence for good. Soon after his appointment, while his eloquence in the pulpit was conciliating the attention and esteem of the most educated classes, and powerfully enforcing the great truths of Christianity, he, along with some clerical friends, set on foot the *Christian Instructor*, a monthly magazine, intended to promote the views of the Evangelical party and the cause of sound theology. Of this magazine he was not only the editor, but the author of a large proportion of its contents. He also engaged in other literary labours, and contributed several important articles to the *Edinburgh Encyclopædia*. In 1814, the new and handsome church of St George's having been completed, in what was then the extreme west end of the city, he was appointed by the Town Council to that charge, which he held till his death. Here, in the midst of all his more public labours, Thomson discharged most zealously and assiduously the duties of a parish minister, caring for the welfare of his flock in all respects, and doing his utmost for their intellectual, moral, and religious improvement. Perceiving the deficiency of means of education in the parish, he formed and carried out the plan of erecting a day-school within its bounds. Not only did he raise the necessary funds for this purpose, but he willingly undertook the drudgery of preparing school-books even for the most elementary classes; and, when necessary, himself taught in the school. The experiment proved eminently successful. Indeed it may be said to have introduced a new era in Scottish education; and many of her present advantages in this respect Edinburgh owes to Andrew Thomson. Many of his pupils have themselves become teachers of no mean ability and success; and his school-books are at this day, if the least ambitious, not the least read of his writings. It was not to be expected that a man in such a prominent position, so opposed to the prevailing party, and of such a vehement and uncompromising spirit, could escape the obloquy and misrepresentation of opponents; and a remarkable instance of this occurred in 1817, on the occasion of the death of the Princess Charlotte. In the universal grief caused by that sad event, the churches were in many places opened for Divine Service on the day of the funeral. Mr Thomson, along with many others, strongly objected to this as a dangerous innovation on the Presbyterian worship; and St George's, alone of the city churches, remained closed on that day. A torrent of abuse was poured on the head of the minister who had presumed to have conscientious objections to what his brethren scrupled not to do; and the outcry was hardly quieted by the audacious preacher's appropriate sermon on the next Sab-

Thomson, Andrew.

bath, and by a pamphlet in his defence by Dr M'Crie, the biographer of Knox and Melville. With him Mr Thomson had become acquainted shortly after his settlement in Edinburgh; and a cordial friendship subsisted between them, interrupted only by death. In 1820, the ruling party in the church, stung by the frequent attacks of the *Christian Instructor*, introduced a motion of censure in the General Assembly, which was carried, but only by a majority of one. The Evangelical party were gradually gaining ground, though still forming a minority in the Church Courts. The great question of the day was about Pluralities, or the holding of other offices, generally professorships, along with the ministry; a practice defended by the Moderates, but opposed in every case by the Evangelicals. The last great debate on the subject was in the Assembly of 1824, on the case of Principal Macfarlane of Glasgow, when the eloquence of Dr Chalmers at the bar, and of Dr Thomson in the house, had to yield to the force of numbers. But the matter that occupied most of Dr Thomson's public labours in the later years of his life was the celebrated Apocrypha controversy. This discussion, now well-nigh forgotten, was occasioned by the British and Foreign Bible Society circulating on the continent copies of the Bible with the Apocryphal books annexed or intermixed. The first who publicly opposed this practice was Mr R. Haldane in 1824; and it was not till 1826 that Dr Thomson entered the discussion by preparing the "second statement" of the Edinburgh Bible Society, of which he was secretary. Certainly this controversy, into which Dr Thomson entered with all his heart, was carried on in what seems now an extremely vehement and bitter style; but perhaps it is not more remarkable for these characteristics than were most of the discussions of that day. On both sides there were doubtless ranged good and sincere men; and on both sides, as none better knew than Dr Thomson, the heat of debate elicited hasty and intemperate invectives; but there can be little doubt that the cause which Thomson advocated, and which ultimately triumphed, was that of truth and uprightness. During the continuance of this long and voluminous contest, Dr Thomson took some part in the discussions occasioned by the opinions of Edward Irving and his friends; and published a series of sermons on *The Doctrine of Universal Pardon*. His attention was also about this time directed to the subject of West India slavery, and his last public effort was in behalf of emancipation. At a public meeting on the subject, held in October 1830, after Jeffrey had delivered a speech advocating gradual emancipation, Dr Thomson rose, and deprecating all half measures, demanded the immediate abolition of slavery. His sudden and vehement appeal produced such an effect, that the meeting was divided, and broke up in confusion; but at one held soon after, the course he recommended was approved, and a petition to that effect was subsequently signed by 22,000 persons. On the morning of the last day of his life, 9th February 1831, Dr Thomson rose in his usual health; and after baptising a child, left his house to pay some parochial visits. Thereafter he attended a meeting of presbytery, and gave his usual attention to the business in hand. He returned home with a friend, from whom he parted at his own door in Melville Street. While standing there for a moment, he turned round as if to say something, and suddenly fell down insensible. Medical aid was summoned, but in vain: thus suddenly and thus calmly his spirit had fled. The solemn and unexpected event produced an unprecedented impression in Edinburgh and throughout Scotland. He was buried on the 15th of February, near his friend and father in the church Sir Henry Moncreiff, in St Cuthbert's churchyard; 2000 mourners followed his remains to the grave, and 10,000 spectators beheld the sad procession. So passed from among men a man who did a great work in his age, and left his mark on the succeeding one. It is impossible within the limits of this notice to delineate his character: its great features, as visible to the public, may be gathered from his deeds; an echo of his eloquence may be caught from his writings; but the man himself cannot be better portrayed than by two who knew him intimately. Dr M'Crie says:—

Thomson, Anthony Todd.

"Dr Thomson was by constitution a reformer; he felt a strong sympathy with those great men who, in a former age, won renown by assailing the hydra of error, and of civil and religious tyranny; and his character partook of theirs. In particular, he bore no inconsiderable resemblance to Luther, both in excellencies and defects; his leonine nobleness and potency, his masculine eloquence, his facetiousness and pleasantry, the fondness which he showed for the fascinating charms of music, and the irritability and vehemence which he occasionally exhibited, to which some will add the necessity which this imposed on him to make retractions,—which, while they threw a partial shade over his fame, taught his admirers the needful lesson, that he was a man subject to like passions and infirmities with others. But the fact is, though hitherto known to few, and the time has now come for revealing it, that some of these effusions which were most objectionable, and exposed him to the greatest obloquy, were neither composed by Dr Thomson, nor seen by him, until they were published to the world; and that in one instance, which has given rise to the most unsparing abuse, he paid the expenses of a prosecution, and submitted to make a public apology, for an offence of which he was as innocent as the child unborn, rather than give up the name of the friend who was morally responsible for the deed;—an example of generous self-devotion which has few parallels."

And Dr Chalmers says:—

"To myself he was at all times a joyous, hearty, gallant, honourable, and out-and-out trustworthy friend; while in harmony with a former observation, there were beautifully projected on this broad and general groundwork some of friendship's finest and most considerate delicacies. By far the most declared and discernable feature in his charater was a dauntless and direct and right-forward honesty, that needed no disguise for itself, and was impatient of aught like dissimulation or disguise in other men. There were withal a heart and a hilarity in his companionship, that everywhere carried its own welcome along with it; and there were none who moved with greater acceptance, or wielded a greater ascendant, over so wide a circle of living society."

Assuredly he was a man whom posterity should not willingly let die; and if he is now less remembered than he deserved, it is only "caret quia vate sacro."

His principal works are:—*Sermons on Infidelity*, 1821; *Lectures on portions of the Psalms*, 1826; *Lectures on Select portions of Scripture*, 2d edition, 1828; *Sermons on various subjects*, 2d edition, 1830; *Sermons on Universal Pardon*, 1830; *Sermons and Sacramental Addresses* (published posthumously, with a memoir prefixed), 1831. (J. S. C.)

THOMSON, *Anthony Todd*, a medical writer and practitioner of considerable celebrity, was born in Edinburgh on the 7th of January 1778, and was educated at the High School there with Brougham, Jeffrey, Cockburn, and other notable men of the day. He studied medicine, and became a member of the once famous Speculative Society in 1798. Having graduated next year, he went to London, and commenced practice in Sloane Street, Chelsea. The first literary work of this singularly industrious individual was his *Conspectus Pharmacopiæ*, 1810. In 1811 he published *The London Dispensatory*, and in 1821 his *Lectures on Botany*. The *Conspectus* and the *Dispensatory* have already gone through very many editions. He was appointed Professor of Materia Medica to the London University in 1828, and to the chair of Medical Jurisprudence in 1832. During the latter year he published his *Elements of Materia Medica*, and gave his lectures on medical jurisprudence to the *Lancet* in 1836–37. The health of Dr Thomson began to give way in 1848, and he fell a victim to bronchitis on the 3d of July 1849. One of his last works was his *Domestic Management of the Sick-*

Thomson, James.

Room; and his book on *Diseases of the Skin*, with which he was occupied at his death, has since been given to the world, accompanied by a memoir of the author by Dr Parkes. The wife of Dr A. T. Thomson has likewise contributed pretty largely to historical biography.

THOMSON, *James*, a poet of great eminence, was born in the parish of Ednam and county of Roxburgh, on the 11th of September 1700. His father was minister of that parish, which is contiguous to Kelso. The maiden name of his mother was Beatrix Trotter, and she was coheiress with her sister of a small property, Widehope, in Roxburghshire. At an early age James showed great aptitude for learning; and Mr Riccaulton, a neighbouring clergyman, furnished him with books, and took upon himself the chief direction of his studies. Mr Riccaulton was himself a poet, and author of a piece on *Winter*, which Thomson said contained some "masterly strokes that awakened him," and suggested his own poem of *Winter* (*Letter to Cranstoun*). The elementary branches of knowledge Thomson acquired at Jedburgh. He was early distinguished for poetical talent; but on the first day of every year he is said to have committed his boyish effusions to the flames. Being intended for the church, Thomson was entered of the University of Edinburgh. His father died in 1720, leaving a numerous family; but the widow raised what money she could on her property by mortgage, and removed to Edinburgh with her children. James studied four years in the Divinity Hall. In October 1724, he delivered a college exercise—an illustration of part of the 119th Psalm—which is described as having been so splendid or florid in style as to call for reproof from the Professor, Mr Hamilton, who characterised it as unintelligible to ordinary persons, and bordering on indecency, if not profanity. Thomson had genius long before he acquired taste.

The poet's prospects in the Scottish Church being indifferent enough, he left Edinburgh and proceeded to London, intending to take orders in the Church of England. But to graduate at Cambridge or Oxford, and pursue classical and mathematical studies at the age of twenty-five, were formidable difficulties to the poor and indolent poet, and he was glad to accept an appointment as tutor in the family of Lord Binning at East Barnet. The mother of Lord Binning, Lady Grizel Baillie, had encouraged the poet's removal to London, and took a warm interest in his welfare; but Thomson, it appears, discharged the duties of tutor for only nine months. His mother died in May 1725, about two months after he had parted from her to proceed to England, and he dedicated some verses to her memory. In September of the same year, he commenced his poem of *Winter*, which was published in March 1726; a bookseller, Millan, having given him three guineas for the copyright. It was dedicated to Sir Spencer Compton, afterwards Earl of Wilmington.

At this period of his history, the indigent bard was much indebted to the friendship of Mallet, who was then tutor to the sons of the Duke of Montrose. Mallet was a man of consummate dexterity, and very well qualified to enlighten his countryman in the art of pushing his fortune. In his zeal for the dignity of letters, Dr Johnson remarks that Thomson at this time "obtained the notice of Aaron Hill, whom, being friendless and indigent, and glad of kindness, he courted with every expression of servile adulation." Yet Hill was an ingenious and benevolent man, upon whom much praise could be conscientiously bestowed. He was also a man of spirit, as Pope had occasion to ascertain, when he provided him with a niche in the *Dunciad*. A proof of all these qualities now appeared in his conduct to the young poet. Of the dedication Sir Spencer Compton took no notice, until there appeared in the newspapers a copy of complimentary verses, addressed by Hill to Thomson, lamenting the miseries of genius, and condemning the paltry Mæcenases of the age. The result of this memento was an interview with Thomson, in which Sir Spencer, with perhaps the grace and delicacy of one bestowing alms upon a mendicant, made the poet a present of twenty guineas. A second impression of *Winter* was now called for, and the author's friends began rapidly to increase. Among these was Dr Rundle, afterwards Bishop of Derry, who introduced him to the Lord Chancellor Talbot. In 1727 appeared *Summer*, which was followed by "A Poem sacred to the Memory of Sir Isaac Newton." To this production he was enabled, by the instruction of his friend, Mr John Gray, F.R.S., to impart a philosophic spirit, worthy of the departed sage. In 1728 was published *Spring*, dedicated to the Countess of Hertford, afterwards Duchess of Somerset, by whom the poet was invited to pass some time at the family-seat. The countess was herself addicted to the muses, and regaled her visitor by reciting to him many of her poetical lucubrations. This species of pastime, however, Thomson found somewhat insipid, and sought relief so frequently in the jovial company which surrounded his lordship's table, that he forfeited the favour of his learned hostess; and this invitation to become her guest, which was the first, was also the last that he ever received. For *Spring* the poet received from Millan the publisher fifty guineas. In 1729 appeared his poem of *Britannia*, and an elegy on the death of Congreve, that favourite of all poets and patrons. On the 28th of February 1729–30, the tragedy of *Sophonisba* was acted at Drury Lane; and in the following year, by the addition of *Autumn*, the plan of *The Seasons* was completed, and they were combined in a 4to volume, for which 454 copies were subscribed, Pope having taken three copies. The success of the play was much more moderate than was anticipated by the author's numerous and powerful friends. The feeble verse,

O, Sophonisba, Sophonisba, O!

and the parody to which it gave rise, spoken by a wag in the pit,—

O, Jemmy Thomson, Jemmy Thomson, O!

are still remembered: a fate which has attended few of his other tragic lines. His genius does not seem to have been dramatic; he is often flat, and when he rises, he seldom rises above rant; even his declamation, into which his dialogue too often expands, is not splendid, and his pathos is not affecting. In this, and in all his other plays, there is a perpetual repetition of the word glory, which surely argues poverty of sentiment; and Hurd did him little injustice when he applied to his palpable and laborious art in tragedy the words of Horace, *promissus grandia turget*. Nor does he display any skill in depicting character, being a more diligent observer of external nature than of the qualities of men. His heroine hates the Romans, and, with little variation of expression, she says so every time she appears upon the scene. Syphax is only another Bajazet, and his rival Masinissa a common tragic lover, with whose raptures and lamentations no one has much sympathy.

About this time, or perhaps earlier, Thomson is said to have been under great obligations to the eccentric generosity of Quin, the celebrated actor, who, as the story goes, relieved him from a spunging-house in Holborn. After the publication of his *Seasons*, one of his creditors had him arrested, judging it was a likely time to procure payment. The amount of the debt was not forthcoming, and Thomson had every prospect of a lengthened sojourn in his involuntary retirement, when he was visited by Quin, with whom he had no personal acquaintance. The comedian gracefully apologised for his intrusion, to which Thomson was easily reconciled. The additional liberty of ordering supper was also taken in good part. After they had

Thomson, James.

supped luxuriously and drunk freely, Quin informed his new associate that he was indebted to him in the sum of one hundred pounds for pleasure received in the perusal of the *Seasons*. He then deposited the money on the table, and took his departure, leaving the imprisoned bard full of gratitude and amazement.

Thomson's poetical labours were, in 1730, agreeably interrupted by an invitation to attend the eldest son of Lord Talbot upon his travels. For this advantageous opportunity of extending his experience, he was indebted to the friendship of Dr Rundle. Upon his return to England, he was made secretary of briefs; the profits of which appointment were fully adequate to all his wants and desires. When in Italy, he conceived the idea of writing the poem of *Liberty*, which was afterwards completed in five parts, successively published in quarto; the first, second, and third in 1735, the fourth and fifth in 1736. This poem he dedicated to the Prince of Wales. One who has read the achievements of the masters of the world, and seen their posterity sunk in slavery and vice, is apt to imagine that he can say something that is new on the blessings of freedom and the horrors of oppression. But his sensations, which have been felt by all, have been described by many; and in the fervour of composition, mistaking the children of memory for the offspring of fancy, a great writer may produce, upon such an extensive theme, nothing but a tissue of common places, when he dreams that he has been making an invaluable addition to the treasures of knowledge. No man, whether sane or otherwise, prefers darkness and chains to light and the free range of creation; and when Thomson proved, by a multiplicity of examples drawn from the history of every age and nation, that the former were to be shunned and the latter pursued, the reader was neither amused nor instructed. By a species of infatuation not uncommon among authors, Thomson considered this poem the best of all his productions. It was coldly received by the public when it first appeared; and after the poet's death, when Sir George (afterwards Lord) Lyttelton was collecting his works for the press, he thought the best way of consulting the reputation of his deceased friend was to abridge it; a strange and unwarrantable proceeding, which no motives can justify. In the mutilated condition to which it was reduced by Lyttelton, it now appears.

The mortification of finding the public opinion of his poem opposed to his own, was followed by the death of Lord Talbot, an event which deprived Thomson of his place. The new chancellor, Lord Hardwicke, kept it vacant for some time, in order to afford him an opportunity of applying, in the usual form, to be reinstated; but no such application was made, and his lordship bestowed it upon another person. The silence of Thomson probably proceeded from an incurable habit of neglecting his own affairs; for his experience was sufficient to inform him, that the dignity of a needy man who expects to be loaded with unsolicited benefits will soon be his sole possession. His great friends, however, did not desert him; and soon after he had ceased to be a placeman, he was introduced to the Prince of Wales, who, among other modes of courting popularity, professed himself a friend to men of letters. Being questioned by the prince on the state of his affairs, Thomson informed his royal highness that "they were in a more poetical posture than formerly." This gay reply produced what might have been denied to a tedious catalogue of grievances, a pension of one hundred pounds a year. This allowance, well-timed as it was, being insufficient to support him in his former mode of living, he again had recourse to his pen. In 1738, his tragedy of *Agamemnon* was acted at Drury Lane. The performance was graced by the presence of Pope, who, on his entering the theatre, received from the audience nearly all the applause of the evening; for although supported by the acting of Quin in the hero, the play, to use the words of Johnson, "had the fate which commonly attends mythological stories, and was only endured, but not favoured." Being still compelled to write for the stage, Thomson next produced *Edward and Eleanora*, to the first edition of which is prefixed the following advertisement: "The representation of this tragedy on the stage was prohibited in the year one thousand seven hundred and thirty-nine." Brooke's *Gustavus Vasa* was the first, and Thomson's the second, play prohibited by the operation of the new act for licensing dramatic performances. In both cases, this act seems to have been exercised with very superfluous rigour. The following lines, however, which occur near the beginning of Thomson's tragedy, may perhaps have arrested the eye of authority, and sealed its fate:—

Thomson, James.

> "In times like these,
> Disturb'd and low'ring with unsettled freedom,
> One step to lawless power, one old attempt
> Renew'd, the least infringement of our charters,
> Would hurl the giddy nation into tempest."

In conjunction with Mallet, he afterwards wrote the masque of *Alfred*, which was played before the Prince of Wales. To the favour of that illustrious personage, who was on bad terms with the court, it is probable that he owed, in some degree, the prohibition of his former drama. In *Alfred* was first published the national anthem of "Rule Britannia," and it is uncertain whether Thomson or Mallet was the author of the lyric. Mr Bolton Corney, a diligent inquirer, considers that Mallet has the best claim to it. The tragedy of *Tancred and Sigismunda*, taken from the novel in *Gil Blas*, was performed at Drury Lane in 1745. It was the most successful of his dramatic efforts, and kept possession of the stage until a recent period. The *Castle of Indolence*, the last of his works that was published in his lifetime, appeared in 1748, and is unquestionably—especially the first canto—the most highly finished and poetical of his works. Previous to this, when Lyttelton was in office, Thomson received the appointment of surveyor-general of the Leeward Islands. His clear emoluments amounted to about L.300 a year, and the duties of his office he was suffered to perform by deputy.[1]

The amiable and warm-hearted poet had now the enjoyment of lettered ease and comfort. His only fault seems to have been indolence (he had "no motive," he said, to make him get up in the morning), and he became "more fat than bard beseems." In the prime of life, while his fame was daily brightening, he was suddenly cut off. He had for some time resided in a snug cottage, embowered among trees, at Kew Lane, near Richmond. A cold caught upon the river between London and Kew was succeeded by a fever, of which he had partly recovered, when imprudent exposure to the evening dews induced a recurrence of his malady, and terminated his life on the 27th of August 1748. His remains were interred in the church of Richmond in Surrey; and, in 1762, a monument was erected to his memory in Westminster Abbey. The expense of this memorial was defrayed by an edition of his works, published during that year, in two volumes quarto. The king subscribed L.100. A Life of the author was prefixed by his intimate friend Dr Murdoch. But the noblest tribute to the memory of Thomson is the beautiful ode of Collins, beginning,

> "In yonder grave a Druid lies,
> Where slowly winds the stealing wave;
> The year's best sweets shall duteous rise
> To deck its poet's sylvan grave."

[1] His friend Paterson, the author of the tragedy of *Arminius*, which was prohibited by the Lord Chamberlain soon after *Edward and Eleanora* met a similar fate, was Thomson's deputy, and lived to succeed him in his office.

Thomson, Thomas.

The tragedy of *Coriolanus*, which he had prepared for the stage, was after his death performed at Covent Garden. The profits of the representation discharged his debts, and left a considerable overplus, which was remitted to his sisters. The principal character was supported by Quin, who also delivered a prologue written by Lyttelton. When he had to utter the following lines, the great comedian, who had long lived on terms of the most affectionate intimacy with Thomson, was entirely overcome by his emotions:—

> "He lov'd his friends—forgive this gushing tear—
> Alas! I feel I am no actor here."

Thomson was of a dull aspect, till quickened by conversation. In a mixed or a numerous company he was ill at ease, and appeared to disadvantage; but when surrounded by a few familiar faces his embarrassment disappeared, and he became frank, cheerful, and amusing. As a son and brother, his conduct was exemplary. A letter to his sister, inserted in Johnson's narrative, breathes the purest spirit of fraternal affection. He was warmly attached to his friends, whom he inspired with the same degree of cordial regard and tenderness.

From Thomson, as an author, has never been withheld the highest praise, that of originality. "He thinks," says Johnson, "in a peculiar train, and he thinks always as a man of genius; he looks round on nature and life with the eye which nature bestows only on a poet; the eye that distinguishes, in everything presented to its view, whatever there is on which imagination can delight to be detained, and with a mind that at once comprehends the vast and attends to the minute. The reader of the *Seasons* wonders that he never saw before what Thomson shows him, and that he never yet has felt what Thomson impresses." Where intellectual eminence was not conspicuous, Johnson distributed commendation with a very sparing hand, whether the character reviewed was dignified by rank, which he valued much, or by virtue, which he valued more. Upon a lover of liberty, a man of easy morals, and a writer of blank verse (in his estimation a delinquent almost as odious as either), he would have bestowed no praise that he could conscientiously have withheld. This liberal encomium on Thomson, therefore, ought to satisfy the warmest admirers of the poet. Since the time of Johnson criticism has taken a wider range, and possessed a more searching and æsthetic spirit, but has not withered one leaf of Thomson's laurels.

THOMSON, *Thomas*, an eminent chemist, was born at Crieff in Perthshire, on the 12th of April 1773. Passing from the parish school of his native town, he became a pupil of Dr Doig of Stirling, and subsequently entered the University of St Andrews. After spending three years at this seat of learning, he entered upon his medical studies at the University of Edinburgh, and in 1796 became connected with the *Encyclopædia Britannica*, for an early edition of which he wrote the articles CHEMISTRY, MINERALOGY, VEGETABLE SUBSTANCES, ANIMAL SUBSTANCES, DYEING SUBSTANCES, &c. These articles formed the basis of his *System of Chemistry*, which he published at Edinburgh in 1804, in 4 vols., and afterwards greatly enlarged and improved as the demand for the book increased. Dr Thomson's lectures on chemistry, which he commenced at Edinburgh in 1800, were continued with increasing popularity until 1810. Meanwhile he invented the system of chemical symbols, which are now substantially adopted by men of science; and he was the first to open a laboratory in Britain for practical manipulation. He published his *Elements of Chemistry* in 1810. In 1812 he visited Sweden, and wrote a description of that country on his return. Dr Thomson commenced the *Annals of Philosophy* in 1813, and was chosen lecturer on chemistry to the University of Glasgow in 1817, which was elevated into a professorship the year following. He was one of the first to recognise the value of Dalton's atomic theory. The works of this eminent chemist were henceforward numerous and popular. He wrote, in 1825, in 2 vols., *An Attempt to Establish the First Principles of Chemistry by Experiment;* in 1830–31, he published the *History of Chemistry* in 2 vols.; in 1836, appeared likewise in 2 volumes, his *Outlines of Mineralogy and Geology;* and in 1849 he issued his last work, on *Brewing and Distillation*. Thomson made a great many discoveries in chemistry, and has left behind a considerable reputation both as an original discoverer and as a practical teacher of his favourite science. Dr Thomas Thomson died in 1852. His son, who bears his name, is known to be a distinguished botanist, and is superintendent of the East India Company's Botanic Gardens at Calcutta.

Thonon ‖ Thornhill.

THONON, a town of Savoy, capital of the province of Chablais, 20 miles N.E. of Geneva, on the south shore of the lake. It is an ancient town, irregularly built, with a handsome town-hall, several churches, a court of law, potteries, and some trade in corn, wine, and timber. Pop. 4428.

THOR. See MYTHOLOGY.

THORDA, or THORENBURG, a market-town of the Austrian empire, capital of a county of the same name, in Transylvania, on the Aranyos, 17 miles S.E. of Klausenburg. It is meanly built, and contains Protestant, Roman Catholic, and Greek churches; a monastery, town-hall, gymnasium, and military school. In the vicinity are salt-mines, and the remains of the Roman fortress Salinæ. Pop. 8112.

THORILD. See SCANDINAVIAN LITERATURE.

THORN, a fortified town of the kingdom of Prussia, in the province of West Prussia, government and 52 miles S.S.W. of Marienwerder, on the right bank of the Vistula, here crossed by a wooden bridge 823 yards long. It is defended by walls, bastions, and two forts, and entered by two gates; and it consists of an old and a new town. There are here five churches, one of which contains a statue of Copernicus, who was a native of the town, a fine town-hall, a gymnasium and other schools, several convents, and manufactures of woollen and linen cloth, hosiery, leather, silk, and much esteemed gingerbread. An active trade is carried on in corn and timber. Thorn was founded by the Teutonic knights in 1232, and admitted into the Hanseatic League in the beginning of the fourteenth century. It was taken by Charles XII. of Sweden in 1703, after a siege of four months. Pop. 13,113.

THORNBURY, a market-town of England, Gloucestershire, 3 miles from the estuary of the Severn, and 11 N.E. of Bristol. It has a large parish church, in the later English style, with a lofty and richly adorned tower, places of worship for Wesleyans, Independents, Baptists, and Quakers, several schools, alms-houses, and other charitable institutions. In the neighbourhood are the ruins of Thornbury Castle. Pop. of the parish, 4614; of the town, 1470.

THORNE, a market-town of England, in the West Riding of Yorkshire, on the right bank of the Don, 28 miles S. by E. of York, and 166 N. by W. of London. It has an ancient parish church, several dissenting places of worship, three schools, a mechanics' institute, and some trade in corn, timber, and coal. Some of the people are employed in rope-making and weaving. Pop. 2820.

THORNEY, a market-town of England, in the county and 35 miles N.N.W. of Cambridge, 82 N. by W. of London. It has a Norman church, formerly only the nave of a conventual chapel, national and infant schools, and alms-houses. Fairs for horses and cattle are held here twice a year. Pop. 2174.

THORNHILL, SIR JAMES, nephew of the great English physician Dr Thomas Sydenham, and father-in-law of Hogarth the distinguished painter, was himself an artist of great celebrity in his day, and was born at Weymouth in

Thornhill || Thorough Bass.

1676. The father of Thornhill was a gentleman of some family pretensions in Dorsetshire (Bryan conjectures Derbyshire), but who squandered his estate so completely that his son James had to trust to a legacy of L.30, which was left him by his maternal uncle, Dr Sydenham, to supply the necessities of a professional education. (*Life of Sydenham*, p. xlv., in the first volume of the *Sydenham Society's* publications, London, 1848.) Young Thornhill, who was at his uncle's death just thirteen years old, apprenticed himself to a painter of no note, where he learned dexterity, if he acquired little insight into his art. Subsequently he applied himself with great industry to his profession, and gained considerable reputation as a historical painter. He visited Holland, Flanders, and France, but returned to England without having visited Italy, the mother of the fine arts. Thornhill was appointed by Queen Anne to ornament the cupola of St Paul's Cathedral, for which he executed eight designs illustrative of the history of the apostle in memory of whom the building had been erected. These gave very great satisfaction, and have since been engraved by Du Bose, Beauvais, Baron, Vandergucht, and Simmoneau. Thornhill was subsequently engaged in decorating the apartment at Hampton Court with emblematical subjects relative to the history of Queen Anne and her consort, George Prince of Denmark. Among his principal works are the ornaments of the great saloon and refectory at Greenwich Hospital. High as was Thornhill's merits and reputation, Walpole mentions, in his *Anecdotes*, that it was difficult for him to obtain the stipulated prices for his works. Forty shillings a square yard was the rate at which he was paid for his labour on the ceiling of St Paul's and the Hospital of Greenwich. His fame seems to have steadily increased, however, for in the next reign he was not only made a knight, but was chosen to represent his native town in Parliament. The Duke of Bedford, on the demolition of his house at Bloomsbury Square, presented fine copies of Raphael's cartoons to the Royal Academy, drawn by Sir James's own hand, and purchased at the sale of his pictures. Sir James Thornhill died in 1734, leaving a son, whom he had procured the appointment of sergeant-painter, and a daughter, who married the celebrated artist Hogarth.

THORNHILL, a village of England, in the West Riding of Yorkshire, on the Calder, 31 miles S.W. of York. It has an old parish church in the early English style, Wesleyan and Baptist chapels, two schools, and manufactures of woollen cloth, hardware, glass, chemical substances, &c. Not far off stand the ruins of an old castle, demolished by the Roundheads in the civil war. Pop. of the parish, 6858.

THORNHILL, a burgh of barony of Scotland, in the county and 13 miles N.N.W. of Dumfries, near the Nith. It is generally well-built, for the most part of red freestone; and it contains a fine parish church, a United Presbyterian church, several schools, and a literary institution. Leather, stockings, &c., are made here. Pop. 1658.

THOROUGH BASS (Ital. *Basso Continuo*). See MUSIC. From an edition of Emilio del Cavaliere's musical drama, called *La Rappresentazione di Anima e di Corpo*, published by Guidotti in 1600 at Bologna, it appears that Cavaliere was one of the earliest musicians who conceived the idea of writing an instrumental bass different from the vocal bass, gave it the name of *basso continuo*, and accompanied it by numerals and signs intended to direct the instrumental performers in the improvised accompaniments which they executed. "This fact," says an eminent continental writer, "is proved by the instructions which Guidotti has given in that edition regarding those numerals and signs. *I numeri piccoli posti sopro le note del basso continuato per suonare*, says Guidotti, *significano la consonanza e la dissonanza di tal numera, come il 3 terza, il 4 quarta, e cosè di mano in mano.*" Thus it would seem that G. Sabbatini, who, in his work printed at Venice in 1628, claims the invention of *figured bass*, must yield the priority at least to Cavaliere. It appears, however, that G. Sabbatini was the first person who published the precepts of the so-called Rule of the Octave. Andrea Majer of Venice, in his *Discorso sulla Origine, Progressi, e Stato attuale, della Musica Italiana*, says, that in the *Euridice* and Madrigals of Caccini, and other compositions of the sixteenth century, we find a *basso continuo*. But this does not overturn L. Viadana's claim, set forth as about 1597, in his *Cento Concerti*, published in 1603; since the *Euridice* was set to music by Perti and Caccini, and also performed in 1600; while Caccini's *Euridice*, set to music entirely by himself, and also his Madrigals, were first published in 1615. (See MUSIC, sect. *Harmony*.)

Thorwaldsen.

THORWALDSEN, ALBERT, an eminent sculptor, a native of Denmark. It is asserted by one of his biographers that his lineage could be traced from the ancient and royal house of Harold Hildetand; but if so, the fortunes of the family were not only humble, but it seems far from prosperous at the period of the young Albert's birth. His father, Gotskalk Thorwaldsen, an Icelander, was a carver in wood, and was employed, especially, in executing ornamental figures, or what are known as figure-heads for ships. Gotskalk was travelling with his wife towards Copenhagen, in search of employment, when, between that city and a place called Raisciawich, the subject of this memoir first saw the light. Albert Thorwaldsen was born on the 19th day of November in the year 1770.

It may be assumed, that the family was established in Copenhagen, as Albert, at the early age of twelve years, was admitted a student of the Academy of Fine Arts, where he received instruction from the painter Abildgaard. In 1787, he gained a silver medal; and, two years after, a gold one, for a composition of "Heliodorus driven from the Temple." In 1793, he received the highest reward that could be conferred on a student; this was the grand prize which carried with it the substantial advantage of an allowance, for a term of years, of 500 thalers, equal to rather more than one hundred pounds English. This provision placed it in his power to travel, and after some time he proceeded to Italy, then, as now, the great school for studying his art. He must, however, have remained some time longer in Copenhagen before he availed himself of his privilege; for his arrival in Rome, after a tedious voyage of ten months, in a Danish frigate, is dated in 1796.

It is said that Thorwaldsen had at one time serious doubts whether he should devote himself to the art in which he afterwards became so eminent. He was undecided whether he should choose sculpture or painting as a profession, till his visits to the Vatican, where so many masterpieces of sculpture are collected, determined his choice. But even after this he distrusted his power to succeed, and expressed his hopelessness that he should ever be able to approach, in any works he might produce, the excellence of the ancients. It is recorded that, with this feeling, he destroyed many of his works, in spite of the encouragement he received from his friends, who saw in him the promise of a great artist. Notwithstanding these occasional fits of depression he still laboured diligently, and modelled various works of Greek subjects, in all of which he showed how thoroughly he had studied the spirit of the ancient examples. But all this zeal and devotion had hitherto led to no profitable result in increasing his means. He had no commissions for his works, and he too well knew the time was expiring when he could reckon on the aid of his pension. The turning point of his fortunes was, however, at hand. Among the works he had completed was the model of a statue of Jason, of heroic size, naked, and bearing on his arm the golden fleece; a figure exhibiting an intimate acquaintance with

Thorwaldsen. the human form, simple in treatment, and of a fine style of art. Mr Thomas Hope, the banker, happened to visit the studio of the young Dane. He was struck with the noble character of the "Jason," recognised at once the ability of the sculptor, and commissioned Thorwaldsen to execute it for him in marble. This timely assistance gave a fresh impulse to the exertions of our artist. The opportunity he had so ardently desired and so long waited for was now afforded him, and from this beginning may be traced an unceasing flow of employment and success. For the remainder of his career, till his death in 1844, he was constantly engaged in the active exercise of his art.

Thorwaldsen now determined to establish himself permanently in Italy, and, though he occasionally travelled to the north, Rome was his fixed residence. His *studio* occupied an extensive range of buildings, in the near neighbourhood of the Piazza Barberini.

It would not be possible in our limited space to describe particularly all the works deserving notice of this indefatigable artist. Of his numerous statues of Greek subjects, as Mars, Mercury, Ganymede, the Graces, Venus, Hebe, Psyche, and others of the pseudo-classical school, it is not necessary to say more than that they bear the stamp of the masterhand, and admirably imitate the idealised character of the best ancient examples. His statue of "Mercury watching Argus" may be selected as one of the happiest illustrations of Greek poetry in this imitated style of sculpture. Another of his productions, also derived from classical sources, and especially deserving attention, is his fine historical composition, representing, in a series of *relievi*, "The Triumphal Entry of Alexander into Babylon," a noble work, sufficient of itself to establish the fame of its author. It was originally designed by command of Napoleon I. to decorate a part of the Quirinal Palace at Rome. Afterwards it was executed in marble for Count Somariva, for his villa at Como. It is now in the palace of Christianburg, Copenhagen.

But Thorwaldsen has proved his claim to rank infinitely higher than a merely successful copyist or imitator of Greek sculpture. The above, and various others of his works of this class, merit the fullest praise, but the most happy productions of the kind are always subject to the immense disadvantage of comparison with the real Greek examples on which they are founded; and even when, as is possible, they occasionally show a decided superiority, in some mechanical or academical qualities, over ancient remains, the best of them have necessarily an artificial character which precludes them from taking equal rank with original Greek art. The real genius and individual feeling of Thorwaldsen are more truly and more favourably shown in those works which illustrate religious and similar subjects; and which, reflecting his own sentiment or *idea*, appeal also to contemporary sympathies. His colossal statue of "Christ," executed for a church in Copenhagen, is of this class, and stands pre-eminent among modern works in sculpture; for sentiment, as well as other art qualities, it may fearlessly compete with any ancient work. The Saviour is represented standing with both arms extended, and but slightly advanced. The hands are open, as if inviting approach. The action is simple and dignified, and the expression at once noble and tender. The forms are of the purest type of beauty; and the large mantle, which constitutes the drapery, is boldly and skilfully arranged, leaving the arms and feet, which show the *stigmata*, and a portion of the chest of the figure, exposed. Statues of the "Twelve Apostles," for the same church, are equally admirable specimens of this sculptor's deep feeling and judicious treatment when engaged on works of this class. A series of statues for the tympanum or pediment of the church, representing "The Preaching of St John," combined into an effective whole by the concentration of interest exhibited in all the figures as they listen, in various attitudes of attention, to the preacher, is another happy instance of this sculptor's power of applying his art to the noblest illustration. Various *rilievi* from Scripture might likewise be quoted as equally exhibiting Thorwaldsen's judicious tendency to apply his art to address itself to modern sympathies. Among the more important portrait works executed by this artist, may be mentioned two equestrian statues, of Maximilian Frederick of Bavaria, and Prince Poniatowski; also, a fine seated figure of Galileo, and another of Byron, now at Cambridge. The latter, though a work of great merit, is not one of the best specimens of the sculptor's ability. He also executed the monument of Pius VII. in St Peter's; but this work also affords very inadequate evidence of the real power of Thorwaldsen. His not being a member of the Romish Church subjected him to many illiberal annoyances during the arrangement of this monument, and its effect is materially injured both by the unfavourable position it occupies and by its want of relative scale. It is composed on the usual plan of such works. The Pope is represented seated, and below him, on either side, are statues supposed to characterise Force and Wisdom. A work of Thorwaldsen well known to travellers is a colossal lion erected near Lucerne, to commemorate the gallant Swiss guards who fell in defending the Tuileries on the 10th of August 1792. The *bassi-rilievi* by Thorwaldsen, representing Day and Night, are amongst his best known smaller works. Thorwaldsen.

Canova, the great Italian sculptor, was in the height of his fame when Thorwaldsen began to attract the attention of judges of art; and it may be truly said that the latter was the first and only competitor who proved himself worthy to dispute the well-earned pre-eminence of his distinguished fellow-labourer in the art. The character and mode of treatment of sculpture by these celebrated professors soon, however, exhibited so wide a difference and so distinct an individuality, that they became the founders, as it were, of separate schools. Each had his admirers and partisans by whom their respective merits were sincerely recognised but as freely discussed. Canova, it was allowed, excelled in all the refinements of execution, was thoroughly acquainted with the best examples of form, had much fancy, and exhibited it in almost every variety of work; but it was objected, and not without reason, that his style was open to the charge of meretriciousness, in the absence of that pure and quiet character that so eminently distinguishes sculpture of the best schools. Thorwaldsen, on the other hand, sometimes neglected the advantages to be derived from fine and careful execution, but he never lost sight of the chaste and tranquil expression which essentially belongs to this art. He appealed usually to the deeper seated feelings of the spectator, in what were evidently the more favourite subjects of his practice, namely, religious and moral illustration; and even where mere physical beauty was the object of representation, as in his imitations of the ancient Greek types, no work of his is suggestive of any but pure associations.

Thorwaldsen died at Copenhagen on the 25th of March 1844. He attended the theatre, as was his custom, in the evening of that day. Before the performance commenced, he fell back in his chair in a fit of apoplexy, and although he was immediately conveyed home and received the most anxious attention, he expired without speaking.

Thorwaldsen received during his lifetime the most honourable testimonials of respect and admiration. Frederick of Denmark conferred on him letters of nobility, and he received decorations and orders of knighthood from various sovereigns of Europe. His obsequies were performed with great pomp in the Holm Church. The king, in deep mourning, was present at the funeral, at which the crown-prince and other royal and distinguished personages also

Thou. attended, walking as mourners. The queen and princesses also assisted at the ceremony, and the concourse of people, including the public bodies, municipal and academical, amounted to many thousands. An interesting part of the ceremony was the performance of a *requiem* written by the sculptor's intimate and dear friend Œhlenschlager.

Thorwaldsen was rather above the middle height, firmly built, with broad shoulders. The outline of his face was rather square. His general expression was calm and thoughtful, and very pleasing. His eyes were light and penetrating; his mouth wide and usually closely shut. He wore his hair, which had grown nearly white, in large masses divided over his fine broad forehead, and falling on each side, something like a lion's mane, nearly to his shoulders.

Thorwaldsen will always take rank with Canova and Flaxman as one of the great regenerators of Sculpture. The former, his elders, were almost the first to break through the miserable routine of the worst mixed Italian and French art which had descended from Bernini and his school. Thorwaldsen nobly aided in advancing this revolution, and with them assisted in establishing the practice of sculpture upon true principles. (R. W—T.)

THOU, Jacques Auguste De, or, as his name is frequently written in its Latinized form, Jacobus Augustus Thuanus, was a distinguished French historian, and was born at Paris on the 8th of October 1553. In his infancy he was very weak and sickly, and infirmity of health clung to him into man's years. Indisposed to play like other boys by reason of his frail health, he cultivated a taste for drawing and reading when he should have been engaged in the boyish amusements peculiar to his years. De Thou was originally designed for the church, but he allowed his mind to take a much wider course in its thirst for knowledge than was fairly consistent with an aspirant after priest's orders. He greedily studied literature and science, and contracted so great a liking for Cujus, the celebrated jurist, that he set out for Valence in Dauphiné, and attended his lectures on Papinian. Here he formed the acquaintance of Joseph Scaliger, who remained one of his constant friends throughout life. De Thou returned to Paris in 1572 after a year's absence, to witness the marriage of Henry of Navarre; to see the dead body of Coligny hanging from the gibbet; and to be a spectator of the horrible massacre of St Bartholomew. Next year he went to Italy as an attendant of Paul de Foix; he visited Flanders and Holland in 1576, and in 1578 he accepted, with reluctance, the office of an ecclesiastical councillor of the parlement of Paris. In 1582, while on a visit to Bordeaux, he formed the friendship of honest, garrulous old Montaigne, whose character and genius he has warmly praised. His father, Christophe de Thou, first president of the parlement of Paris, having died during the same year, and both his elder and younger brothers being now dead, it was deemed advisable for De Thou to cease to be an ecclesiastic. He accordingly resigned that profession soon after, and accepted the office of Master of Requests, and was appointed to his uncle's place of *président du mortier* to the parlement of Paris. The De Thous had always remained firm adherents of royalty, and the most illustrious of them would not disgrace his ancestry. He was admitted a counsellor of state to Henry III. at Chartres, and was engaged in various delicate and important missions for Henry III. during the succeeding years. He visited Blois, Paris, Germany, and Italy, all in the royal cause. The death of Henry reached him in Venice in 1589. De Thou immediately set out for France by way of Switzerland, and was received very graciously by Henry IV. at Châteaudun. Henceforward he became a very useful servant to the crown. He was made keeper of the Royal Library on the death of Bishop Amyot in 1591, and in 1593 he commenced his great work *Historia Sui Temporis*, on which he had meditated for fifteen years. From this period until his death his time was much occupied in the composition of his history; and except the arrangement of the Edict of Nantes, in which he had an important share, he engaged very little in public business. The death of Henry in 1610 virtually brought his political life to a termination. Soured with public disappointments, and torn by private griefs, caused mainly by the death of his second wife, he died at Paris on the 7th of May 1617, in his sixty-fourth year. A son of De Thou's by his second wife, François August, fell a sacrifice to the inexorable vengeance of Cardinal Richelieu on the 12th of September 1642. Thourout || Thrapston.

From 1604, when the first eighteen books of De Thou's *History* appeared, the author was received with acclamation by all the reading public of Europe, as the first historian of the age. During his life there appeared eighty books of it in all, and the remainder, forming in all one hundred and thirty-eight books, were published in 1620. The space over which his record extends, is from the year 1544 to 1607; from the closing years of Francis I. till nearly the completion of the reign of Henry IV. It has all the liveliness and freshness of a narrative, written by a man who was a principal actor in the scenes which it is his business to chronicle; it has, besides, the rare merit of being singularly impartial, the author recognising with uncommon frankness the excellence and even occasional superiority of statesmen and citizens who were avowed rivals to the nation which it was both his duty and his pride to honour and exalt. But it is much more upon the excellence of the workmanship that De Thou's *History* lives, than upon the comparative accuracy and faithfulness of its recorded facts. While the style of the work certainly displays abundance of easy, flowing eloquence, it is perhaps deficient in the higher quality of vivid picturesqueness. The language in which it was written was Latin; and the author has spared neither time nor labour to make it severely classical. That it does not come quite up to this ideal is, perhaps, not to be wondered at. The best English edition of De Thou's *History* is that in 7 vols. by Samuel Buckley, 1733. De Thou likewise wrote a number of Latin poems, one of which, entitled *De Re Accipitraria* (On Hawking), appeared in 1584. The *Life* of this author has been frequently written. The above notice has been gathered from his autobiography, which terminates in 1601, and from Collinson's *Life of Thuanus*, London, 1807.

THOUROUT, a town of Belgium, capital of a canton in the province of West Flanders, 11 miles S.W. of Bruges. It has a fine church, a town-hall, several schools, and benevolent institutions. Linen, hats, leather, cordage, earthenware, soap, tobacco, and other goods are made here. In the vicinity are the remains of an old castle, once the residence of the Counts of Flanders. Pop. 8405.

THRACE, the ancient name of a country in the S.E. of Europe, now forming part of European Turkey. In the earliest times the name was used in a very vague sense, and applied to the whole region north of the Ægean Sea, including Macedonia and even Scythia; but when this country became better known to the Greeks, Thrace was confined within narrower and more definite limits. It was bounded on the N. by the Danube, E. by the Euxine and the Bosphorus, S. by the Propontis and the Ægean, and W. by the Strymon, or, at a later period, by the Nestus, which separated it from Macedonia. After the Roman conquest, its size was still further reduced by the chain of Hæmus being made its northern boundary. It corresponds partly with the modern Rumili, which also includes part of Macedonia and Thessaly. (See Rumili.)

THRAPSTON, a market-town of England, in the county and 18 miles N.N.E. of Northampton, on the Nen, which is here crossed by a bridge. The parish church is a cruciform building with a tower and spire; and there are

Thrashing || Thucydides.

also Wesleyan and Baptist chapels, several schools, and charitable institutions. Whips and bobbin lace are made here. Pop. 1183.

THRASHING. See AGRICULTURE.

THREE RIVERS, a town of Canada East, inferior in importance only to Quebec and Montreal in that section of the province, stands on the north bank of the St Lawrence, at its confluence with the St Maurice, 90 miles from Quebec, and about as far from Montreal. It has a splendid Roman Catholic cathedral, English and Scotch churches, a Wesleyan chapel, a mechanics' institute, and several schools. In and about the town there are large iron-works, saw-mills, and machine shops; and there is an active trade in lumber which is conveyed down the St Maurice. Three Rivers is one of the oldest towns in the province; it was for a long time stationary, but is now making rapid progress. Pop. about 7000.

THUCYDIDES, the greatest of Greek, and in some respects of all historians, was a native of Attica, and belonged to the deme of Halimus, and the phyle of Leontis. His father's name is variously given as Olorus, or Orolus, but the former is assumed as more probably the correct form. His mother's name was Hegesipyle. Through her he claimed kindred with the family of Miltiades, the victor of Marathon, but the relationship is difficult to trace. It is conjectured with some show of truth, that his mother was the grand-daughter of Miltiades' wife. His age, like his parentage, is involved in much obscurity. He says himself that he lived through the Peloponnesian war, and saw it brought to a close. If the statement preserved by Aulus Gellius, on the authority of Pamphilus (xv. 23), be true, that he was forty years of age when that war broke out, he must have been born in B.C. 471. Lucian, probably in jest, records a story that Herodotus read his great work in its finished form to the assembled Greeks at Olympia B.C. 456, and that among his hearers was Thucydides, then a lad of fifteen, who was melted to tears by the recitation. The story was long accepted as authentic, but modern criticism has plausibly doubted, if not fairly disproved, its truth. True or false, however, it furnishes no clue to fixing reliably the age of the younger historian.

Not less doubtful than either of the points already alluded to is that of Thucydides' education. It is highly probable, that, living as he did at Athens, he should have enjoyed all the advantages of early culture which that city, then in the acme of its intellectual fame, was able to bestow. It is said that Antiphon of Rhamnus, the first orator of the day, was his instructor in rhetoric; and though there is no positive evidence, it is far from improbable that such really was the case. This much is certain, that Antiphon was teaching publicly at Athens when Thucydides was a youth, and that Cicero, in his eulogy on Antiphon, quotes the historian in corroboration of his praise. On somewhat similar grounds he is believed to have studied philosophy under Anaxagoras, who is known to have resided for a considerable time at Athens. That he ever practised oratory as a profession, is not known for certain. That he possessed great oratorical powers, is plain from the speeches in his history. One of the first authentic facts of his life is that recorded by himself (ii. 48), that he was in Athens at the time of the great plague, that he suffered from it, and was one of the few who escaped with life from its attacks. This happened in the second year of the war, at a time when he had not fairly committed himself to public life. Most probably it was after his recovery that he began to take a part in state affairs, and he must have shown some administrative capacity, for in the eighth year of the war (B.C. 424) we find him in command of a small squadron at Thasos, on his way to the relief of Amphipolis, then besieged by the Lacedæmonians. He arrived too late at the scene of action to effect his purpose. Amphipolis had already surrendered on favourable terms to Brasidas the Spartan general, but the seaport of Eion was saved. The loss of Amphipolis—probably the most important position of the war—was a great blow to the Athenians; and Thucydides, to avoid the punishment of death which he had reason to believe would follow his failure, went into exile, and did not return to Athens till the year B.C. 403, when the war had been brought to a close. His own statement merely records, that after his failure at Amphipolis he became an exile, but makes no mention of a formal trial or sentence. He gives no certain clue as to the place or places where these twenty years were spent. His biographer, Marcellinus, maintains, that he retired first to Ægina and afterwards to Thrace, where he possessed gold mines of considerable value. He may have had his head-quarters here, but there are the best reasons for believing that he travelled a good deal, and in the course of his travels collected materials for portions of his history. His minute descriptions of different parts of Sicily and southern Italy are such as could scarcely have been written without a personal inspection of the localities. The story, however, that he spent the whole term of his exile in Italy, and that he finally died at Thurii, a colony identified with the name of Herodotus, does not deserve a moment's consideration. The time, place, and manner of his death, it is true, are involved in much obscurity. It is pretty generally agreed among ancient writers that he died a violent death, but the scene and the cause of his death are alike unknown with certainty. One account, preserved by Plutarch, narrates that he was killed at Scaptesyle in Thrace, and that his remains were conveyed to Athens, and buried in the tomb of the family of Miltiades. Pausanias relates, that he was assassinated at Athens shortly after his return from exile, and that his grave was to be seen near the Pylæ Melitides. Whether he died at Athens or not, however, the weight of evidence assigns that city as the spot where his remains found their last resting-place.

Thucyd. ides.

Of the domestic life of the great historian, even less is certainly known than of his public career. In the absence of well authenticated facts it may be stated, that one account describes him as having married a Thracian princess, in whose right he inherited the gold mines that gave him much of his social prestige at Athens, and among which he spent some at least of the years of his banishment. Suidas says that he left behind him a son named Timotheus, and a daughter, to whom is attributed, but on insufficient grounds, the eighth book of his History.

The subject of Thucydides' great work is the Peloponnesian war, which lasted from B.C. 431 to B.C. 404. From the political and moral agencies which he found at work in Greece at the commencement of that war, he foresaw that the struggle would be the most important and the most severe that had ever taken place in his native land. Accordingly he began to collect the materials for his work from the day on which war was declared. His social position opened up to him the best sources of information. Of some of the most important events and movements he was himself an eye-witness. What he did not actually see with his own eye, he spared no pains or time in verifying from the accounts of others. And the result of all his labours is a work which, as a mere repertory of well-ascertained facts, is surpassed by no production of any statist of modern times, who has enjoyed all the latest appliances of science for collecting and verifying details. Due regard being had to the age in which it was produced, the history of Thucydides must be admitted by every candid student to be a perfect marvel of accuracy; and the more carefully the book is perused, the more strongly will this impression force itself upon the mind of the reader. Unlike most other ancient historians, he appreciated fully the advantages of chronology, and is careful to narrate events as nearly as possible in the order of the time when they happened.

Thucydides.

The incidents are chronicled according to the summers and winters of the years in which they took place. All the negotiations carried on by the states which took part in the struggle are recorded, when possible, in the very words of the ambassadors. When that was impossible, the substance of their speeches is given, as closely as convenient, in the very words of the orators. Another respect in which his work stands out in marked contrast with almost all extant, certainly with all ancient histories, is its impartiality. Although the events which he describes took place many of them under his eyes, and all of them during his lifetime; and though he was himself a native and a citizen of the state which took the lead in everything that was done and suffered, he writes as coldly and impartially as if he had been a citizen of another state, describing events that had happened in another country ages before his birth. Except from a few incidental hints, it would not be easy to gather from the body of the work whether the author were an Athenian or a Spartan, and it is impossible fairly to make out on which side his own personal sympathies are enlisted. Rarely does he digress from the subject matter in hand. When he does so, it is never with a view to impress on the reader his own personal importance, or that of the country to which he belonged, or to startle or delight him with picturesque descriptions of great scenes or events. Not unfrequently this very sternness of treatment gives a force to his bare narrative that all the arts of rhetoric would have failed to reach. His descriptions of the plague at Athens, and of the miserable expedition of the Athenians against Sicily, produce from this cause an effect that is absolutely tragic. When he indulges in a digression at all, it is only to trace to their sources the causes of the events previously described, and the action of the various states upon each other. Details of the personal characters of the principal actors, social changes, and home politics, are things that find little favour in his sight. The predominance in his mind of the reflective faculty impelled him irresistibly to speculation on the general causes and political principles on which the course and issue of events depended. In his subtle power of appreciating and tracing these causes, he had no equal, and indeed no rival, among ancient writers of history.

The style of Thucydides is well adapted to the subject he took in hand to describe. Utterly devoid of useless ornament, it presents the very maximum of strength and energy. The ordinary flourishes of rhetoric find no place in his work. Every word has its own meaning and its own place, and is carefully weighed before it is set down. Conciseness, a rare virtue among a people of glowing imagination and warm temperament like the Greeks, is with him carried to an almost vicious extreme. And the consequence is, that of all the old historians, Thucydides is by far the most difficult to comprehend. While the thought is always as clear as crystal, the expression is not unfrequently obscure and involved. In the speeches, in particular, with which his work abounds, this defect is conspicuous; and even Cicero, an accomplished Greek scholar, is driven to confess that these are sometimes hardly intelligible. Difficult they undoubtedly are; but so well have the details of the Peloponnesian war been investigated in recent times, that there is no chapter in the work of its best chronicler, however perplexing, which the modern student, if he choose, may not understand through all its obscurities both of grammatical structure and historical allusion.

The editions of Thucydides, as may readily be imagined, are very numerous. The Greek text was first published by Aldus, at Venice, in 1502. The second notable edition was that of Henry Stephens, in 1564, which comprised the Latin translation by Valla. Immensely superior to all that preceded it, is the German edition of Bekker, Berlin, 1821, in 3 vols. 8vo. Subsequent, and, in some matters of detail, better editions are those of Poppo, Leipzig, 10 vols. 8vo, 1821–28; Göller, 2 vols. 8vo, Leipsig, 1826; and Arnold, 3 vols. 8vo, Oxford, 1830–35. The translations of Thucydides' history are likewise very numerous. It was translated into French by Claude Seyssel in 1527, and subsequently by Levesque in 1795, and by Gail in 1807. The last and perhaps best German translation is that of H. W. Klein, Munich, 1826. Hobbes' English translation is well known. It was based chiefly on Latin versions, and was executed for the sake of the political writing of the original. More accurate are those of W. Smith, which appeared in 1753; of S. T. Bloomfield, published in London in 1829; and of the Rev. H. Dale, 2 vols., 1848. (J. C—L.)

Thümmel || Thünberg

THÜMMEL, Moritz August Von, a German writer of distinction, was the second son of a family of nineteen children, and was born at Schönfeld, near Leipzig, on the 27th of May 1738. After passing through the University of Leipzig, where he made many friends, and among others he was fortunate enough to secure the esteem of an old advocate, who left him at his death 24,000 dollars, he retired in 1783 to Sonneborn, where he continued to reside for the most part until his death, which took place at Coburg on the 26th of October 1817. The literary fame of Thümmel was established by his *Wilhelmine*, "a comic poem in prose," first published in 1764. It is considered a masterpiece of polished humour and playful satire. His greatest work, however, is the one entitled *Reise in den Mittaglichen Provinzen von Frankreich* (Travels in the Southern Provinces of France), in 10 vols., 1791–1805; which, like Sterne's *Sentimental Journey*, is more a web of fiction than of travels, and glitters all over with humorous pleasantry and satirical observation. A complete edition of his works has been published in 6 vols., and a biography by J. E. von Gruner in 1819.

THUN, a town of Switzerland, on the Aar, near the lake of the same name, in the canton and 16 miles S.S.E. of Bern. It is walled, and contains many fine buildings, among which are an old church, a town-hall, an old and a new castle. In the vicinity there are much-esteemed baths. Thun is thronged with visitors and tourists in summer, but the permanent population is only 3379. The lake is about 10 miles long by 2 wide, and 1896 feet above the sea-level. It is traversed by the river Aar, and its shores are lined with fine gardens and villas. The scenery is very fine, and steamers ply daily on the lake.

THUNBERG, Carl Petter, an eminent traveller and a distinguished botanist of Sweden, was born on the 11th of November 1743, at Jönkoping. He became a pupil of Linnæus at the University of Upsala, where he graduated in medicine in 1770. Thunberg, obtaining the Kohrean prize for three years, set out to visit Holland, where he was induced to embark on a voyage of exploration to the distant island of Java, in quest of vegetable treasures. He sailed as far as the Cape of Good Hope in 1771, and three years afterwards he set sail for the Japan isles. Thunberg remained in that remote region for the next five years, busily engaged in making collections of plants, and in observing the habits, manners, and language of the people. On his return in 1779 he visited England, and made a short stay in London, where he made the acquaintance of Sir Joseph Banks. He found that during his absence his countrymen had not forgotten him. In 1777 he was made demonstrator of botany at Upsala, and he succeeded Linnæus as professor of botany in 1784. Next year he was knighted, and in 1815 he was made commander of the order of Wasa. Thunberg published in 1784 his *Flora Japonica;* in 1788 he began to publish his travels, which were ultimately completed in 4 vols. This work has been translated into English, French, and German. He completed his next work, the *Prodromus Plantarum*, in 1800; in 1805 he finished his *Icones Plantarum;* and in 1813 his

Thunder ‖ Thurgau.

Flora Capensis. Thunberg published numerous memoirs in the *Transactions* of the Swedish, German, French, Dutch, and English scientific societies, and he was chosen an honorary member of sixty-six of those learned associations. Thunberg died on the 8th of August 1828, aged eighty-five.

THUNDER. See ACOUSTICS and METEOROLOGY (§§ 126–142).

THURGAU (Fr. *Thurgovie*, Ital. *Turgovia*), a canton of Switzerland, bounded on the N. by the Lake of Constance and the Rhine, which separates it from Schaffhausen; E. and S. by St Gall; and W. by Zürich. Its form is an irregular triangle; its length from E. to W. 29 miles, its greatest breadth 20, and its area 268 square miles. It derives its name, signifying the valley of the Thur, from that river which enters it from the canton of St Gall, and flows through it from E. to W. A series of gradually rising hills on each side of the river separate it on the one side from the Lake of Constance, and on the other from the valley of the Toss in Zürich. Thus the surface of the canton, unlike that of the most part of Switzerland, is not mountainous, but rather belongs to an undulating table-land, and its loftiest summit does not rise more than 1000 feet above the Lake of Constance. The chief rivers are the Thur and its affluents, the Sitter and the Murg. The soil is on the whole fertile, and the climate, except in the extreme south, where the mountains approach the limits of the canton, mild and temperate. Sandstone is the prevailing geological formation, and it is for the most part soft and unfit for building, but in some places there are deposits of excellent limestone. Coal is found in various places, but in such small quantities as to be incapable of being worked with any profit. Agriculture is the prevailing occupation of the people, wheat, rye, barley, and oats being raised, but not in sufficient quantities to supply the home consumption. Vines grow in several parts of the canton, and a large amount of wine is made; but the chief production of the country is fruit, especially apples, pears, and cherries. The canton contained in 1854 86,600 acres of arable land, 55,000 of meadows and pasture land, 4700 of vineyards, and 40,000 of forests and orchards. The country abounds in game, especially waterfowl; and the rivers and Lake of Constance are well supplied with fish. Considerable numbers of cattle are reared on the meadow-lands, and many lean cattle are brought here to be fattened, and afterwards exported. In 1854 the canton contained 14,095 milch cows. The most important manufactures are those of linen, silk, cotton cloth, hosiery, lace, muslin, &c. These articles, as well as cattle, fruits, wine, and cider, are exported; while wheat, hardware, woollen goods, and colonial articles, are imported. The Lake of Constance and the Rhine afford considerable facilities for commerce. The inhabitants are of German descent, and about three-fourths of them are Protestants. The government of the canton is democratic, and the legislative power is in the hands of a great council of 100 members, elected for a term of two years by all citizens above twenty-five possessing property worth L.10 and upwards. The executive consists of a council of 6; and there are 2 *landammans* annually appointed, who preside over each council for six months alternately. The judicial establishment consists of 8 subordinate courts and a supreme court of appeal. Thurgau is the 17th of the Swiss cantons; it is represented by 2 members in the council of states, and by 4 in the national council. It was originally governed by courts of its own; and, after various changes, passed in 1264 to the house of Hapsburg, from whom it was conquered by the Swiss cantons in 1460. It remained in a position of subjection till 1798, when it was admitted as a separate state into the confederation. The present constitution was adopted in 1831. The capital is Frauenfeld. Pop. (1850) 88,908.

Thuril ‖ Thurlow.

THURII, or THURIUM, a Greek city in the south of Italy, on the north shore of the Tarentine Gulf, was founded, in 452 B.C., by a body of Sybarite exiles, near the spot where their ancient city had stood till it was destroyed by the Crotonians 58 years before. (See SYBARIS.) The rise of a new colony reawakened the anger of the Crotonians, and after 5 years they expelled the Sybarites. These, after an unsuccessful appeal to Sparta for assistance, applied to the Athenians, who resolved to send out a colony along with the persecuted Sybarites. The leaders of this colony were Lampon and Xenocritus; and among the settlers were the historian Herodotus and the orator Lysias. Notwithstanding some disputes between the Sybarite and the Athenian settlers, which led to the removal of the former, the city rapidly rose to a prosperous state, and received accessions of population from many parts of Greece. A war between Thurii and Tarentum, which occurred about this time, was terminated by a compromise; but, in 390 B.C., the city received a severe blow from a total defeat of their army by the Lucanians. From this period it began to decline, and was at length obliged to submit to the Roman power, in order to escape the continued attacks of the Lucanians. Even as late as the time of the empire, Thurii was a place of some importance: its final decay was gradual; and the period of its total ruin cannot be ascertained. The site of this ancient town has not yet been precisely determined.

THURINGIAN FOREST (Germ. *Thüringer-wald*), a mountain-chain in central Germany, extending N.W. from the Frankenwald, for a distance of about 50 miles from the sources of the Werra and Schwarza, to the confluence of the Werra and Horsel, where it joins a branch of the Rhöngebirge in the neighbourhood of Eisenach. Its highest summits are Behrberg and Schneekopf, both above 3000 feet high. The mountains are composed for the most part of porphyry, granite, and clay-slate; and covered with forests of pines.

THURLES, a market-town of Ireland, in the county and 20 miles N.N.E. of Tipperary, on the right bank of the Suir. It is for the most part well built of stone; and has a small episcopal church, a Roman Catholic cathedral and college, a convent and two nunneries, Wesleyan and Baptist chapels, several schools, a market-house, court-house, jail, hospital, and barracks. A considerable trade in corn is carried on. In the neighbourhood are the ruins of a monastery and two castles. Pop. 5908.

THURLOW, EDWARD, *Lord*, was born at Little Ashfield in Suffolk, where his father was a clergyman of the Church of England, in 1732. Having completed his preliminary education at Canterbury school, he removed to Caius College, Cambridge, from which, however, he was "permitted to withdraw" from indecorous behaviour towards the dean. He entered the society of the Inner Temple, and in Michaelmas term, 1754, he was called to the bar. Thurlow, while preparing for the bar, had, despite his jovial habits and his loud debating at Nando's coffee-house, got up a very fair amount of law learning. His mind was quick and penetrating, and when once he had got an idea into his head he kept it. Audacity, if not his chief characteristic, was nevertheless the first feature in his disposition which an observer seized upon. With such gifts, it was not difficult to prophesy the future career of Thurlow. He joined the Western Circuit, and in seven years he was King's Counsel. During the next ten years his practice increased rapidly, so that, with the exception of a few of the most eminent advocates, he had more to do than all his compeers. The preparation and arranging of the evidence in the trial of the appeal before the House of Lords in the great Douglas case, was performed in such a masterly manner by Thurlow that it had its due effect in opening his way to subsequent elevation. In 1768 he entered Parlia-

Thurso ‖ Tiberius.

ment as member for Tamworth, and attached himself to Lord North's administration. In 1770 he was made solicitor-general, and next year he was appointed attorney-general. From the firm adherence of Thurlow to the policy of his chief respecting the American colonies, which the king was known to have much at heart, he at once secured the personal regard and confidence of royalty, which did not waver for the next twenty years. In 1778 Thurlow was raised to the peerage with the title of Baron Thurlow, and was made Lord Chancellor on the resignation of Bathurst. During the Rockingham administration he held the great seal by the express command of the king, and despite all opposition he recklessly denounced the measures of the existing government as "a jumble of contradictions." His opposition did not cease with the Rockingham administration. When Pitt came to power he placed Lord Thurlow on the woolsack, where he appeared to act cordially with the cabinet until 1788, when, in consequence of the king's mental alienation and a regency seeming probable, he was suspected of carrying on intriguing communications with the Prince of Wales. Pitt and his colleagues regarded him with distrust. A breach was made which gradually widened, until Pitt informed the king that the Lord Chancellor or himself must retire. His majesty at once gave orders for Lord Thurlow to lay down the seals of office. This occurred in 1792, and the remaining years of his life are rendered in no way remarkable. Having ceased to take a personal share in politics, and having very little personal influence, he gradually sunk out of public notice. He was passionate and overbearing, and his character could not stand the test of consistency. Yet he was consulted by the royal family down until his death, which occurred at Brighton on the 12th of September 1826.

THURSO, a burgh of barony and seaport of Scotland, in the county of Caithness, on a bay of the same name on the southern shore of the Pentland Firth, 21 miles N.W. of Wick. It is irregularly laid out, but contains, especially in the suburbs, many neat and substantially built houses. The parish church is an elegant building; and the town has also a Free church, and places of worship for the Original Seceders, Baptists, and Independents, several schools, two public libraries, and a news-room. Linen and woollen cloth, leather, ropes, and fishing-nets are made here; fisheries of haddock, cod, and lobsters are carried on in the bay; and there is some trade in grain, cattle, sheep, and paving-stones. The bay is unfavourably situated, and too much exposed to the sea for being a resort of much shipping; and the town is consequently not likely to increase much in size or importance. A little to the east stands an old castle, the residence of Sir George Sinclair of Ulbster. Pop. (of the town) 2908; (of the parish) 5096.

TIBER. See PAPAL STATES.

TIBERIUS, CLAUDIUS NERO CÆSAR, the third of the twelve Cæsars, born November 16, B.C. 42. He was the elder son of Tiberius Claudius Nero and Livia Drusilla, and therefore belonged on both sides to the Claudian family,[1] of whose cruel and contemptuous characteristics he proved himself to be a worthy inheritor.

The infancy and boyhood of the future emperor were perilous and unfortunate. He was born in the midst of civil war, and shared the danger of his parents. His father had embraced the party of L. Antonius in the Perusian war, and, on the surrender of Antonius, was forced to flee hastily from Naples, where he had taken refuge. During the night of this escape, the young Tiberius twice nearly ruined the fugitives by the noise of his infant wailing; and was often in danger during the wanderings of his parents through Sicily and Achaia. On one occasion they were overtaken by the flames of a burning wood, and were in such imminent peril that the robe and even the hair of Livia were scorched and burned. In B.C. 40 the reconciliation of Antony and Octavianus (Augustus) enabled the elder Tiberius to return to Rome; and two years after (B.C. 38), he had the intolerable meanness to divorce Livia, in order to hand her over to Augustus, to whom she was forthwith married with the amicable assent of her former husband, although she was already six months advanced in pregnancy. In B.C. 33 Tiberius Nero died, and his funeral oration was pronounced before the Rostra by his son, who was then only nine years old.

Tiberius.

The young Tiberius, as the emperor's stepson, received a princely education, and profited by it to the utmost. Grammar, rhetoric, and the Greek and Latin languages, formed the main subjects of his studies, and he applied himself to them with an assiduity which, joined to his unboyish Claudian reserve, earned him from his companions the nickname of "Old Man."[2] One of his tutors was Theodorus of Gadara, who was said to have discovered, even under the grave dissimulation of his clever pupil, the germs of his future character, and to have angrily denounced him as "a mixture of blood[3] and mud."

His education also involved an introduction into public life, and he exhibited gladiatorial shows in honour of his father and grandfather, at which he displayed much liberality and magnificence. Before his marriage with Julia, he married Vipsania Agrippina, the daughter of Agrippa, and the granddaughter of Cicero's friend Atticus. By her he had one son, Drusus. It is to his credit that he appears to have loved her with deep and faithful affection; and it was not without great disgust that he was forced by Augustus to divorce her and marry the beautiful but dissolute Julia. He saw Vipsania only once again casually in the streets; and it was observed that he gazed after her with such a straining and anxious look, that care was taken to prevent the recurrence of such a rencounter. For the first year he lived with Julia in tolerable harmony, in spite of the distaste with which her licentiousness (of which he had himself been the object) had at first inspired him; but the death of their infant child widened the breach which gradually took place between them, and led to a virtual separation, the result of mutual ill-will.[4]

Augustus, with admirable good sense, determined to educate his stepsons and grandsons in the practical duties of their high office, and to inure them, by labour and government, to a sense of their high rank. Tiberius took part both in civil and military duties.[5] He served his first campaign against the Cantabrians, and was employed by Augustus no less than nine times in expeditions against various German[6] nations. His achievements won for him a share in Horace's[7] splendid panegyric, as well as the less lasting honours of an ovation and triumph. He rapidly went through the various curule offices, and obtained a *second* consulship in B.C. 7. Drusus was killed by a fall from his horse B.C. 9; and Tiberius, who pronounced his funeral oration, gained additional applause and popularity by the conspicuous display of fraternal affection in the care which he paid to his brother's remains. His crowning honour was the tribunitian power conferred on him by the senate for five years, a distinction of the most unusual and almost imperial character, which he attained B.C. 6.

Thus far he had been prudent and prosperous, and had attracted by his abilities, his self-denial, and his circumspection, the favourable notice both of the emperor and of the state. But in this very culmination of his glory he seemed wilfully to shatter all his future prospects, and even to endanger his life, by suffering his Claudian pride to betray him into a perverse and splenetic outburst of wayward and unaccountable petulance. He asked leave to retire to Rhodes. His real object is unknown. It may have been his deeply seated disgust at the notorious adulteries of a wife whom he was unable to control; it may have been[8] a tormenting jealousy of the young Cæsars; it may have been a desire to gain popularity by absence; or a mere fit of passionate weariness at the routine of a court. He and his devoted flatterer Velleius Paterculus represented it as a considerate regard for the grandsons of Augustus; but it probably was a mere trait of that hereditary insanity which displayed itself in restless obstinacy.

At Rhodes he spent the next seven years, having chosen this retreat for its beauty and salubrity. Here he lived in a small house, laid aside all state, appeared without any retinue, and mingled on nearly equal terms with the Greeklings who surrounded him. But it is dangerous to argue with a prince even when he is incognito; and a professor who ventured on a spirited discussion was thrown into prison. Tiberius in this respect might have served as a warning to Frederick the Great, who treated the philosophers of his court with a similar mixture of tyranny and condescension. It was here that he heard of the banishment of Julia; and while he must have

[1] Suet. Tib. 1–3. For a spirited sketch of the Claudii see Macaulay's *Lay of Virginia*.
[2] Philo, *Leg. ad Caium*. 23. 'Ο πρεσβύτης.' [3] Suet. Tib. 27. [4] Id. 7. [5] Id. 8, 9.
[6] Tac. *Ann.* ii. [7] Hor. *Od.* iv. 4. [8] Tac. *Ann.* i. 53; Suet. Tib. 10.

Tiberius. felt real joy at being able to send her a divorce, he interceded for her with feigned moderation, and begged her father to allow her to retain all his presents. At the conclusion of his tribunate he begged leave to return, as having sufficiently proved his freedom from all jealousy against C. and L. Cæsar. But Augustus had been thoroughly displeased at his disloyal pertinacity, and refused his request, not only sternly but with a sneer.

Tiberius was therefore forced to remain at Rhodes, and gradually dropped into oblivion and contempt, having barely obtained, by his mother's intercession, the nominal position of legatus. To avert the accusations which began to be freely whispered against him, he begged the presence of some guardian over his words and actions, and retired into a simpler and almost squalid mode of life. A fresh cause of solicitude arose from the hostile spirit displayed to him by C. Cæsar, whose mind had been poisoned by the insinuations of his tutor M. Lollius; and it was even reported that, at a certain banquet, some one had offered Caius to sail at once to Rhodes, and "bring back the head of the exile." These circumstances compelled him at length to use Livia's influence and most earnest prayers to win him a permission to return (A.D. 2); and even this was only allowed on the consent of Caius, and the exaction of an express condition that he would take no part whatever in public business.

The death of C. and L. Cæsar, and the banishment of Agrippa Posthumus, made Tiberius, in A.D. 4, the acknowledged heir of the empire, and during the next ten years (A.D. 4–14) Augustus wisely occupied him in military employments. He showed himself one of the ablest generals of the day; and his unblushing panegyrist, Velleius Paterculus, who accompanied him as *præfectus equitum*, has in this case done no more than justice to the abilities he displayed. In three years he subdued the revolt of Illyricum, in the face of almost insuperable difficulties. There is no doubt that by these victories he saved Rome from the perilous results of the Varian massacre, and the triumph which he enjoyed (A.D. 12) was justly merited. He was no less successful in Germany, although his victories there were nearly bloodless; and the young Germanicus, who accompanied him, had in him a useful example of discipline and moderation. It is also to his credit that he shared unmurmuringly all the hardships of his soldiers, eating his meals seated on the bare turf,[1] and often spending the night without the shelter of a tent. It is therefore no wonder that, notwithstanding the severe discipline which he maintained, he was the favourite of the soldiers. Altogether, as we have already mentioned, he served in Germany no less than nine campaigns.[2]

In A.D. 14, after presiding at the census conjointly with Augustus, he was once more despatched into Illyricum, and Augustus accompanied him as far as Beneventum. But he had no sooner started than he was summoned by Livia to the emperor's bedside. According to one report, he found him still living, and spent a day in his closet receiving his last commands; according to another, Augustus was already dead when he arrived, but Livia, like Queen Tanaquil, concealed the fact until all the proper arrangements had been made for her son's undisputed succession. One of these arrangements was the murder of the young Agrippa, who died innocent but unpitied. It had been rumoured that Augustus, before his death, had visited his unhappy grandson in his desolate island, accompanied by a single friend, Fabius Maximus, who afterwards forfeited his life for his want of reticence. It is very unlikely that Augustus ever meant to alter the succession in his favour, although he probably felt for him a deeper natural affection than he ever entertained for his adopted stepson. The whispers of the court, that Augustus had probed the dark recesses of his successor's dissimulation, and remarked that "the Roman people were to be pitied for being subjected to such slow-grinding jaws,"—and that he instantly checked, on the entrance of his gloomy coadjutor, the harmless gaiety of his conversation and pursuits,—are hardly reconcilable with the extant letters, in which he addresses Tiberius with the warmest affection; but they confirm the insinuation of the emperor himself, that in adopting his stepson instead of his grandson, he sacrificed natural inclination to "the welfare of the republic."[3]

Still we can hardly believe that Augustus, in his will, had ordered the murder of Julia's only remaining son. On the return of the tribune from his bloody mission, which the personal strength of Agrippa had rendered difficult of accomplishment, Tiberius, like Henry IV. in similar circumstances, not only denied that the command had ever been given, but threatened to call the tribune to account. He omitted to fulfil the threat, but for some reason this political murder seems to have left very little stain on his public character.

The general outline of his conduct, during the first ten years of his reign, displayed diligence, moderation, and wisdom; and yet, although the merit of it was recognised, it won for Tiberius no popularity. His manners were eminently unattractive, and his face seemed always to wear the scowl of suspicion or the sneer of contempt. Even his sense of decorum increased the odium against him. Vitiated Rome might have tolerated his banishment of Jewish and Egyptian proselytes, but regarded with disgust his dislike of plays and gladiatorial shows, his repression of luxurious extravagance, and even the stringency of his laws against female licentiousness. Tiberius.

In the first year of his reign died Julia, the daughter of Augustus, against whom for fifteen years he had cherished the most unremitting spite, and had even deprived her, after her father's death, of the ordinary means of sustenance. A trait of similar relentlessness is shown in his neglect of the unhappy Ovid, which further illustrates his ungenial character. The revolt of the Pannonian legions, which he suppressed by sending his son Drusus—the still more dangerous disloyalty of the German army, which was only thwarted by the firmness of Germanicus—and the secret conspiracy of Scribonius Libo, were but a few of the occurrences which proved to him the danger of his position, and made him fancy that "he was holding a wolf by the ears." The most important step which he took to secure his safety was the concentration of the Prætorians in a single camp at Rome, which became in after-years the most effectual engine for suppressing popular tumults and firmly establishing the imperial power. Tiberius followed the example of vicious centralisation which had been set by his predecessor; he was jealous of the slightest interference with his civil duties, and was so eager to do and superintend everything himself, that for two years after his accession he barely left his own house. From this circumstance, and the frequent feints he made of visiting the provinces and armies, he received the nickname of "Callippides." He had a dislike to intrusting men with power, and when he had once appointed a good provincial governor whom he could trust, he used to leave him in the office for a long period of time. His suspicious and morose character left him almost without a friend, and it was only by the most cautious approaches and the most unbounded submission that Sejanus gained so complete an ascendant over his mind. It is to this man's mean and secret calumnies that the gradual deterioration in the emperor's character is due. At first Tiberius had several times interfered to save the unfortunate victims of the senate's timid jealousy; he shielded Ennius and Silanus from frivolous charges of *læsa majestas*, and mitigated the punishments of Appuleia and Lepida.[4] But when his mind had been soured by the unpopularity which he did not think he had deserved, and his precise, business-like, and litigious spirit had led him to too scrupulous a regard for his own rights, he let slip the detestable machinations of the delators against the lives and fortunes of the trembling citizens, and admitted charges of a merely constructive treason, which left no man the ordinary liberty of speech and life.

There was no need of the poisoned whispers of Sejanus to make Tiberius regard Germanicus with jealous hate. In spite of the disparaging murmurs and remarks against him and Agrippina, in which he both publicly[5] and privately indulged, he was well aware that his own reputation was quite eclipsed by the successes of this young hero, whose virtues made him the darling of the Roman people, and the narrative of whose achievements reads, in the page of the eloquent historian, like a gorgeous dream. After cutting short his splendid career of victory by the pretended honours of a triumph and a consulship, the emperor appointed Cn. Piso to counterpoise his authority; and there is too much reason to believe that Piso and his wife Plaucina received secret encouragement to thwart Germanicus and his wife, both by open insolence and secret plots. The melancholy end of the story is but too well known, and it was universally believed by the Roman people that their favourite had fallen a victim to the plots of his uncle. There is, however, no proof of Tiberius's guilt, and the evidence adduced against Piso was so suicidal in its self-contradictions, that, brutal as his conduct was, we may be allowed to entertain the hope that he stopped short of the crime of murder. Piso died, by his own hand, to escape condemnation, and the miserable history of his mission gave the final death-blow to the emperor's hold on the affections of his subjects.

In A.D. 23 Tiberius lost his only son Drusus, who was poisoned by Sejanus. Tiberius bore the loss with equanimity, and even with indifference, answering with a jeer the embassy of condolence sent by the inhabitants of the Troas. This event marks another epoch in the decline of his character. The administration of his first ten years had been entirely to his honour, but now each successive event marks a new stage in his degradation. From this time, Tiberius gave full play to the informers. Serenus, Cremutius Cordus, Sabinus, and other illustrious Romans, were among their earliest victims, while Cornutus and others only escaped them by committing suicide. The emperor now openly favoured this vile class of men; and on one occasion[6] actively and angrily interfered to prevent any curtailment of their prerogatives. In a word, this fatal cruelty, so deeply ingrained in his character, broke forth at length

[1] Suet. Tib. 18. [2] Tac. *Ann.* ii. 26, and ibi. Orelli. [3] Suet. Tib. 21.
[4] See other instances of similar clemency, Tac. *Ann.* iv. 22, 36. [5] Tac. i. 69; ii. 26. [6] Tac. *Ann.* iv. 30.

Tiberius. in all its virulence, so that, in the words of Racine, his name must be henceforth regarded as

"Aux plus cruels tyrans une cruelle injure."

In the 12th year of his reign, A.D. 26, at the age of 68, he left the city never to return. His pretext was the dedication of a temple to Augustus at Nola; his real reason was disgust, chagrin, weariness, and that desire for solitude which grew stronger and stronger with the consciousness of his crimes. While he was supping at Terracina, Sejanus had an opportunity of riveting his influence still more firmly by a display of real loyalty. The roof of the grotto fell in, and many of the guests were crushed; but Sejanus protected his master by completely covering him with his own body, which he bent over the emperor in the form of an arch.[1] At last, Tiberius chose, as his retreat, the small and lovely island of Capreæ, where he built twelve villas on all the spots which enjoyed the finest prospects, and were open to the most pleasant combinations of the sunlight and the breeze. The glorious bay, the deep blue water, the richly cultivated fields, and the vineyards, among which nestled many fair cities, under the giant cone of Vesuvius, which had not yet devastated the scene with its dormant fires, made Capreæ a delicious retirement; but, above all, its steep shores protected him from the hated incursions of public curiosity. The very fisherman shunned in terror the dreaded shore on which savage punishment was the result of accidental intrusion. The island was henceforth to be branded with eternal infamy; its cliffs were the instruments of cruel execution; its caves were the haunts of abominable lust; in loathing and contempt, its very name was altered from Capreæ to "Caprineum."

In the second year of his retirement, A.D. 29, was snapped the last link that bound him to decency and virtue, the influence of his mother Livia. Aged as she was, this remarkable woman retained to the last the respect and obedience, although not the affection of the son for whom she had done so much. He did not even simulate any sorrow at her death, and refused to visit her in her last illness. This event marks the transition to the last and most terrible epoch of his life. It is well known that Tacitus divides his life into periods; it was "illustrious and honourable"[2] in the main, whatever may have been its hidden vices, as long as he was a private citizen (*i.e.*, till he attained the age of 56), if we except the foolish exile to which he condemned himself at Rhodes, it was exteriorly, at least, decorous during the lives of Germanicus and Drusus; it was free from the worst extremes until the death of Livia; but, after this, it was detestably and unredeemably degraded. The vice which first assumed its terrible climax was cruelty. The horrible tragedies which accompanied the death of Agrippina and her two eldest sons are alone sufficient to brand his name with eternal infamy.

It was only by slow degrees that the mind of Tiberius awoke to the machinations of Sejanus, and then it was only by slow efforts and cunning plots that he sufficiently nerved up his irresolute and procrastinating spirit to punish him. But for the ready vigour of Macro, he would probably have delayed too long; and although he had provided an early communication of the result by signals from the shore, and the means of an escape in the swiftest triremes in case of failure, he spent the time of the crisis in sickening anxiety, and even for nine months afterwards could not summon up sufficient courage to leave his house.

From this time, A.D. 31, till his death, the reign of Tiberius is one of the most loathsome spectacles which the human intellect can contemplate. Henceforward, debauchery, the records of which are only fit to be buried in infernal darkness for ever, was added to the fearful catalogue of the old man's sins. Strange that a man who had lived in continence for at least sixty years, should, after he was 70, break loose into an abandonment of shameless riot unparalleled in the annals of the world. It has been well remarked,[3] that he ended where Augustus began; in Augustus, the cunning, cruel, and cold-blooded youth grew up into the moderate and laborious ruler; in Tiberius, the grave, precocious child, the able general, the honourable citizen, deteriorated, in the drunkenness of absolute power, into the shameless and monstrous criminal. But virtue and conscience were amply avenged. Torn at last by the relentless furies of cruelty, avarice, and lust, he became what Pliny[4] calls him, "tristissimus, ut constat, hominum."

At length, the long reign of Tiberius drew to a close. During all his life he had enjoyed robust health, and it was his boast that for thirty years he had never had a moment's need of a physician. This freedom from sickness not only proves that he had a fine constitution, but is an additional argument in favour of the temperance of his early life. He was broad-shouldered and strongly built; his whole body was well proportioned, and his fingers were so strong that he could split a fresh apple by mere pressure, and bring blood by a fillip on the head. But at last his strength failed. He died, Tiberius ‖ Tibet. in the villa of Lucullus at Misenum, in the 78th year of his age and the 23d of his reign, on the 16th of March A.D. 37.

The deathbeds of princes are often surrounded with unnecessary mystery; but we have reason to believe that the end of Tiberius was at least accelerated by the machinations of Caius and the violence of Macro. His death was hailed with delight and imprecations on his memory. His body was demanded for the Gemoniae; and "Tiberius to the Tiber!" rang through the streets of Rome. A public funeral was, however, accorded to him; and the people had too soon reason to acknowledge that there might be rulers more detestable than he. In reviewing his life, we have seen the main facts of his character; its long concealment of vicious tendencies, its deep and dark deceitfulness, its self-disparaging timidity, its irresolution, its pride, its loneliness, its cruelty, its jealousy, its lust. The closest parallel which history offers to his career will be found in the character of Louis XI. of France.

Tiberius was singularly beautiful, and his features show traits so noble that, as Niebuhr has remarked, it is a pleasure to look at them. His complexion was fair, and his hair flowed abundantly over his shoulders; his eyes were very large, and possessed the singular faculty of seeing in the dark when he first awoke. His gait was slow and rigid; he walked with his head thrown stiffly back, and accompanied his slow, rare, and pompous remarks, with a slight movement of his hand. Augustus had observed all these signs of unpopular arrogance, but attributed them to the inborn haughtiness of the Claudian race. But in maturer years, all the beauty and majesty in the person of Tiberius had vanished; age and dissipation had bent his body, and he might well dread any exhibition of a countenance from which the soul and the intelligence had died away, and which his shameless dissipation had covered with the leprosy of disease. (See ROMAN HISTORY, § 40.) (F. W. F.)

TIBET, THIBET, or TUBET, the name given by Europeans to a large country of Central Asia. The name is unknown to the natives, but has passed to us through the Persians and Turks; the true native name of the land being *Bod*, or *Bodyul, i. e.*, Land of Bod. By the Hindoos it is called *Bhot*, and by the Chinese *Tsang*.

Position and divisions. It lies between 27. and 35. N. Lat., 74. and 103. E. Long., and is bounded on the N. by Chinese Turkestan, the desert of Gobi, and the Koko-Nor territory; E. and S.E. by the Chinese provinces of Se-chuen and Yunnan; S. by the Birman Empire, Assam, Bootan, Sikkim, Nepaul, and the N.W. provinces of British India; and W. by Cashmere and Badakshan. The southern frontier is formed by the Himalaya range, and the northern partly by that of Kuen-Lun, and partly by that of Karakorum, but on the east and west the boundaries are less clearly and certainly defined. The north-eastern and eastern frontiers are formed by the Bayen-Kharat Mountains, and the River Ya-Loung-Kiang, which flows southwards from them, and joins the Yang-tse-Kiang; but the countries about this part are frequently at war with one another, and are sometimes subject to China, sometimes to Tibet. The extreme west limit of Tibet is marked by the Indus at the point where it turns southwards into India, and by the lofty spurs of the Karakorum range, which project southwards to the bank of that river. But here, too, various tribes are mingled together in a very wild and little-known country. The whole area is about 30,200 square miles. The extensive country marked out by these limits is divided into three great parts—Eastern, Central, and Western Tibet; or by their native names, *Kham*, *Bod*, and *Nari*. Kham extends from the Chinese frontier to the gorge through which the Brahmaputra passes the Himalaya Mountains. This division is probably the largest of the three, as it is much broader than the others, and is sometimes called *Bodchan*, *i. e.* Great Tibet. The line that separates Central from Western Tibet may be considered as a continuation of that which forms the eastern boundary of Nepaul, separating it from Sikkim. Bod or Central Tibet is also called *Utsang*, and it is subdivided into the

[1] Tac. *Ann.* iv. 59; Suet. Tib. 39.

[2] No charge can be substantiated against him at this period; Suetonius, indeed, says that he was a drunkard, and that his name in consequence was changed into Biberius Caldius Mero; but this is probably a mere epigram.

[3] Ampère, "L'Hist. Rom. à Rome" (*Rev. des Deux Mondes*, vi. 103).

[4] H. N. xxviii. 5.

Tibet.

provinces of *Kongbo*, *Takpo*, *Us*, and *Tsang*, lying in that order from east to west. Nari, or Western Tibet, forms a long narrow tract, extending from the east end of Nepaul to the west border of Badakshan; and is subdivided into three large provinces; *Mangyul*, extending along the borders of Nepaul as far as the water-shed between the Brahmaputra and the Indus, *Khorsum*, occupying the upper, and *Maryul* the lower part of the valley of the Indus. Little is known to us of the greater part of Tibet. The only parts that have been explored by the English are those which border on our East Indian empire; where Captain Strachey and others have reached the mountain-range that forms the northern boundary of Tibet; and, more recently, the brothers Schlagentweit have penetrated still farther north, though unfortunately one of them has perished among the wild and barbarous tribes of Turkestan. The independent kingdom of Nepaul, which is itself closed against English travellers, forms a barrier against the exploration of Central Tibet; and for our knowledge of Eastern Tibet, we are almost entirely indebted to the researches of the French missionaries Huc and Gabet, who traversed the country from the borders of the Koko Nor to Lhassa, and again from that capital to the western frontiers of China.

Physical features.

As far as is known, Tibet is throughout a mountainous country. It contains the highest elevations, and is traversed by the head waters of some of the largest rivers of the continent of Asia. The Indus, the Brahmaputra, and the Yang-tse-kiang, all have their origin in this country; and the regions which they severally water correspond nearly, though not quite exactly, with the divisions of Western, Central, and Eastern Tibet. The general position and features of the basin of the Indus, which comprises the districts of Maryul and Khorsum in Western Tibet, is thus described by Captain Strachey:—"If we conceive the whole breadth of Asia towards its medial meridian to be divided into three great zones, approximately parallel to the equator, of which the northernmost or Siberian drains into the Polar Seas, the central or Turkish into inland seas or sandy deserts, and the southern or Indian into the Indian Ocean,—the western half of Tibet will occupy the very northernmost border of the last region, forming in this respect an easterly continuation of *Afghanistan*, and the great south Asiatic water-shed will lie along the northernmost confines of the Tibetan table-land, dividing Tibetan from Turkish waters, and altogether behind the *Indian Himalaya*." This region is estimated to be 600 miles in length by 150 in average breadth, which would make its area about 90,000 square miles. Of this area about 40,000 square miles are occupied by the province of Maryul, or the low country, a name that is now almost obsolete and superseded by those of its two divisions *Balti* and *Ladak*. Khorsum signifies the three continents or regions, and comprises *Ruduk* in the north, occupied chiefly by lakes; *Guge* in the south-west, by rocks; and *Purang* in the south-east, by glaciers; to which must be added that of *Gar*, in the centre. This whole region consists of a mass of lofty rocky mountains, with a few plains and valleys among them. The bottom of the lowest valley, which is that of the Indus in the north-east, is nearly a mile above the sea-level, the mountains in many places are 4 miles high, and some of the loftiest summits attain an elevation of 5 miles. About a tenth of the whole surface consists of alluvial beds, which are composed of the detritus from the rocks, and from the bottoms of the valleys. In the upper part of the country these beds are generally about 15,000 feet high, and further down about 10,000 feet, being in the latter case narrower and less extensive. The mountains are very irregularly disposed, but the general direction of the chains is from S.S.E. to N.N.W. The only extensive plain is one in the province of Guge, between 15,000 and 16,000 feet high, 120 miles in length, and from 15 to 60 in breadth. The principal river in this part of Tibet is the Indus, which is here called the *Senge Tsangspo*, or Lion River, and traverses the country from S.E. to N.W. for a distance of 750 miles. It receives from the right a branch 300 miles long, which waters the most of the north of the country. Next to it, the most important streams are the *Langchen Tsangspo*, or Elephant River, afterwards called the Sutlej, and the *Mopcha Tsangspo*, or Peacock River, which is the Karnali, an affluent of the Ganges. It is estimated that not less than 12,000 square miles are here occupied with lakes. Of these, the most important are those called *Pangong*, *Rul*, *Shaldat*, *Konkyu*, *Mapham*, and *Langak*; none of which has any outlet, while the water of all is more or less salt, of some excessively so. The central portions of Tibet are known to us almost exclusively through the reports of Chinese geographers, and our information is very scanty. Along the borders of Nepaul and Bootan there are three parallel mountain-chains, the most northerly of which is not traversed by any rivers, while several affluents of the Ganges flow through passes in the other two chains. North of these mountains lies the valley of the *Tachok Tsangspo*, or Horse River, the principal stream in this part of Tibet. It rises near the Lake of Mapham, and flows south-east, receiving numerous affluents from both sides until it reaches the debatable land on the borders of the Birman empire, where it turns to the south through a pass in the mountains. This river is in all probability identical with the Brahmaputra, although the Chinese assert that it is one of the chief affluents of the Irrawaddy; and the truth has not yet been quite conclusively ascertained. North of this river there are other chains of mountains, but this region is hardly at all known. Probably a continuation of the Karakorum range traverses the country from W. to E.; and beyond this rises the chain of Kuen-Lun, forming the northern boundary of Tibet. The country, as a whole, though mountainous, is not destitute of many large valleys, and abounds in lakes and rivers. Of the lakes, the largest is the *Tenkiri*, which lies in a large and extensive valley; and the most important of the others are the *Pahan*, the *Ekir*, the *Lank-poo*, the *Leo*, the *Tunkong*, and others. Eastern Tibet, like the rest of the country, as far as it has been described at all, is described as a land of mountains. The north-eastern part is desert, cold, barren, and uninhabited, save by nomadic tribes, who live by plunder: the journey from the Koko Nor territory to Lhassa traverses a series of mountain-ranges and plateaus, where the cold is excessive, and the vegetation scanty in the extreme. The Bayen-Kharat range, which forms the boundary between Tibet and the Koko Nor territory, is the water-shed between the rivers Yang-tse-kiang and Hoang-ho, which here flow very near each other, though they afterwards diverge widely. The former of these rises and flows for a considerable distance in Tibet, where it is known first by the name of the *Mouroui Oussou*, afterwards by that of the *Kara Oussou*, and still further down by that of the *Kin-Cha-Kiang*. It flows at first S.E., then S., turning towards the E. as it approaches the borders of China. The other most important river is the *Ya-Long-Kiang*, which is formed by the confluence of the *Dza-Tchou* and *Om-Tchou*, and is believed to flow S.E. through Cochin China into the Chinese Sea. The southern portion of the country is less barren and desolate than the northern; it contains many fertile and well cultivated valleys, but the mountains are not less remarkable for their height and rugged character. Their general direction here is from N. to S. The largest plain in this part of Tibet is that of Bathang, near the Chinese frontier, which is about 350 miles in length. In Western Tibet the prevailing geological formations consist of primitive and metamorphic rocks; but limestone, greenstone, porphyry,

Western Tibet.

Eastern Tibet.

Tibet.

Tibet. and marble also abound. In Central and Eastern Tibet the mountain-ranges are almost exclusively formed of granite, except in the extreme east, where calcareous chains occur.

Climate. The climate of the different parts of Tibet varies very considerably, according to their position and elevation. In general, owing to the mountainous character of the country, it is in winter very cold; while during the summer the sun's rays are often intensely hot. In all the neighbouring countries Tibet is commonly regarded as a land of snow and ice; and in some parts the cold is so intense as to render them uninhabitable. But there are exceptions to this general character; for some of the plains and valleys, such as that in which Lhassa stands, enjoy a mild and genial climate. In Western Tibet the air is extremely dry; rain seldom falls, and snow only in small quantities. This is especially the case in Ladak; but in the regions further east, tremendous thunderstorms usher in the summer, and rain frequently falls during that season.

Productions. In such a barren and rugged country, the vegetable productions are naturally far from abundant. But little

Vegetables. wheat, and still less rice, is raised. Corn is indeed exported in the extreme west; but the staple article of food for the inhabitants is black barley, from which a liquor is distilled that forms their chief luxury. Pulse, turnips, and cabbages are grown. Fruit and wood are very scarce, except in some more favoured valleys towards the east, where grapes, peaches, apricots, melons, &c., are raised; and forests of pines and other trees cover the sides of the mountains. The animals, however, both wild and tame, are numerous. The horses are small, but spirited and handsome. Large droves of sheep and cattle graze on the mountain pastures;

Animals. and form an important part of the wealth of Tibet. Among animals peculiar to the country are the *bhoràl*, intermediate between the sheep and deer, and remarkable for its long fur; the *yak*, or bushy-tailed bull; the musk-deer; and the shawl-goat, which affords a valuable wool, largely exported to Cashmere. Of the wild beasts, lynxes, bears, tigers, and elephants are the most numerous. Wild-fowl abound near the rivers and lakes, which are also well supplied with

Minerals. fish. In mineral treasures Tibet is very rich. Gold is found in great abundance, in nuggets, in veins, and in the sands of the rivers; and the fact that many speculators are willing to pay to the government in advance 400 lb. of pure metal for the privilege of mining, proves that it must be very abundant. The principal mines are at Lunchee, Tardsong, and Lethang. At the last of these places there is also a silver mine. Iron is found in several places; and in the plain of Bathang mercury and cinnabar are obtained. Tibet also contains rock-salt, lapis lazuli, turquoises, &c.

Manufactures and commerce. Many manufactures are carried on by the Tibetans, especially at the capital. They are good goldsmiths, and excel in sculpture and in cutting precious stones. Weaving is also carried on to a large extent; and the cloth that is made is narrrow but of firm texture, and of all degrees of fineness, from the thickest and most shaggy to the finest possible merino. Idols are also made, and sticks of perfume to burn in their honour. Dyeing is carried on with good success; and much pottery is made. The trade of Tibet, though not very extensive, is on the increase. It is carried on chiefly with China, India, and Assam. The chief emporiums for the Chinese commerce are Lhassa and Si-ning. Caravans come to Tibet with cattle, mules, horses, camels, tea, silk, cotton, tobacco, furs, porcelain, European cutlery, &c.; which are exchanged for gold, woollen cloth, idols, incense, and wax-candles. The annual value of this trade is not less than 2 millions of taels (L.750,000). Chinese productions are exported to Nepaul, Bootan, and Bengal, in exchange for rice, indigo, paper, spices, &c. From Assam, Tibet receives silk, gums, and iron; and to Cashmere it exports shawl-wool, bullion, tea, borax, salt, and turquoises. The Tibetans have a coin about the size of a shilling, which is broken into pieces for smaller values, and all larger transactions are carried on by means of silver ingots valued by weight.

Tibullus.

Inhabitants. The people of Tibet belong to the large family usually called Mongolian. They are of middle size, and slightly tawny complexion; though in the higher classes there are some as fair as Europeans. Their hair is dark, their beards thin; and they have small eyes, prominent cheek-bones, large mouths, and thin lips. They have all the pliancy and agility of the Chinese, with the strength and vigour of the Tartar; and in character they are brave, generous, and frank, honest, and superstitious, though not so much so as the Tartars. Of foreigners the principal classes are the *Pèboun* or Bootanese, who are the chief workers in metals, and the *Katchi* or Mohammedans from Cashmere, who are mostly merchants. The religion of Tibet is Buddhism, which has here its great seat and centre. The origin and chief features of this singular faith are described in the article GOTAMA BUDDHA. In the province of Balti in the extreme west, the Mohammedan religion prevails; and there are believed to be throughout Tibet about 8000 Roman Catholics; but these are almost the only exceptions to the universal prevalence of Buddhism.

The language spoken in Tibet is, like that of China, composed of monosyllables, without inflexions. It is well adapted for the expression of religious and philosophical ideas; and there is an extensive literature, which consists, however, chiefly of translations of the sacred books of Buddhism.

Government. The government of Tibet is entirely ecclesiastical, being in the hands of *lamas* or priests, and especially in those of the *Talé* or *Dalai-Lama*, who is not only, as it were, the pope of the Buddhist hierarchy, but the visible deity and incarnation of Buddha. He has the supreme executive, legislative, and administrative power; but on account of his great sanctity it is only in affairs of high importance that he directly interferes. Most of the ordinary business of the state is managed by an officer called the *Nomekhan*, appointed for life by the Talé-Lama, and inferior only to him; and by four ministers called *Kalons*. On the death of the Talé-Lama, it falls to the grand council, or *Houtouktou*, of lamas of the highest rank to elect a successor; or rather to discover the person into whom, as they say, the soul of Buddha has transmigrated. This is decided, after numerous religious ceremonies, by lot; and the choice generally falls on an infant. The various provinces of Tibet are subdivided into principalities, governed by Lamas of the Houtouktou, who receive their authority from the Talé-Lama and acknowledge his supremacy. Of these, the highest is the *Banchin Erdeni*, who resides at Djachi Loumbo, the capital of Tsang; and is second only to Talé-Lama. Ambassadors are frequently sent from China to Tibet; and in all the principal towns there is a Chinese governor who commands the military forces. The whole Chinese force in the country is estimated at 60,000 men, of whom 50,000 are infantry. Although the country enjoys a nominal independence, the court of Pekin exerts a predominant influence.

The principal towns in Tibet are—Lhassa, the capital and seat of the Talé-Lama; Djiambo, the capital of Kham or Eastern Tibet; Djachi Loumbo, the capital of Tsang; and Leh, the capital of Ladak, and principal town in Western Tibet. The entire population of the country is estimated at 6,000,000.

TIBULLUS, ALBIUS, a very elegant poet, was born at Rome about the year of the city 690. He belonged to the equestrian order; but as his father had espoused the cause of Pompey, his estate was impaired in the issue of the unhappy contest which ensued. About the age of twenty-two, the son retired to his villa at Pedum, and by

Tibullus.

the cultivation of his demesne endeavoured to retrieve his fortune. Love and poetry likewise occupied no inconsiderable share of his attention; and the names, real or fictitious, of his mistresses, Delia, Neæra, and Nemesis, are familiarly known to all classical readers. He had contracted a friendship with Messala Corvinus, who was distinguished by his eloquence as well as by his military talents. The inhabitants of Pannonia having revolted in the year of Rome 718, Augustus employed this general to reduce them to subjection. He invited Tibullus to accompany him, nor did the poet shrink from the toils and dangers of such an expedition. When Messala was soon afterwards raised to the consulship, he composed the panegyric which appears at the beginning of his fourth book of Elegies. It is however written in hexameters, and in a style inferior to that of his elegiac verse. The same distinguished individual was in 725 intrusted with an extraordinary command in Syria, and was again accompanied by Tibullus; but he soon became so seriously indisposed that he was sent on shore and left in the island of Phæacia. This was poetic ground, and here he composed the third elegy of his first book. Having afterwards been enabled to resume his voyage, he attended his friend through Cilicia, Syria, Egypt, and Greece. Aquitania revolted in the course of the ensuing year, when Messala was despatched on another expedition, being still attended by the poet; and having reduced this province, he, in 727, obtained the honour of a triumph, in which the military services of Tibullus entitled him to some share. This was the last of his warlike expeditions, and he now returned to his favourite pursuits. He lived on terms of intimacy with Horace, who has addressed to him one of his odes and one of his epistles. Macer and Valgius were likewise among the number of his poetical friends. He appears to have cherished the love of freedom, and to have scorned to advance his fortunes by flattering Augustus. According to the authority of Domitius Marsus, a poet of that age, who wrote his epitaph, he died nearly at the same time with Virgil. Virgil died in the year of Rome 735; and if Tibullus died in the same year, he may have attained the age of forty-five. As he is represented by Marsus as a young man, he must have been under the age of forty-six. His loss was bewailed by Ovid in an affectionate elegy. Horace has described him as handsome in his person, as blessed with riches, and the art of enjoying them. Tibullus is always classed among the most tender and elegant of the Latin poets who have written in elegiac verse. He has more correctness, if not more fancy, than Ovid, and is less mythological than Propertius. The cadence of his verse is often very pleasing.

The poems of Tibullus have very frequently been printed along with those of Catullus and Propertius. In this form they were first published at Venice in quarto about the year 1472; and several other impressions followed within a brief interval. Two editions issued from the press of Aldus, Venet. 1502–15, 8vo. And in the meantime appeared the edition of Junta, Florent. 1503, 8vo. An edition was published by Janus Dousa, several by Joseph Scaliger; and others which deserve particular notice are those of Morel in 1604, and of Passerat in 1608. The first separate edition of Tibullus was printed in quarto about the year 1472. This was speedily followed by at least other two editions without dates; and by a third, "cum commentario Bernardini (Cyllenii) Veronensis," Romæ, 1475, 4to. An edition with a commentary was published by a learned Portuguese, Achilles Statius, Venet. 1567, 8vo. For a more recent and valuable edition we are indebted to Janus Brockhusius, Amst. 1708, 4to. Another edition, sometimes described as the best, was published by Vulpius Patavii, 1749, 4to. The next deserving particular notice is the third edition, published by Heyne, Lipsiæ, 1798, 8vo. There is also an edition by Wunderlich, Lips. 1817, 2 tom. 8vo, with a supplement by Dissen in 1819. Voss (1811), Bach (1819), Goldbérg (1826), Lachmann (1829), and Dissen (1835), have all published editions of Tibullus, of which the two last contain the best text.

Tibur ‖ Ticino.

An English translation of Tibullus was published by Dart in 1720, and a poetical one by Dr Grainger in 1752. Bohn has published, in his "Classical Library," a prose translation by Kelly, 1854.

TIBUR, a town of ancient Latium, pleasantly situated on the Anio. Here Horace had his villa and house, and here he wished to end his days.

TICAO ISLE, one of the Philippine Islands, situated due south of the large island of Luzon, about 28 miles in length by 7 in average breadth. Here the Spanish galleon used to take in water and provisions before setting sail for Acapulco. Long. 123. 40. E. Lat. 12. 36. N.

TICHFIELD, or TITCHFIELD, a market-town of England, Hampshire, in a pleasant valley on the Aire, 8 miles S.E. of Southampton. It is an old and generally well-built town, containing an interesting parish church, in a variety of styles, Saxon, Norman, and Gothic, with some ancient monuments, an independent chapel, national schools, breweries, flour-mills, and manufactories of bricks and parchment. Markets for corn are held here weekly. In the vicinity are the ruins of Tichfield House, where Charles I. took refuge when pursued by Cromwell in 1647. Pop. of the parish, 3956.

TICINO, or TESSIN, one of the cantons of Switzerland, in the extreme south of that country, on the Italian side of the Alps, bounded on the N.W. by the canton of Valais, N. by those of Uri and Grisons, E. by that of Grisons, S.E. and S. by Lombardy, and W. by Piedmont. Its form is that of an irregular triangle, with its apex towards the south; its length from N. to S. is 39 miles, its mean breadth 29, and its area 1033 square miles. The greater part of the canton is mountainous, and is divided into many valleys by several offsets from the central chain of the Lepontine and Rhaetian Alps. The largest of these valleys are the Val Levantina, in the centre; the Val Maggia, the upper part of which is called the Val Lavizzara, to the west; and the Val Blegno to the east; all extending in a nearly parallel direction from north to south. The Ticino, the principal river of the canton, rises in Mount St Gothard, flows down the Val Levantina, and enters Lake Maggiore at its northern extremity. Leaving this lake near Sesto in Italy, the river flows on in a southerly direction, forming the boundary between Lombardy and Piedmont, and, after a course of about 100 miles, enters the Po at Pavia. The Maggia, the next in size of the rivers of the canton, flows down the Val Maggia, and enters Lake Maggiore, near Locarno. This lake does not so properly belong to Switzerland as to Italy; for only a small portion at its very head is included within the limits of the canton. The Lake of Lugano, on the contrary, belongs chiefly to Ticino; its shape is very irregular, its length 20 miles, and its breadth little more than one. It discharges its waters, by means of the river Tresa, into Lake Maggiore; and it receives several small streams, which are separated from the other rivers of the canton by a chain of hills called Monte Ceneve, running from north-east to south-west, and terminating in the shore of Lake Maggiore. These hills divide the country into two unequal parts, differing widely in their climate and physical characteristics; the northern and larger portion being rugged and mountainous, while the southern is lower, and has more of an Italian than of a Swiss character. In the extreme north of the canton there are some of the loftiest summits in Switzerland; such as the Splügen, St Bernardin, and St Gothard; and from these hills many large glaciers descend. The rugged surface and inclement climate of the north of the canton render it unsuitable for agriculture; and the inhabitants

Tides.

are obliged to depend chiefly upon the rearing of cattle for their subsistence; while even the Alpine pastures here are not so large and good as on the northern slopes of the Alps. The south of the canton, however, has a very different character. Here the climate is mild; the hills are covered with forests of chestnuts, the lower slopes with vines and olives, and the plains with corn-fields and orchards, where grow figs, oranges, pomegranates, and peaches. Few minerals are found in Ticino in any considerable quantities; in some parts iron is wrought, and coal to a small extent; but marble is the most valuable mineral production of the canton, and is found in great abundance and of various kinds. The other productions are very varied. Cattle, sheep, goats, and pigs, are numerous; horses and mules few. Many kinds of game abound in the forests, and chamois on the mountains; and the rivers and lakes contain abundance of fish. Cattle, cheese, wine, fruit, hides, hay, and marble are the chief articles exported; and corn is imported from Lombardy. The manufactures are few and of little importance, consisting of coarse cloth, leather, platted straw, and tobacco. Many of the natives of Ticino, unable to find work at home, emigrate to the neighbouring countries. The people are of Italian origin, and, with few exceptions, Roman Catholics. The language spoken is a dialect of the Italian. The government is republican; and the right of suffrage is vested in all natives who are above twenty-five, and possess property to the value of L.8. These elect every four years a grand council of 114 members, which appoints the executive council of 9, and the judges in the various courts. There is a supreme court for the canton, and inferior tribunals for each district. The grand council sits by rotation at Lugano, Locarno, and Bellenzona, which are the chief towns. The canton is represented by 2 members in the council of states, and by 6 in the national council of Switzerland. It is the 18th in rank of the states of the confederation, to which it was not admitted till 1815, having been previously a territory subject to the other cantons. Pop. (1850) 117,759.

Tickell || Tides.

TICKELL, THOMAS, an English poet, who holds a high place among the minor minstrels of his country, was born at Bridekirk, in Cumberland, in 1686. He entered Queen's College, Oxford, in 1701, graduated in 1708, and became a fellow in 1710. He is said to have gained the favourable notice of Addison by some verses which he published in praise of that writer's *Rosamond*. On Addison's promotion to be secretary of state, Tickell was made under-secretary in 1717. He had already published in 1713 his *Prospect of Peace*, and next year he sang the praises of the *Royal Progress*. In June 1715 he published a poetical translation of the first book of the *Iliad*, some lines of which Dr Johnson preferred to the contemporary version of Pope, although, as a whole, it was very inferior to it. The only poem of more than temporary celebrity is his *Colin and Lucy*, which Gray, in a letter to H. Walpole, says, he has "always thought the prettiest in the world." Goldsmith pronounces Tickell's Elegy on Addison "one of the finest odes in our language," and Johnson declares that "a more sublime or elegant funeral poem is not to be found in the whole compass of English literature;" while Steele, again, alleges that it is only "prose in rhyme." Though neither very tender nor very imaginative, it nevertheless possesses many of the qualities of true poetry. Tickell held the office of secretary to the Lords-Justices of Ireland from 1725 till his death in 1740.

TIDES.[1]

THE alternate rising and falling which are observed to take place in the surface of the waters, generally twice in the course of a lunar day, or of $24^{h.}\ 49^{m.}$ of mean solar time, on most of the shores of the ocean, and in the greater part of bays, firths, and rivers which communicate freely with it, are the phenomena denominated *the tides*. These form what are called a *flood* and an *ebb*, a *high* and *low water*. The whole interval between high and low water is called a *tide;* the water is said to *flow* and to *ebb;* and the rising is called the *flood tide*, and the falling the *ebb tide*. This rise or fall of the waters is exceedingly different at different places, and is also variable everywhere. At Plymouth, for instance, it is sometimes 20 feet between the greatest and least heights of the water in one day, and sometimes only 12 feet. These different heights of tide succeed each other in a regular series, diminishing from the greatest to the least, and then increasing from the least to the greatest. The greatest is called a *spring tide*, and the least a *neap tide*. This series is completed in about fifteen days. More careful observation shows that two series are completed in the time of a lunation. For the spring tide in any place happens at a certain interval of time, generally between one and two days, after new or full moon; and the neap tide at a certain interval after the quarter: or, more accurately speaking, the spring tide occurs when the moon has got a certain number of degrees eastward either from the line of conjunction with the sun or of opposition to him, and the neap tide when she is at a certain distance from her first or last quadrature. Thus the whole series of tides appears to be chiefly regulated by the moon, and seems to be only to a small extent under the influence of the sun; for it is further observed that high water happens when the moon has nearly a certain position with respect to the meridian of the place of observation, preceding or following the moon's southing by a certain interval of time; which, at new and full moon, is generally not far from being constant with respect to the same place, but very different in different places; whereas the interval between the time of high water and noon changes almost everywhere about six hours in the course of a fortnight.

The interval between two succeeding high waters is variable. It is shortest about new and full moon, being then about $12^{h.}\ 19^{m.}$; and about the time of the moon's quadratures it is $12^{h.}\ 30^{m.}$ But these intervals are somewhat different at different places. The tides in similar circumstances are greatest when the moon is in the equator, and at her smallest distance from the earth, or in her perigee; and, gradually diminishing, are smallest when she is in her apogee, and farthest from the equator.

Such are some of the more general and regular phenomena of the tides. In certain places there are four tides in the lunar day, in others but one; and in some there is scarcely any perceptible variation of level which regularly keeps time with the moon. The tides being important to all commercial nations, great exertions have recently been made to obtain the means of predicting them. Some account

[1] This article on the Theory of Tides, written for a former edition by the late Dr Thomas Young, has been allowed to stand here in its integrity, mainly from the acknowledged excellence of the article by eminent scientific men of the present day. The more recent inquiries of Lubbock and Whewell into the subject will be found noticed in the SIXTH DISSERTATION, art. 69, &c., and its more practical aspects will be found treated off sufficiently under the head PHYSICAL GEOGRAPHY, § 66, &c.—*Ed.*

Tides. of these and other empirical researches, which have of late been conducted on an extensive scale and with great care, will be given in the latter part of this article.

History. It is of tides, most probably, the Bible speaks, when God is said to set bounds to the sea, and to say, "thus far shall it go, and no farther." Homer would be the earliest profane author who notices the tides, if indeed it be to them he refers (in the 12th book of the Odyssey) when he speaks of Charybdis rising and retiring thrice a day. Herodotus and Diodorus Siculus speak more distinctly of the tides in the Red Sea. Pytheas of Marseille is the first who says any thing of their cause. According to Strabo, he had been in Britain, where he must have observed the tides of the ocean. Plutarch says expressly that Pytheas ascribed them to the moon. It is remarkable that Aristotle says so little about the tides. The army of Alexander, his pupil, were startled at first seeing them near the Persian Gulf; and Aristotle would probably be well informed of all that had been observed there. But in all his writings there are only three passages concerning them, and these are very trivial. In one place he speaks of great tides in the north of Europe; in another, of their having been ascribed by some to the moon; and in a third, he says, the tide in a great sea exceeds that in a small one.

The Greeks had little opportunity of observing the tides. The conquests and the commerce of the Romans gave them more acquaintance with them. Cæsar speaks of them in the fourth book of his Gallic War. Strabo, after Posidonius, classes the phenomena into daily, monthly, and annual. He observes, that the sea rises as the moon approaches the meridian, whether above or below the horizon, and falls again as she rises or falls; that the tides increase at the time of new and full moon, and are greatest at the summer solstice. Pliny explains the phenomena at some length, and ascribes them to the sun and moon dragging the waters along with them (b. ii. c. 97). Seneca (*Nat. Quest.* iii. 28) speaks of the tides with correctness; and Macrobius (*Somn. Scip.* i. 6) gives a tolerable description of their motions. Such phenomena naturally exercise human curiosity as to their cause. Plutarch (*Placit. Phil.* iii. 17), Galileo (*Syst. Mund.* dial. 4), Riccioli in his *Almagest*, ii. p. 374, and Gassendi, ii. p. 27, have collected most of the notions of their predecessors on the subject; but they are of so little importance as not to deserve our notice. Kepler, in accounting for the tides (*De Stella Martis*, and *Epit. Astron.* p. 555), had evidently been aware of the principle of gravitation, but not of the law. He says that all bodies attract each other, and that the waters of the ocean would all go to the moon were they not retained by the attraction of the earth. He then proceeds to explain their elevation under the moon and on the opposite side, because the earth is less attracted by the moon than the nearer waters, but more than the waters which are more remote. The honour of a complete explanation of the tides in a general way was reserved for Sir Isaac Newton. He laid hold of this class of phenomena as the most incontestable proof of universal gravitation, and has given a most beautiful and synoptical view of the whole subject; contenting himself, however, with merely exhibiting the chief consequences of the general principle, and applying it to the phenomena with singular address.

Theory of the tides. The investigation of the phenomena of the tides has been justly considered as uniting some of the greatest difficulties that occur in the various departments of natural philosophy and astronomy. It implies, first, a knowledge of the laws of gravitation, concerned in the determination of the forces immediately acting on the sea, and of the periods and distances of the celestial bodies, which modify the magnitudes and combinations of these forces; and, secondly, of the hydraulic theories of the resistances of fluids, and of the motions of waves and undulations of all kinds, and of the theoretical determination of the form and density of the earth, as well as of the geographical observation of the breadth and depth of the seas and lakes which occupy a part of its surface; so that the whole subject affords abundant scope for the exercise of mathematical skill, and still more for the employment of that invention and contrivance which enables its possessor to supersede the necessity of prolix computations wherever they can be avoided. Tides.

The history of the theory of the tides is naturally divided into several periods in which its different departments have been progressively cultivated. The ancients from the times of Posidonius and Pytheas, and the moderns before Newton, were contented with observing the general dependence of the tides on the moon, as following her transit at an interval of about two hours, and their alternate increase and decrease not only every fortnight, but also in the lunar period of about eight years. The second step consisted in the determination of the magnitude and direction of the solar and lunar forces, by which the general effects of the tides were shown, in the *Principia*, to be the necessary consequences of these forces. The third great point was the demonstration of Maclaurin, that the form of an elliptic spheroid affords an equilibrium under the action of the disturbing forces concerned; while the further contemporary illustrations of the subject by Euler and Bernoulli, though they afforded some useful details, involved no new principle that can be put in competition with Maclaurin's demonstration. The fourth important step was made by Laplace, who separated the consideration of the *form* affording mere equilibrium, from that of the *motion* occasioned by the continual change of that form; while former theorists had taken it for granted that the surface of the sea very speedily assumed the figure of a fluid actuated by similar forces, but remaining perfectly at rest, or assuming instantly the form in question. Laplace's computation is however limited to the case of an imaginary ocean, of a certain variable depth, assumed for the convenience of calculation, rather than for any other reason. Dr Thomas Young has extended Laplace's mode of considering the phenomena to the more general case of an ocean covering a part only of the earth's surface, and more or less irregular in its form; he has also attempted to comprehend in his calculations the precise effects of hydraulic friction on the times and magnitudes of the tides. As far as the resistance may be supposed to vary in the simple ratio of the velocity, Dr Young's theory is sufficiently complete, and explains several of the peculiarities which are otherwise paradoxical in their appearance; but there still remains a difficulty to be combated with respect to the effects of a resistance proportional to the square of the velocity, and this, it is hoped, will be in great measure removed in the present article, which, however, from the space that is allotted to it, must be considered rather as a supplementary fragment than as a complete treatise. This theory will be divided into four sections: the first relating to the contemporaneous progress of the tides through the different seas and oceans, as collected from observation only; the second to the magnitude of the disturbing forces tending to change the form of the surface of the earth and sea; the third to the theory of compound vibrations with resistance; and the fourth to the application of this theory to the progress and successive magnitudes of the tides, as observable at any one port.

Sect. I.—*Of the Progress of Contemporary Tides, as inferred from the times of High Water in different Ports.*

The least theoretical consideration relating to the tides, is that of their progress through the different parts of the ocean, and of its dependent seas. The analysis of these ought to be very completely attainable from direct obser-

Tides. vation, if the time of high water had been accurately observed at a sufficient number of ports throughout the world; and, on the other hand, if the earth were covered in all parts with a fluid of great and nearly uniform depth, the tides of this fluid would be so regular, that a very few observations would be sufficient to enable us to deduce the whole of the phenomena from theory, and to trace the great waves, which would follow the sun and moon round the globe, so as to make its circuit in a day, without any material deviation from uniformity of motion and succession. Having collected, for the actual state of the sea and continents, an abundant store of accurate observations of the precise time of high water with regard to the sun and moon, for every part of the surface, and having arranged them in a table according to the order of their occurrence, as expressed in the time of any one meridian, we might then suppose lines to be drawn on a terrestrial globe, through all the places of observation, in the same order; and these lines would indicate, supposing the places to be sufficiently numerous, so as to furnish a series of tides very nearly contemporary, the directions of the great waves, to which that of the progress of the tides in succession must be perpendicular. If, however, we actually make such an attempt, we shall soon find how utterly inadequate the observations that have been recorded are, for the purpose of tracing the forms of the lines of contemporary high water with accuracy or with certainty, although they are abundantly sufficient to show the impossibility of deducing the time of high water at any given place from the Newtonian hypothesis, or even from that of Laplace, without some direct observation. It might at least be supposed very easy to enumerate the existing observations, scanty as they may be, in a correct order; but there is a number of instances in which it is wholly uncertain whether the time observed at a given port relates to the tide of the same morning in the open ocean, or to that of the preceding evening. This inconvenience may, however, in some measure be remedied, by inserting such places in two different parts of the table, at the distance of twelve and a half hours from each other. The following table is the result of an approximation obtained in this manner, the principal hour-lines having been partially traced on a map of the world, in order to afford some little direction to the correct insertion of the times of high water without the material error of half a day. Tides.

Time of High Water at the Full and Change of the Moon, reduced to the Meridian of Greenwich.

	Longitude.	H. W. Gr. T.		Longitude.	H. W. Gr. T.		Longitude.	H. W. Gr. T.
	H. M.	H. M.		H. M.	H, M.		H. M.	H. M.
S. Georgia	2.26W.	1.24	Brest	0.18	15.36	Socotora and C. Guardafui	20.30W.	21.30
Cape of Good Hope	1.14E.	1.20	Bayonne	0. 6	16. 6			
St Helena	0.23W.	5.13	C. St Vincent	0.36	16. 6	Ulietea	10. 6	21.39
Cape Corse	0. 7	3.35	Corunna	0.37	16. 7	Huaheine	10. 4	21.55
Rio Janeiro	2.53	4.58	Belleisle	0.12W.	16.12	Shoreham	0. 1	22. 1
I. Martin Vaz	1.56	5.41	Palmiras Pt.	18.12	16.12	Foul Pt. Mad.	20.41	22. 1
I. Ascension	0.57	6.27	Port Cornwallis	17.49	16.19	Botany Bay	13.55	21.55
Christmas Sound	4.46	7.10	Rochelle	0. 5	16.20	St Valery en Caux	0. 3 E.	22.12
St Jago	1.34	13.34	Vannes	0.11	16.24	Macao	16.26W.	22.16
Port Désiré	4.20	8.35	St Paul de Leon	0.16	16.38 or	St Valery sur Somme	0. 6 E.	22.24
St Helena, S. A.	4.40	8.40	Morlaix		18. 0	Dunnose	0. 5W.	22.20
Quibo	5.29	8.59	Rochfort	0. 4	16.49	Brighton	0. 1	22.31
Sierra Leone	0.53	9. 8	Bear Island	5.20	17.20	Dublin	0.25W.	23.35
Easter I.	7.19	9.19	Christmas Island	19.24	17.24	Abbeville	0. 7 E.	22.57
St Julian's	4.35	9.20	Chiloe	5. 0	17.30	Beachy Head	0. 1 E.	22.59
Maragnon Mouth	3.20	9.20	Cape Clear	0.38	16.48	Cowes	0. 6W.	23. 5
St John's, Newf.	3.30	9.20	Annamocka	11.39	17.39	Needles	0. 6W.	23. 6
Guadaloupe	4. 7	10. 7	St Peter and Paul Awatsha	13.25	18. 1	Anholt	0.47 E.	23.13
Panama	5.21	7.47				Boulogne	0. 6	22.33
Tortugas	4.51	10.51	Kinsale	0.34	17. 3	Hastings	0. 3	22.21
Cape Blanco	8.16	10.54	Eddistone	0.18	18.18	Deal Castle	0. 6	22.36
Bermudas	4.14	11.14	Falmouth	0.20	18.20	Dover	0. 5	22.40
Martinique	4. 5	11.35	Rotterdam I.	12.21	18.21	Dungeness	0. 4	22.26
Guayaquil	5.17	11.17	Drake's I. Plymouth	0.17	17.32	Dieppe	0. 4	22.46
Senegal	1. 6	11.36	Plymouth	0.17	17.47	Almirantes Eagle I.	21.28W.	23.48
Callao	5. 8	10.55	Avranches	0. 5	18.35	Almirantes Curreuse	21.17	25.27
Halifax	4.14	11.44	Eaoowe	11.38	18.38	Portsmouth	0. 4W.	23.36
Marquesas	9.16 to 9.17	11.46 to 12.16	St Maloes	0. 8	18.38 50ft	Ostend	0.12 E.	24. 8
			Londonderry	0.29	18.59	Nieuport	0.11	23.44
Quebec	4.44	12.14	Tonga Taboo	12.20	19.10	Gravelines	0. 8 E.	24.22
Cape La Hogue	0. 8	12.38	Granville	0. 6	17.48	Alderney	0. 9W.	21. 0
Gibraltar	0.20	12.50	Pudyona	13. 1	19.31	Bergen	0.21 E.	22. 3
Tahoga, Pan. Bay	5.22	13.10	St Francisco	8. 8	19.33	False Bay	22.45W.	25.16
Funchal	1. 8	13.42	Cork	0.34	17.10	Drontheim	0.41 E.	25.34
Portobello	5.19	13.19	Bristol	0.10	19.10	Rouen	0. 4W.	25.41
Cape Bojador	0.58	13.28	Barfleur	0. 5	20.55	Aberdeen	0. 9	25.34
Churchill R. P. of Wales Fort	6.17	13.37	Cherbourg	0. 6	19.24	North Cape	1.43 E.	26. 1
			Venus Pt. Otah	9.58	22. 0	Leith and Edinburgh	0.13W.	26.33
Terceira	1.49	16.10	Mauritius	20.10	21.12	Amsterdam	0.19 E.	27.11
New York	4.57	13.33	Lizard	0.21	20.45	Rotterdam	0.18	27.12
Cape Henlopen, Virg.	5. 1	14. 1	Nootka Sound	8.27	20.47	London Bridge	0. 0	27.15
Cadiz	0.25	14. 5	Guernsey	0. 9	20.54	Archangel	2.36 E.	27.24
Karakakooa Bay	10.24	14. 9	Pulo Condore	18.53	21. 9	Bordeaux	0. 2W.	27.32
Virgin Cape, Pat.	4.32	14.32	Calcutta	16. 6	21.11	Hamburg	0.40 E.	29.20
Valparaiso	4.49	14.21	Seychelles Alm.	20.18	21.12	Bremen	0.35 E.	29.25
Cape Charles	4.57	14.57	Stromness	0.14	21.20	Antwerp	0.18 E.	28.46
Goree Island	1.10	15.10	N. Zealand Q. C. S.	12.13	21.23	Scolt Head	0. 3	30.17
York Fort	6. 9	15.19	N. Zealand Dusky B.	12.55	23.54	Lynn	0. 2	30.43
Lisbon	0.37	15.22	Honfleur	0. 1 E.	21.29	Hague	0.17	31.58
Nantes, Rhé	0. 6	15.26	Havre	0. 0	21.30	Leostoffe	0. 7	34.23
Tanna	11.19	15.41	Caen	0. 1	21.31	London Bridge	0. 0	(39.45)

Tides. It may be immediately inferred from this table, first, that the line of contemporary tides is seldom in the exact direction of the meridian, as it is supposed to be universally in the theory of Newton and of Laplace; except, perhaps, the line for the twenty-first hour in the Indian Ocean, which appears to extend from Socotora to the Almirantes and the Isle of Bourbon, lying nearly in the same longitude. Secondly, the southern extremity of the line advances as it passes the Cape of Good Hope, so that it turns up towards the Atlantic, which it enters obliquely, so as to arrive, nearly at the same moment, at the Island of Ascension, and at the Island of Martin Vaz, or of the Trinity. Thirdly, after several irregularities about the Cape Verd Islands, and in the West Indies, the line appears to run nearly east and west from St Domingo to Cape Blanco, the tides proceeding due northwards; and then, turning still more to the right, the line seems to run north-west and south-east, till at last the tide runs almost due east up the British Channel and round the north of Scotland into the Northern Ocean, sending off a branch down the North Sea to meet the succeeding tide at the mouth of the Thames. Fourthly, towards Cape Horn, again, there is a good deal of irregularity; the hour-lines are much compressed between South Georgia and Tierra del Fuego, perhaps on account of the shallower water about the Falkland Islands and South Shetland. Fifthly, at the entrance of the Pacific Ocean, the tides seem to advance very rapidly to New Zealand and Easter Island; but here it appears to be uncertain whether the line of contemporary tide should be drawn nearly north and south from the Gallapagos to Tierra del Fuego, or north-east and south-west from Easter Island to New Zealand; or whether both these partial directions are correct: but on each side of this line there are great irregularities, and many more observations are wanting before the progress of the tide can be traced with any tolerable accuracy, among the multitudinous islands of the Pacific Ocean, where it might have been hoped that the phenomena would have been observed in their greatest simplicity, and in their most genuine form. Lastly, of the Indian Ocean the northern parts exhibit great irregularities, and among the rest they afford the singular phenomenon of one tide in the day, observed by Halley in the port of Tonkin, and explained by Newton in the *Principia*: the southern parts are only remarkable for having the hour-lines of contemporary tides considerably crowded between New Holland and the Cape of Good Hope, as if the seas of these parts were shallower than elsewhere.

These inferences respecting the progress of the tides are not advanced as the result of any particular theory, nor even as the only ones that might possibly be deduced from the table. Thus the supposion that the direction in which the tides advance must be perpendicular to the hour-lines of contemporary tides, is not by any means absolutely without exception, since a quadrangular lake, with steep shores in the direction of the meridian, would have the times of high water the same for every point of its eastern or western halves respectively, and there could be no correctly defined direction of the hour-lines in such a case. But if any portion of the sea could be considered as constituting such a lake, its properties would be detected by a sufficient number of observations of high water; and the existing table does not appear to indicate any such cases that require to be otherwise distinguished than as partial irregularities. There may also be some doubt respecting the propriety of the addition of twelve and a half hours that has been made to the time of high water in the north-eastern parts of the Atlantic: but it seems extremely improbable that the same tide should travel north-easterly into the English Channel and into the Northern Ocean, and at the same time westerly across the Atlantic, as it must be supposed to do, if it were considered as primarily originating in the neighbourhood of the Bay of Biscay. On the other hand, the bending of the great wave round the continents of Africa and Europe seems to be very like the sort of refraction which takes place on every shelving coast with respect to the common waves, which, whatever may have been their primitive origin, acquire always, as they spread, a direction more and more nearly parallel to that of the coast which they are approaching: and the suppositions which have been here advanced respecting the succession of the tides in different ports, allowing for the effect of a multitude of irregularities proceeding from partial causes, appear to be by far the most probable that can be immediately inferred from the table, at least in its present state of imperfection. Tides.

Sect. II.—*Of the Disturbing Forces that occasion the Tides.*

Since the phenomena of the tides, with regard to their progress through the different oceans and seas, as they exist in the actual state of the earth's surface, appear to be too complicated to allow us to hope to reduce them to computation by means of any general theory, we must, in the next place, confine our attention to the order in which the successive changes occur in any single port; and having determined the exact magnitude of the forces that tend to change the form of the surface of the ocean at different periods, and having also examined the nature of the vibratory motions of which the sea, or any given portion of it, would be susceptible, in the simplest cases, after the cessation of the disturbing forces, we must afterwards endeavour to combine these causes, so as to adapt the result to the successive phenomena which are observed at different times in any one port.

Theorem A. ("E."—Nicholson's Journal, July 1813.) The disturbing force of a distant attractive body, urging a particle of a fluid in the direction of the surface of a sphere, varies as the sine of twice the altitude of the body.

The mean attraction exerted by the sun and moon on all the separate particles composing the earth, is exactly compensated by the centrifugal force derived from the earth's annual revolution round the sun, and from its monthly revolution round the common centre of gravity of the earth and moon; but the difference of the attractions exerted at different points of the earth, must necessarily produce a disturbing force, depending on the angular position of the point with regard to the sun or moon, since the centrifugal force is the same for them all; the disturbing force being constantly variable for any one point, and depending partly on the difference of the distance of the point from the mean distance, and partly on the difference of the direction of the luminary from its direction with respect to the centre, or, in other words, on its parallax.

In the case of a sphere covered with a fluid, it will be most convenient for computation to consider both these forces as referred to the direction of the circumference of the sphere, which will differ but little from that of the fluid; and it will appear that both of them, when reduced to this direction, will vary as the product of the sine and cosine of the distance from the diameter pointing to the luminary, that is, as half the sine of twice the altitude: for the difference of gravitation, which depends on the difference of the distance, will always vary as the sine of the distance from the bisecting plane perpendicular to that diameter, and will be reduced to the direction of the surface by diminishing it in the ratio of the cosine to the radius; and the effect of the difference of direction will be originally proportional to the sine of the distance from the diameter, and will in like manner be expressed, when reduced, by the product of the sine and cosine; and each force, thus reduced, will be equal, where it is greatest, to half of its primitive magnitude, since sin. cos. $45° = \frac{1}{2}$. "Thus, the gravitation towards the

Tides. moon at the earth's surface, is to the gravitation towards the earth as 1 to 70 times the square of $60\frac{1}{2}$, or to 256 217: and the former disturbing force is to the whole of this as 2 to $60\frac{1}{2}$ at the point nearest the moon, and the second as 1 to $60\frac{1}{2}$ at the equatorial plane, and the sum of both, reduced to the direction of the circumference, where greatest, as 3 to 121, that is, to the whole force of the earth's gravitation, as 1 to 10 334 000; and in a similar manner we find, that the whole disturbing force of the sun is to the weight of the particles as 1 to 25 736 000." Or, if we call the moon's horizontal parallax p, and substitute $\frac{1}{p}$ for the distance, the whole of the lunar disturbing force in the direction of the surface will be $\frac{3}{2} \cdot \frac{p^3}{70} = \frac{3}{140} p^3$; or, if z be the moon's zenith distance from any point of the surface, $f = \frac{3}{70} p^3$ sin. cos. z.

THEOREM B. [F.] The inclination of the surface of an oblong spheroid, slightly elliptical, to that of the inscribed sphere, varies as the sine of twice the distance from the circle of contact; and a particle resting on any part of it, without friction, may be held in equilibrium by the attraction of a distant body [situated in the direction of the axis].

If a sphere be inscribed in an oblong spheroid, the elevation of the spheroid above the sphere must obviously be proportional, when measured in a direction parallel to the axis of the spheroid, to the ordinate of the sphere, that is, to the sine of the distance from its equator; and when reduced to a direction perpendicular to the surface of the sphere, it must be proportional to the square of that sine; and the tangent of the inclination to the surface of the sphere, which is equal to the fluxion of the elevation divided by that of the circumference, must be expressed by twice the continual product of the sine, the cosine, and the ellipticity, or rather the greater elevation e, the radius being considered as unity: so that the elevation e will also express the tangent of the inclination where it is greatest, since 2 sin. cos. $45° = 1$; and the inclination will be everywhere as the product of the sine and cosine.

If, therefore, the density of the elevated parts be considered as evanescent, and their attraction be neglected, there will be an equilibrium, when the ellipticity is to the radius as the disturbing force to the whole force of gravitation; for each particle situated on the surface will be actuated by a disturbing force tending towards the pole of the spheroid, precisely equal and contrary to that portion of the force of gravitation which urges it in the opposite direction down the inclined surface. Hence, if the density of the sea were supposed inconsiderable in comparison with that of the earth, the radius being 20 839 000 feet, the greatest height of a lunar tide in equilibrium would be 2·0166 feet, and that of a solar tide ·8097: that is, supposing the moon's horizonal parallax about 57′, and her mass $\frac{1}{70}$ of that of the earth.

THEOREM C. [G.] The disturbing attraction of the thin shell contained between a spheroidical surface and its inscribed sphere, varies in the same proportion as the inclination of the surface, and is to the relative force of gravity depending on that inclination, as three times the density of the shell to five times that of the sphere.

We may imagine the surface of the sphere to be divided by an infinite number of parallel and equidistant circles, beginning from any point at which a gravitating particle is situated, and we may suppose all these circles to be divided by a plane perpendicular to the meridian of the point, and consequently bisecting the equatorial plane of the spheroid: it is obvious, that if the elevations on the opposite sides of the plane be equal at the corresponding points of each circle, no lateral force will be produced; but when they are unequal, the excess of the elevated matter on one side above that of the other side will produce a disturbing or lateral force. Now, the elevation being everywhere as the square of the distance x from the equatorial plane, we may call it ex^2, and the difference corresponding to any point of that semicircle which is the nearer to the pole of the spheroid, will be $e(x'^2 - x''^2) = e(x' + x'')(x' - x'')$. But $x' + x''$ is always twice the distance of the centre of the supposed circle from the equatorial plane; and the distance of this centre from that of the sphere will be cos. ψ, if ψ be the angular distance of the circle from its pole; and calling φ the distance of this pole from the equatorial plane of the spheroid, the distance in question will be cos. ψ sin. φ, and $x' + x'' = 2$ cos. ψ sin. φ; and the difference $x' - x''$ is twice the actual sine of the arc θ in the supposed circle, that is, twice the natural sine, reduced in the ratio of unit to the radius of this circle, which is sin. ψ, reduced again to a direction perpendicular to the equatorial plane; whence $x' - x'' = 2$ sin. θ sin. ψ cos. φ; and $x'^2 - x''^2 = 4$ sin. θ sin. cos. ψ sin. cos. φ. Hence it follows, that, in different positions of the gravitating particle, the effective elevation at each point of the surface, similarly situated with respect to it, is as the product of the sine and cosine of its angular distance φ from the equatorial plane, the other quantities concerned remaining the same in all positions. But the inclination of the surface of the spheroid, as well as the original disturbing force, varies in the same proportion of the product of the sine and cosine of the distance φ; consequently the sum of this disturbing attraction and the original force will also vary as the inclination of the surface, and may be in equilibrium with the tendency to descend towards the centre, provided that the ellipticity be duly commensurate to the density of the elevated parts.

Now, in order to find the actual magnitude of the disturbing attraction for a shell of given density, we must compute the fluent of $4e$ sin. $\theta d\theta$ sin. cos. $\psi d\psi$ sin. cos. φ, reduced first according to the distance and direction of each particle from the given gravitating particle; and we must compare the fluent with $\frac{4}{3}\pi$, the attraction of the whole sphere at the distance of the radius, or unity. But for the angle θ, the portion of the force acting in the common direction of sin. θ is to the whole attraction at the same distance as sin. θ to 1, so that the attractive force of any point of the semicircle will be $4e$ sin.^{2} θ sin. cos. ψ sin. cos. φ, and its fluxion will be as sin.^{2} $\theta d\theta$, of which the fluent is $\frac{1}{2}\theta - \frac{1}{2}$ sin. cos. θ, or when $\theta = 180°$, $\frac{1}{2}\pi$, and $\frac{1}{2}\pi$ sin. ψ will express the effect of the disturbing attraction of the semicircles, of which sin. ψ is the radius, reduced to the direction of the middle point, of which the distance is 2 sin. $\frac{1}{2}\psi$; the reduction for this distance is as its square to 1; and for the direction, as the distance to sin. ψ, together making the ratio of $\frac{\text{sin. } \psi}{8 \text{ sin.}^3 \frac{1}{2}\psi}$, and the ultimate fluxion of the force will be $2e\pi$ sin. ψ sin. cos. φ sin. cos. $\psi \frac{\text{sin. } \psi}{8 \text{ sin.}^3 \frac{1}{2}\psi} d\psi = 2e\pi \frac{\text{sin.}^3 \psi \text{ cos. } \psi}{8 \text{ sin.}^3 \frac{1}{2}\psi}$ sin. cos. $\varphi d\psi$; but sin. $\psi = 2$ sin. cos. $\frac{1}{2}\psi$, and the fraction becomes $\frac{8 \text{ sin.}^3 \text{ cos.}^3 \frac{1}{2}\psi}{8 \text{ sin.}^3 \frac{1}{2}\psi}$ cos. $\psi =$ cos.$^3 \frac{1}{2}\psi$ cos. $\psi =$ cos.$^3 \frac{1}{2}\psi$(cos.$^2 \frac{1}{2}\psi$ − sin.$^2 \frac{1}{2}\psi$) = cos.$^5 \frac{1}{2}\psi$ − cos.$^3 \frac{1}{2}\psi$ + cos.$^5 \frac{1}{2}\psi$ = 2 cos.$^5 \frac{1}{2}\psi$ − cos.$^3 \frac{1}{2}\psi$. Now, taking the fluent from $\psi = 0$ to $\psi = 180°$, we have $2\int' \text{cos.}^5 \frac{1}{2}\psi 2d\frac{1}{2}\psi = \frac{8}{5} \cdot \frac{4}{3}$, and $\int' \text{cos.}^3 \frac{1}{2}\psi \times 2d\frac{1}{2}\psi = \frac{4}{3}$, the differ-

Tides.

Tides. ence being $\frac{3}{5}\cdot\frac{4}{3}=\frac{4}{5}$, whence the fluent of the force is found $2e\pi$ sin. cos. $\varphi\times\frac{4}{5}\times\frac{1}{n}$, calling the density of the fluid $\frac{1}{n}$, or, where it is greatest, sin. cos. φ being $=\frac{1}{2}$, $\frac{4}{5}\frac{e\pi}{n}$, while the attraction of the sphere itself is $\frac{4}{3}\pi$, which is to $\frac{4}{5}\frac{e\pi}{n}$ as 1 to $\frac{3e}{5n}$; and since the elevation e expresses also the maximum of the relative force of gravity depending on the tangent of the inclination (Theorem B), it is obvious that the disturbing attraction $\frac{3e}{5n}$ must be to the relative force e as $\frac{3}{n}$ to 5.

Corollary 1. If $n=1$, as in a homogeneous fluid sphere or spheroid, the disturbing attraction becomes $\frac{3}{5}e$, and this attraction, together with the primitive force f, must express the actual elevation e, or $\frac{3}{5}e+f=e$, whence $f=\frac{2}{5}e$, and $e=\frac{5}{2}f$, giving 2·024 and 5·042 for the magnitude of the solar and lunar tides, when $f=$ ·8097 and 2·0166 respectively. But this is obviously far from the actual state of the problem.

Corollary 2. Supposing $n=5{\cdot}4$ (see Quarterly Journal of Science, April 1820), we have $\frac{3e}{27}+f=e$, and $e=\frac{27}{24}f=\frac{9}{8}f$; so that the height of the primitive tides of an ocean of water, covering the whole surface of the earth, such as it actually is, ought to be ·911 for the solar, and 2·27 for the lunar disturbing force; that is, supposing the sea without inertia, so as to accommodate itself at once to the form of equilibrium. But, in the actual state of the irregularities of the seas and continents, it is impossible to pay any regard to this secondary force, since the phenomena do not justify us in supposing the general form of the surface of the ocean such as to give rise to it.

THEOREM D. [H.] When the horizontal surface of a liquid is elevated or depressed a little at a given point, the effect will be propagated in the manner of a wave, with a velocity equal to that of a heavy body which has fallen through a space equal to half the depth of the fluid, the form of the wave remaining similar to that of the original elevation or depression. Dr Young's Elementary Illustrations of the Celestial Mechanics of Laplace, 378, p. 318.

Scholium. The demonstration of this theorem implies that water is incompressible, and that the pressure of each particle placed on the surface is instantaneously communicated through the whole depth of the fluid to the bottom. These suppositions are not indeed strictly accurate in any case, but they introduce no sensible error when the surface of the wave similarly affected is large in comparison with the depth of the fluid. A modern author of celebrity seems to have taken it for granted that the pressure is propagated with the same velocity downwards and laterally; at least, if such is not his meaning, he has been somewhat unfortunate in the choice of his expressions; but there seems no reason whatever why water should communicate force more slowly when it is perfectly confined, than ice would do; and the divergence of the pressure of a certain portion of the surface of water, elevated a little, for example, above the rest, may be compared to the *divergence* of a sound entering into a detached chamber by an aperture of the same size with the given surface, which is probably *small* in comparison with its direct motion, but *equally rapid*, and in both cases depending on the modulus of the elasticity of the medium. Tides.

THEOREM E. [I.] A wave of a symmetrical form, with a depression equal and similar to its elevation, striking against a solid vertical obstacle, will be reflected, so as to cause a part of the surface, at the distance of one fourth of its whole breadth, to remain at rest; and if there be another opposite obstacle at twice that distance, there may be a perpetual vibration between the surfaces, the middle point having no vertical motion. Dr Young's Natural Philosophy, vol. i. p. 289, 777.

Scholium 1. The elevation and depression of a spheroid, compared with the surface of the sphere of equal magnitude, exhibits a symmetrical wave in the sense of the proposition; and it is not necessary that the shores should be very rocky or perpendicular, in order to produce a strong reflection; for even the vibration of the water in the bottom of a common hemispherical basin is considerably permanent.

Corollary 3. The vibrations of the water supposed to be contained in a canal, following the direction of the equator, and 90° in length, would be synchronous with the passage of a wave 180° in breadth, over any point of a canal of the same depth, and surrounding the whole globe.

Scholium 2. It has been usual to consider the elevation of the tides as identical with that of an oblong spheroid, measured at its vertex, and therefore as amounting to twice as much as the depression of the same spheroid at the equator, considered in relation to the mean height belonging to a sphere of the same magnitude; but the supposition is by no means applicable to the case of a globe covered partially and irregularly with water, so that in almost all cases of actual tides, the elevation must be considered as little if at all greater than the depression, as far as this cause only is concerned; there are, however, some other reasons to expect that the elevation of the great wave might often arrive at a distant port in somewhat greater force than the depresssion.

THEOREM F. [K.] The oscillations of the sea and of lakes, constituting the tides, are subject to laws exactly similar to those of pendulums capable of performing vibrations in the same time, and suspended from points which are subjected to compound regular vibrations, of which the constituent periods are completed in half a lunar and half a solar day [or in some particular cases a whole day].

Supposing the surface of the sea to remain at rest, each point of it would become alternately elevated and depressed, in comparison with the situation in which it might remain in equilibrium; its distance from this situation varying according to the regular law of the pendulum (see Theorem B); and, like all minute vibrations, it will be actuated by forces indirectly dependent on, and proportional to, this distance; so that it may be compared to a pendulous body remaining at rest in the vertical line, about which its point of suspension vibrates, and will consequently follow the motion of the temporary horizon, in the same manner as the pendulum follows the vibration of its point of suspension, either with a direct or a retrograde motion, according to circumstances, which will be hereafter explained: the operation of the forces concerned being perfectly analogous, whether we consider the simple hydrostatic pressure depending on the elevation, or the horizontal pressure derived from the inclination of the surface, or the differential force immediately producing elevation and depression, depending on the variation of the horizontal pressure, and proportional to the curvature of the surface. It becomes therefore necessary, for the theory of the tides, to investigate minutely the laws of these compound and compulsory vibrations, which, together with the resistances affecting them, will be the subject of the next section.

Tides. SECT. III.—*Of the Effects of Resistance in Vibrating Motions, whether Simple or Compound.*

THEOREM G. If $dw + Ads + Bsds + Dwds = 0$, we have $e^{Ds}\left(w + \frac{B}{D}s + \frac{AD-B}{DD}\right) = c$; hle being $= 1$.

Scholium. For the better understanding of the mode of investigation which will be employed in these propositions, it will be proper to premise some remarks on the investigation of fluxional equations, by means of multipliers. A person unacquainted with the language of modern mathematicians, would naturally understand by a "criterion of integrability," some mode of distinguishing an expression that would be integrated, from one that was untractable; while, in fact, this celebrated criterion relates only to the accidental form in which the expression occurs, and not to its essential nature. If we take, for instance, the well-known case of the fluxion of hl $\frac{x}{y} =$ hl$x$ — hl$y$, we have $\frac{dx}{x} - \frac{dy}{y} = \frac{ydx - xdy}{xy}$, and making this $= 0$, we have also $ydx - xdy = 0$; and this expression no longer fulfils the conditions of integrability, until we multiply it again by $\frac{1}{xy}$, and restore it to its perfect form. The direct investigation of such a multiplier is generally attended by insuperable difficulties; and the best expedient, in practical cases, is to examine the results of the employment of such multipliers as are most likely to be concerned in the problem, with indeterminate co-efficients, and to compare them with the equations proposed. In common cases, the finding of fluents, when only one variable quantity is concerned, requires little more than the employment of a table of fluents or integrals such as that of Meier Hirsch; and the truth of the solution is in general tested at once, for each case, by taking the fluxion of the quantity inserted in the table: but for the separation of different variable quantities, where they are involved with each other, the employment of proper multipliers is one of the most effectual expedients; and it is still more essential to the solution of equations between fluxions of different orders, or their co-efficients. Such equations require in general to be compared with some multiple of the exponential quantity e^{mt}, which affords fluxions of successive orders, that have simple relations to each other, especially when dt is considered as constant. The multiples of sin. Ct, and cos. Ct, are also very useful in such investigations, and for a similar reason; but the solutions that they afford are commonly less comprehensive than the former, though they are often simpler, and more easily obtained. It is not however necessary that the exponent of the multiplier should flow uniformly, as will appear from the first example of a problem which has been solved by Euler in his Mechanics: the subsequent examples will possess somewhat more of novelty.

Demonstration. The fluxion of $e^{ns}(w + ps + q)$ is $e^{ns}(dw + pds + (nw + nps + nq)\,ds) = e^{ns}\{dw + (p + nq)\,ds + ndsds + nwds)\}$; and comparing with this $e^{ns}(dw + Ads + Bsds + Dwds)$, we have $n = D$, $np = B$, and $p = \frac{B}{n} = \frac{B}{D}$; and, lastly, $p + nq = A$, $q = \frac{A-p}{n} = \frac{AD-B}{DD}$; consequently the fluxion of $e^{Ds}\left(w + \frac{B}{D}s + \frac{AD-B}{DD}\right)$ is equal to nothing, and that quantity is Tides. constant, or equal to c.

Example. Let the given equation be that of a cycloidal pendulum, moving with a resistance proportional to the square of the velocity, or $\frac{ddx}{dt^2} + Bs - D\frac{ds^2}{dt^2} = 0$.

Scholium 2. The space s being supposed to begin at the lowest point of the curve, the fluxion ds is negative during the descent on the positive side, and the force ddx is consequently negative, and equal, when there is no resistance, to Bs, B being a positive co-efficient, equivalent, in the case of gravitation, to $\frac{2g}{l}$ or $\frac{32}{l}$, l being the length of the pendulum, and g the descent of a falling body in the first second. The co-efficient $-D$ is negative, because the resistance acts in a contrary direction to that of the force Bs, as long as s remains positive, and coincides with it on the negative side. But in the return of the pendulum the signs are changed, so that the equation can only be applied to a single vibration; since the two forces in question oppose each other in the same points of the curve in which they before agreed, while the square $\frac{ds^2}{dt^2}$ must always remain positive.

Solution. If we multiply the given equation by ds, and make the square of the velocity, or $vv = w = \frac{ds^2}{dt^2}$, we have $ds\frac{ddx}{dt^2} + Bsds - D\frac{ds^2}{dt^2}ds = 0 = \frac{1}{2}dw + Bsds - Dwds$, and $dw + 2Bsds - 2Dwds = 0$; which, compared with the theorem, gives us 0 for A, $2B$ for B, and $-2D$ for D; and the solution becomes $e^{-2Ds}\left(w - \frac{B}{D}s - \frac{B}{2DD}\right) = c$, or $w = \frac{B}{D}s + \frac{B}{2DD} + ce^{2Ds}$; and if $w = 0$ when $s = \lambda$, we have $\frac{B}{D}\lambda + \frac{B}{2DD} + ce^{2D\lambda} = 0$, or, putting $\frac{B}{D}\lambda + \frac{B}{2DD} = \beta$, $\beta + ce^{2D\lambda} = 0$, and $c = -\beta e^{-2D\lambda}$; β being also $= \frac{B\gamma}{2DD}$, if $\gamma = 1 + 2D\lambda$. We may also substitute σ for $\lambda - s$, and ce^{2Ds}, $= -\beta e^{2D(s-\lambda)}$, will become $= -\beta e^{-2D\sigma}$, and $w = \frac{B}{D}s + \frac{B}{2DD} - \beta e^{-2D\sigma} = \frac{B}{2DD}(1 - \gamma e^{-2D\sigma} + 2Ds)$. Now $e^{-2D\sigma} = 1 - 2D\sigma + 2D^2\sigma^2 - \frac{4}{3}D^3\sigma^3 + \frac{2}{3}D^4\sigma^4 - \ldots$; and $(1 + 2D\lambda)\,e^{-2D\sigma} = 1 + 2D\lambda - 2D\sigma - 4D^2\lambda\sigma + 2D^2\sigma^2 + 4D^3\lambda\sigma^2 - D\frac{4}{3}\sigma^3 - \ldots$; whence $w = \frac{B}{2DD}(2Ds - 2D(\lambda - \sigma) + 4D^2\lambda\sigma - 2D^2\sigma\ldots) = \frac{B}{2DD}(4D^2\lambda\sigma - 2D^2\sigma^2 - 4D^3\lambda\sigma^2\ldots) = B(2\lambda\sigma - \gamma\sigma^2 + \frac{2}{3}D\gamma\sigma^3 - \frac{1}{3}D^2\gamma\sigma^4 + \ldots)$.

Corollary 1. From this solution we obtain the point at which the velocity is greatest; and, by reversing the equation, we may also find the extent of the vibration. For when $dw = 0$, we have $Bsds = Dwds$, and $Bs = Dw$, which is the obvious expression of the equality of the re-

Tides. sistance to the propelling force. Putting the greatest value of $w = \varkappa$, and the corresponding value of $s = \varsigma$, we have $\varkappa = \frac{B}{D}\varsigma + \frac{B}{2DD} + ce^{2D\varsigma} = \frac{B}{D}\varsigma$, since $B\varsigma = D\varkappa$, and $\frac{B}{2DD} = -ce^{2D\varsigma} = \frac{B\gamma}{2DD}e^{2D(\varsigma-\lambda)}$; whence $\frac{1}{\gamma} = e^{2D(\varsigma-\lambda)}$, and $\gamma = e^{2D(\lambda-\varsigma)}$; consequently $\mathrm{hl}\gamma = 2D(\lambda-\varsigma) = \mathrm{hl}(1+2D\lambda)$, and $2D\varsigma = 2D\lambda - \mathrm{hl}(1+2D\lambda)$, and $\varsigma = \frac{1}{2D}\left(2D^2\lambda^2 - \frac{8}{3}D^3\lambda^3 + \ldots\right) = D\lambda^2 - \frac{4}{3}D^2\lambda^3 + \ldots$ And since $\varkappa = \frac{B}{D}\varsigma$, we have $\varkappa = \frac{B}{2DD}(2D\lambda - \mathrm{hl}[1+2D\lambda])$.

Lemma. For the reversion of a series, or of a finite equation, if $z = ax + bx^2 + cx^3 + \ldots$, we have $x = \frac{1}{a}z - \frac{b}{a^3}z^2 + \frac{2b^2-ac}{a^5}z^3 - \frac{5b^3-5abc+a^2d}{a^7}z^4 + \frac{14b^4-21ab^2c+6a^2bd+3a^2c^2-a^3e}{a^9}z^5 - \ldots$

The proof of this well-known formula is the most readily obtained by means of a series with indeterminate co-efficients, such as $x = Az + Bz^2 + \ldots$, which, by actual involution, and by comparison with the proposed series, will give the required values of the co-efficients, as expressed in this Lemma.

Corollary 2. When $w = 0$, we obtain from its value, divided by $B\sigma$, the equation $2\lambda = \gamma\sigma - \frac{2}{3}D\gamma\sigma^2 + \frac{1}{3}D^2\gamma\sigma^3 - \ldots$; and, by reversing this series, we have $\sigma = \frac{2\lambda}{\gamma} + \frac{8}{3\gamma^2}D\lambda^2 + \frac{40}{9\gamma^3}D^2\lambda^3\ldots$, or $\sigma = 2\lambda - \frac{4}{3}D\lambda^2 + \ldots$; the difference of the arcs of descent and ascent being $\frac{4}{3}D\lambda^2$, and the difference of two successive vibrations $\frac{8}{3}D\lambda^2$, when the resistance is very small; this difference being also $\frac{8}{3}\varsigma$; so that the displacement of the point of greatest velocity is $\frac{3}{8}$ of the difference of the successive vibrations.

Scholium 2. If K be the value of w when Dw would be equal to the force of gravity, and $DK = Bl = 2g$, we have $D = \frac{2g}{K}$, or H being the height from which a body must fall to acquire the velocity $\sqrt{K}$, since $K = 4gH$, $D = \frac{1}{2H}$, and $2D = \frac{1}{H}$.

Scholium 3. It is natural to imagine that we might obtain the time from the equation expressing the velocity in terms of the space, if we merely expanded the value of $\frac{1}{\sqrt{w}}$ into a new series, by means of the Newtonian theorem; but the fluents thus obtained for the expression of the time are deficient in convergency; and a similar difficulty would occur if we expressed σ in terms of w by reversing the series, and divided its fluxion by $\sqrt{w}$. The ingenuity of Euler has, however, devised a method of avoiding these inconveniences, by supposing the time to begin at the point where the velocity is a maximum; and it will be necessary, in this investigation, to follow his steps, with some slight variations. Tides.

Corollary 3. In order to find the time of vibration, we take $s - \varsigma = \tau$, and $\varkappa - w = z$, then $s = \tau + \varsigma$, $\sigma = \lambda - \varsigma - \tau$, $w = \frac{B}{2DD}(1 - \gamma e^{-2D(\lambda-\varsigma-\tau)} + 2D[\varsigma+\tau])$, and $\varkappa$ being $= \frac{B}{D}\varsigma$, $z = -\frac{B}{2DD} - \frac{B}{D}\tau + \frac{B\gamma}{2DD}e^{2D(\varsigma-\lambda)}e^{2D\tau}$; but we have seen that $e^{2D(\varsigma-\lambda)} = \frac{1}{\gamma}$, and $-z$ becomes $\frac{B}{2DD} + \frac{B}{D}\tau - \frac{B}{2DD}e^{2D\tau} = \frac{B}{D}\tau - \frac{B}{2DD}\left(2D\tau + 2D^2\tau^2 + \frac{4}{3}D^3\tau^3 + \frac{8}{12}D^4\tau^4 + \ldots\right) = \frac{B}{D}\tau - \frac{B}{D}\tau - B\tau^2 - \frac{2}{3}BD\tau^3 - \ldots = -B\tau^2 - \frac{2}{3}BD\tau^3 - \frac{1}{3}BD^2\tau^4 - \ldots$, and $\frac{z}{B} = \tau^2 + \frac{2}{3}D\tau^3 + \frac{1}{3}D^2\tau^4 + \ldots$ In order to reverse this series, we must put $\frac{z}{B} = y^2$, and $\tau = \mathrm{A}y + \mathrm{B}y^2 + \mathrm{C}y^3 + \ldots$; and by substituting the powers of this series for those of τ in the value of $\frac{z}{B} = y^2 = \tau^2 + \mathrm{P}\tau^3 - \mathrm{Q}\tau^4 + \ldots$, we find $\mathrm{A} = 1$, $\mathrm{B} = -\frac{1}{2}\mathrm{P}$, $\mathrm{C} = \frac{5}{8}\mathrm{P}^2 - \frac{1}{2}\mathrm{Q}\ldots$; and $\tau = y - \frac{1}{3}Dy^2 + \frac{1}{9}D^2y^3 - \ldots$. Hence $\mathrm{d}\tau = \mathrm{d}y - \frac{2}{3}Dy\mathrm{d}y + \frac{1}{3}D^2y^2\mathrm{d}y - \ldots$; and this fluxion, divided by the velocity $v = \sqrt{(x-z)}$, will be the fluxion of the time; or, since

$$\mathrm{d}\frac{z}{B} = 2y\mathrm{d}y \text{ and } \mathrm{d}y = \frac{\mathrm{d}z}{2By} = \frac{\mathrm{d}z}{2\sqrt{B}\sqrt{z}},$$

$$\mathrm{d}t = \sqrt{\frac{1}{B}}\cdot\frac{\mathrm{d}z}{2\sqrt{(xz-zz)}} - \frac{D}{3B}\frac{\mathrm{d}z}{\sqrt{(x-z)}} + \frac{D^2}{6B\sqrt{B}}\cdot\frac{z\mathrm{d}z}{\sqrt{(xz-zz)}} - \ldots:$$

and the fluent becomes $t = \frac{1}{2\sqrt{B}}\mathrm{arc}\ v\ \mathrm{sin.}\ \frac{2z}{x} - \frac{2D}{2B}\sqrt{(x-z)} + \frac{D^2}{6B\sqrt{B}}\left(\frac{1}{2}x\ \mathrm{arc}\ v\ \mathrm{sin.}\ \frac{2z}{x} - \sqrt{[xz-z^2]}\right)\ldots$; the value of which, taken from $z = 0$ to $z = x$, is $\frac{\pi}{2\sqrt{B}} - \frac{2D}{3B}\sqrt{x} + \frac{D^2}{6B\sqrt{B}}(\frac{1}{2}x\pi)\ldots$ If we now make τ negative, for the ascent of the pendulum, the co-efficients $\mathrm{P}, \mathrm{R}, \ldots, \mathrm{B}, \mathrm{D}, \ldots$, will change their signs, and the value of t will be $\frac{\pi}{2\sqrt{B}} + \frac{2D}{3B}\sqrt{x} + \frac{D^2}{12B\sqrt{B}}x\pi + \ldots$, the sum of both being $\frac{\pi}{\sqrt{B}} + \frac{D^2x\pi}{6B\sqrt{B}} + \ldots$, which is the time of a complete vibration, and the difference $\frac{4D}{3B}\sqrt{x} + \ldots$ The effect of the resistance on the whole time involves, therefore, only the second and the higher powers of the co-efficient of the resistance D; and it also disappears with the arc, as x, the square of the greatest velocity, becomes inconsiderable with respect to the velocity itself, and to the time $\frac{\pi}{\sqrt{B}}$.

THEOREM H. If $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2} + A\frac{\mathrm{d}s}{\mathrm{d}t} + Bs = 0$, $\mathrm{d}t$ being con-

Tides. stant, we have $e^{mt}(ds + asdt) = e$; m being $= \frac{1}{2}A \pm \sqrt{(\frac{1}{4}A^2 - B)}$, and $a = \frac{1}{2}A \mp \sqrt{(\frac{1}{4}A^2 - B)}$.

Demonstration. The fluxion of $e^{mt}(ds + asdt)$ is $e^{mt}(d^2s + adsdt + (mds + amsdt)dt) = e^{mt}(d^2s + (a + m)dsdt + amsdt^2)$; and, comparing this fluxion with the proposed equation, we have, for the co-efficients, $a + m = A$, and $am = B$; whence $\frac{B}{m} + m = A$, $m^2 - Am = -B$, $m = \frac{1}{2}A \pm \sqrt{(\frac{1}{4}A^2 - B)}$, and $a = \frac{1}{2}A \mp \sqrt{(\frac{1}{4}A^2 - B)}$.

Example. Let the equation proposed be that of a cycloidal pendulum, vibrating with a resistance proportional to the velocity; that is, $\frac{dds}{dt^2} + A\frac{ds}{dt} + Bs = 0$.

Scholium 1. The resistance is here adequately expressed, in all cases, by the term $A\frac{ds}{dt}$, so that the equation is permanently applicable to the successive vibrations. Thus, in the second descent, on the negative side of the vertical line, Bs being negative, and $-s$ becoming nearer to 0, the fluxion ds is positive, and $A\frac{ds}{dt}$ is of a contrary character to Bs, as it ought to be.

Solution. Since $m = \frac{1}{2}A \pm \sqrt{(\frac{1}{4}A^2 - B)}$, and $a = \frac{1}{2}A \mp \sqrt{(\frac{1}{4}A^2 - B)}$, it is obvious that the two radical quantities will be either possible or imaginary, according as $\frac{1}{4}A^2$ is greater or less than B.

Case i. If A^2 is greater than $4B$, the resistance being very considerable, the solution becomes

$$e^{\frac{1}{2}At \pm \sqrt{(\frac{1}{4}A^2 - B)t}}\left(\frac{ds}{dt} + [\tfrac{1}{2}A \mp \sqrt{(\tfrac{1}{4}A^2 - B)}]s\right) = c;$$

and the velocity $v = -\frac{ds}{dt} = (\frac{1}{2}A - \sqrt{[\frac{1}{4}A^2 - B]})s - ce^{\frac{1}{2}At - \sqrt{(\frac{1}{4}A^2 - B)t}} = (\frac{1}{2}A + \sqrt{[\frac{1}{4}A^2 - B]})s - c'e^{-\frac{1}{2}At + \sqrt{(\frac{1}{4}A^2 - B)t}}$; and if the velocity be supposed to vanish when $s = \lambda$, and $t = 0$, we have $0 = \frac{1}{2}A\lambda - \sqrt{(\frac{1}{4}A^2 - B)}\lambda - c = \frac{1}{2}A\lambda + \sqrt{(\frac{1}{4}A^2 - B)}\lambda - c$.

Corollary 1. Hence it appears that such a pendulum would require an infinite time to descend to the lowest point, since the velocity cannot have a finite value when s vanishes, the exponential quantity never becoming negative.

Scholium 2. The co-efficient B may also be written for an actual pendulum, as measured in English feet, $\frac{32}{l}$, or $\frac{2g}{l}$, if we call g the descent of a falling body in the first second, which is, however, denoted in the works of some authors by $\frac{1}{2}g$, or even by $\frac{1}{4}g$. If we make $\frac{dds}{dt^2} + \frac{32}{l}s = 0$; when $s = l$, the force becomes such that $-d^2s = 32dt^2$, and $-\frac{ds}{dt} = 32$, which is the true velocity generated by such a force in a second of time. Supposing k to be the velocity with which the resistance would become equal to the weight, we must have for $A\frac{ds}{dt}$, $\frac{32}{k}\frac{ds}{dt}$, in order that the force represented by A may become equal to that of gravity, and $A = \frac{2g}{k}$; and if h be the height from which a body must fall to gain the velocity k, since $h = \frac{k^2}{4g}$, $A^2 = \frac{4gg}{kk} = \frac{g}{h}$. Tides. Hence it follows, that when $A^2 = 4B$, which is the time of the possibility of alternate vibrations, $\frac{g}{h} = \frac{8g}{l}$, and $h = \frac{1}{8}l$, the resistance becoming equal to the weight when the body has fallen freely through one eighth of the length of the pendulum.

Case ii. Supposing now the resistance to be more moderate, and $\frac{1}{4}A^2$ to be less than B, and making $B - \frac{1}{4}A^2 = C^2$; we shall have $\sqrt{(\frac{1}{4}A^2 - B)} = \sqrt{(-C^2)} = \sqrt{-1}\,C$; the solution of the equation, $\frac{dds}{dt^2} + A\frac{ds}{dt} + Bs = 0$, will then be $d\left(e^{\frac{1}{2}At \pm \sqrt{-1}Ct}\left[\frac{ds}{dt} + \frac{1}{2}As \mp \sqrt{-1}\,Cs\right]\right) = 0$; whence, by taking the two different values in succession, and adding together their halves, we obtain $d\left(e^{\frac{1}{2}At}\left[\frac{e^{\sqrt{-1}Ct} + e^{-\sqrt{-1}Ct}}{2}(ds + \frac{1}{2}As) + \frac{e^{-\sqrt{-1}Ct} - e^{\sqrt{-1}Ct}}{2}\sqrt{-1}\,Cs\right]\right) = 0$; or, since $\sqrt{-1} = \frac{-1}{\sqrt{-1}}$, $\frac{e^{\sqrt{-1}Ct} + e^{-\sqrt{-1}Ct}}{2}\left(\frac{ds}{dt} + \frac{1}{2}As\right) + \frac{e^{\sqrt{-1}Ct} - e^{-\sqrt{-1}Ct}}{2\sqrt{-1}}Cs = ce^{-\frac{1}{2}At}$. Now the imaginary exponential quantities, thus combined, are the well-known expressions for the sine and cosine of the arc Ct (*Elem. Illustr.* § 358); and the last equation may be written thus, cos. $Ct\left(\frac{ds}{dt} + \frac{1}{2}As\right)$ + sin. $CtCs = ce^{-\frac{1}{2}At}$; whence $v = -\frac{ds}{dt} = \frac{1}{2}As + \frac{\text{sin. } Ct}{\text{cos. } Ct}Cs - \frac{ce^{-\frac{1}{2}At}}{\text{cos. } Ct}$. This fluent, if t were made to begin when $v = 0$, would only afford us such expressions as have hitherto been found intractable; but nothing obliges us to limit the problem to this condition, and it is equally allowable to make the time t begin when $v = \frac{1}{2}As$, the corresponding value of s being called ς, then $\frac{1}{2}A\varsigma = v = \frac{1}{2}As - c$; consequently $c = 0$. The equation will then become $\frac{ds}{s} + \left(C\frac{\text{sin.}}{\text{cos.}}Ct + \frac{1}{2}A\right)dt = 0$; whence hl s — hl cos. $Ct = c' - \frac{1}{2}At =$ hl $\frac{s}{\text{cos. } Ct}$, and $\frac{s}{\text{cos. } Ct} = e^{c' - \frac{1}{2}At}$, or $s = \text{cos. } Ct \cdot e^{c' - \frac{1}{2}At}$; and, when $t = 0$, $s = e^{c'} = \varsigma$; consequently $\frac{s}{\varsigma} = \text{cos. } Ct \cdot e^{-\frac{1}{2}At} = \text{cos. } Ct\left(1 - \frac{1}{2}At + \frac{1}{8}A^2t^2 - \frac{1}{48}A^3t^3 + \ldots\right)$. But since $v = -ds = s\left(C\frac{\text{sin.}}{\text{cos.}}Ct \cdot dt + \frac{1}{2}Adt\right)$, it follows that v must vanish whenever $C\frac{\text{sin.}}{\text{cos.}}Ct + \frac{1}{2}A = 0$, or when ta. $Ct = \frac{-A}{2C}$, that is, in the first instance, very nearly when $Ct = \frac{-A}{2C}$, and $t = \frac{-A}{2CC}$, and $-\frac{1}{2}At = \frac{AA}{4CC}$, and $e^{-\frac{1}{2}At} = 1 + \frac{AA}{4CC}$, very nearly; so that, calling the primitive extent of the arc of vibration $s = \lambda$, we have $\frac{\lambda}{\varsigma} = \text{cos. } Ct\left(1 + \frac{AA}{4CC}\right)$; cos. Ct

Tides. being also, in this case, $= \sqrt{\left(1-\frac{AA}{4CC}\right)} = 1-\frac{AA}{8CC}$, and $\frac{\lambda}{\varsigma} = 1+\frac{AA}{8CC}$, and $\frac{\varsigma}{\lambda} = \frac{8CC}{8CC+AA} = \frac{8B-2AA}{8B-AA} = 1-\frac{AA}{8B-AA}$, corresponding to the verse sine of the time $\frac{-A}{2C}$, or to the arc $\frac{-A}{2C}$, in the circle represented by Ct.

Corollary 2. It follows that both v and s must vanish continually at equal successive intervals, whenever ta. $Ct = \frac{-A}{2C}$, and when cos. $Ct = 0$, respectively; the descent to the lowest point will therefore occupy the time corresponding to $\frac{\pi}{4}+\frac{A}{2C}$, and the subsequent ascent to $\frac{\pi}{4}-\frac{A}{2C}$: the extent of the vibrations being always proportional to $e^{-\frac{1}{2}At}$.

Corollary 3. The greatest velocity must take place at the point where $A\frac{ds}{dt}+Bs=0$, and AC ta. $Ct+\frac{1}{2}A^2=B$, or ta. $Ct=\frac{B-\frac{1}{2}AA}{AC}$, and cot. $Ct=\frac{AC}{B-\frac{1}{2}AA}$, or, if we neglect A^2, cot. $Ct=\frac{A}{\sqrt{B}}=$ cos. $Ct=\frac{s}{\varsigma}$, very nearly.

Corollary 4. The diminution of the successive vibrations is expressed by the multiplier $e^{-\frac{1}{2}At}$, which, when $Ct=2\pi$, the whole circumference, is $1-\frac{A}{C}\pi$, and $\frac{A}{C}\pi\lambda$, or $\frac{A\pi\lambda}{\sqrt{B}}$ is the diminution of the value of s when the pendulum returns to the place from which it first set out, that is, the difference between the lengths of two vibrations, each corresponding to a semicircumference, and this difference is to $\frac{A}{\sqrt{B}}\varsigma$, or $\frac{A}{\sqrt{B}}\lambda$, the displacement of the point of greatest velocity, which measures the greatest resistance, as π to 1, or as 3·1416 to 1. We have seen that, for a resistance varying as the square of the velocity, this proportion was as 8 to 3, or as 2·667 to 1.

Corollary 5. If the pendulum be supposed to vibrate in a second, the unity of time, the diminution of the arc 2λ in each vibration will be $\frac{1}{2}A\times 2\lambda$, and the successive lengths will vary as $e^{-\frac{1}{2}A}\,2\lambda$, $e^{-A}\,2\lambda$, and so forth; and after the number N of vibrations, the extent of the arc will be reduced from 2λ to $e^{-\frac{1}{2}NA}\,2\lambda$; so that if we make $e^{-\frac{1}{2}NA} = M$, we have hl$M = -\frac{1}{2}NA$, and $A=\frac{2}{N}\text{hl}\frac{1}{M}$. Thus, if in an hour the vibrations were reduced to $\frac{2}{3}$ of their extent, which is rather more than appears to have happened in any of Captain Kater's experiments, we should have $N = 3600$, and $M=\frac{2}{3}$, whence $A=\frac{1}{1800}\times 4054651 = 00022526$, and $A^2 = 000\,000\,050\,75$; and since $B = \frac{32}{l} = 9{\cdot}81$, $C=\sqrt{(B-\frac{1}{4}A^2)} = \sqrt{B}\sqrt{\left(1-\frac{AA}{4B}\right)} = \sqrt{B}\left(1-\frac{AA}{8B}\right) = \sqrt{B}\left(1-\frac{AA}{78{\cdot}5}\right)$; the fraction being only $= 000\,000\,000\,65$; or about one second in 1600 millions, that is, in about fifty years.

Scholium 3. Although the isochronism of a pendulum, with a resistance proportional to the velocity, was demonstrated by Newton, yet Euler appears to have failed in his attempts to carry the theory of such vibrations to perfection; for he observes (*Mechan.* ii. p. 312), *Etsi ex his appareat, tempora tam ascensuum quam descensuum inter se esse æqualia, tamen determinari non potest, quantum sit tempus sive descensuum sive ascensuum: neque etiam tempora descensuum et ascensuum inter se possunt comparari. Æquatio enim rationem inter* s *et* u *definiens ita est complicata, ut ex ea elementum temporis* $\frac{ds}{u}$, *per unicam variabilem non possit exprimi.* Tides.

Scholium 4. In confirmation of the solution that has been here proposed, it may not be superfluous to show the truth of the result in a different manner. Taking $s=\varsigma e^{mt}$ cos. Ct, we have $\frac{ds}{dt}=\varsigma e^{mt}$ (m cos. Ct — C sin. Ct), and $\frac{dds}{dt^2}=\varsigma e^{mt}$ (m^2 cos. Ct — Cm sin. Ct — Cm sin. Ct — C^2 cos. Ct); whence $\frac{dds}{dt^2}+A\frac{ds}{dt}+Bs=\varsigma e^{mt}$ (m^2 cos. Ct — 2 Cm sin. Ct — C^2 cos. Ct + Am cos. Ct — AC sin. Ct + B cos. Ct) = 0, and (m^2 — C^2 + Am + B) cos. Ct — (2Cm + AC) sin. Ct = 0: an equation which is obviously true when the co-officients of both its terms vanish, and $2Cm = -AC$, or $m=\frac{1}{2}A$; and again $C^2 = m^2+Am+B = \frac{1}{4}A^2-\frac{1}{2}A^2+B = B-\frac{1}{4}A^2$. The former mode of investigation is more general, and more strictly analytical; but this latter is of readier application in more complicated cases, and it will hereafter be further pursued.

Lemma. If a moveable body be actuated continually by a force equal to that which acts on a given pendulum, the body being in a state of rest when the pendulum is at the middle of its vibration, the space described in the time of a vibration will be to the length of the pendulum as the circumference of a circle is to its diameter. For the force being represented by cos. Ct, or cos. x, for the pendulum, it will become sin. x with regard to the beginning of the supposed motion, and the velocity, instead of sin. x, becomes — cos. x, or 1 — cos. x; so that the space, instead of 1 — cos. x, is x — sin. x, which, at the end of the semivibration, is $x=\frac{\pi}{2}$, instead of 1 — cos. x = 1, the space described by the simple pendulum, which is equal to its length.

Scholium 5. There is a paradox in the relations of the diminution of the vibration to the distance measuring the greatest resistance, which it will be worth while to consider, in order to guard ourselves against the too hasty adoption of some methods of approximation which appear at first sight unexceptionable. The pendulum, if it set out from a state of rest at the point of greatest resistance, would perform a vibration to the extent of double the distance of that point, or $2\frac{A}{\sqrt{B}}\lambda$, the initial force being measured by that distance. Now, when the resistance is very small, its magnitude may be obtained without sensible error from the velocity of the pendulum vibrating without resistance at the corresponding part of the arc; and the velocity may be supposed to vary as sin. Ct, and the resistance, in the case of this proposition, as sin. Ct or sin. x also. Hence it may be inferred by means of the Lemma, that the whole diminution of the space will be to $\frac{A}{\sqrt{B}}\lambda$ as π to 1, or that it will be equal to $\frac{A}{\sqrt{B}}\pi\lambda$, which has already

Tides. been found to be the actual difference of two successive semivibrations. The accuracy of this result, however, must depend on the mutual compensation of its errors; for the approximation supposes, that if the resistance vanished at the lowest point, the subsequent retardation would be such as to diminish the space by the effect of the diminution of the velocity acting uniformly through the remainder of the vibration, while in fact the diminution of the space from this cause would be simply equal to a part of the arc proportional to the diminution of the velocity, since the arc of ascent is simply as the velocity at the lowest point. Hence it is obvious, that the effects of the resistance are too much complicated with the progress of the vibration to allow us to calculate them separately; and accordingly, when the resistance is as the square of the velocity, or as $\sin.^2 x$, the diminution of velocity is expressed by $\frac{1}{2}x - \frac{1}{2}$ sin. cos. x, and that of the space by $\frac{1}{4}x^2 - \frac{1}{4}\sin.^2 x$, which, at the end of a vibration, becomes $\frac{1}{4}\pi^2$ instead of π; that is, since the distance of the point of greatest velocity is here $\varsigma = D\lambda^2$, $\frac{1}{4}\pi^2 D\lambda^2 = 2{\cdot}467\ D\lambda^2$, while the more accurate mode of computation has shown that the true diminution of the space is $2{\cdot}667\ D\lambda^2$. (Theorem G.) If we chose to pursue the mode of approximation here suggested, with accuracy, it would be necessary to consider the resistance as a periodical force acting on a pendulum capable of a synchronous vibration, as hereafter in Theorem K, Schol. 1.

THEOREM J. If $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2} + Bs + M \sin. Ft = 0$, we may satisfy the equation by taking $s = \sin.(\sqrt{B}.t) + \frac{M}{FF - B} \sin. Ft$.

Demonstration. The value of s here assigned gives us $\frac{\mathrm{d}s}{\mathrm{d}t} = \sqrt{B} \cos. \sqrt{B}t + \frac{MF}{FF-B} \cos. Ft$, and $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2} = -B \sin. \sqrt{B}t - \frac{MFF}{FF-B} \sin. Ft$; so that $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2} + Bs = B \sin. \sqrt{B}t + \frac{MB}{FF-B} \sin. Ft - B \sin. \sqrt{B}t - \frac{MFF}{FF-B} \sin. Ft = \frac{MB - MFF}{FF-B} \sin. Ft = -M \sin. Ft$.

Corollary 1. If, in order to generalize this solution, we make $s = \alpha \sin. \sqrt{B}t + \beta \cos. \sqrt{B}t + \gamma \sin. Ft + \varepsilon \cos. Ft$, we may take any quantities at pleasure for α and β, according to the conditions of the particular case to be investigated; but ε must be $= 0$; that is, the motion will always be compounded of two vibrations, the one dependent on the length of the pendulum, or on the time required for the free vibration, indicated by $\sqrt{B}t$, the other synchronous with Ft, the period of the force denoted by M; the latter only being limited to the condition of beginning and ending with the periodical force.

Corollary 2. In the same manner, it may be shown that the addition of any number of separate periodical forces, indicated by the terms M' sin. $F't$, M'' sin. $F''t$, ..., will add to the solution the quantities $\frac{M'}{F'F' - B} \sin. F't$ $\frac{M''}{F''F'' - B} \sin. F''t$, and so forth.

Example 1. Supposing a pendulum to be suspended on a vibrating centre, and to pass the vertical line at the same moment with the centre, we may make α and $\beta = 0$, and $s = \frac{M}{FF - B} \sin. Ft$ only; the vibration being either direct or reversed, according as F is less or greater than $\sqrt{B}$, or than $\sqrt{\frac{32}{l}}$, which determines the spontaneous vibration of the pendulum. Tides.

Example 2. But if the ball of the pendulum be supposed to begin its motion at the moment that the centre of suspension passes the vertical line, we must make $s = \frac{M}{FF-B}$ (sin. Ft — cos. $\sqrt{B}t$); and the subsequent motion of the pendulum will then be represented by the sum of the sines of two unequal arcs in the same circle; and if these arcs are commensurate with each other, the vibration will ultimately acquire a double extent, and nearly disappear in a continued succession of periods, provided that no resistance interfere. And the consequences of any other initial conditions may be investigated in a manner nearly similar. Thus, if the time of free vibration, under these circumstances, were $\frac{1}{3}$ of the periodical time, the free vibration, in which the motion must be supposed initially retrograde, in order to represent a state of rest by its combination with the fixed vibration, would have arrived at its greatest excursion forwards, after three semivibrations, at the same moment with the fixed vibration, and after three complete vibrations more would be at its greatest distance in the opposite direction, so as to increase every subsequent vibration equally on each side, and permanently to combine the whole extent of the separate arcs of vibration. But in this and in every other similar vibration, beginning from a state of rest in the vertical line, that is, at the point where the periodical force is evanescent, the effect of the free or subordinate vibration with respect to the place of the body will obviously disappear whenever an entire number of semivibrations has been performed.

Corollary 3. The paradox stated in the fourth scholium on the last theorem may be illustrated by means of this proposition, and will serve in its turn to justify the mode of computation here employed in a remarkable manner. It has been observed in Nicholson's Journal for July 1813, that the mode of investigating the effects of variable forces, by resolving them into parts represented by the sines of multiple arcs, and considering the vibrations derived from each term as independent in their progress, but united in their effects, may be applied to the problem of a pendulum vibrating with a resistance proportional to the square of the velocity; and that for this purpose the square of the sine may be represented by the series $\sin.^2 x = {\cdot}8484 \sin. x - {\cdot}1696 \sin. 3x - {\cdot}0244 \sin. 5x - {\cdot}00813 \sin. 7x - {\cdot}0029 \sin. 9x - {\cdot}0013 \sin. 11x - \ldots$ Now, if we employ this series for resolving the resistance supposed in Theorem G into a number of independent forces, the greatest resistance being measured by $\frac{A}{\sqrt{B}}\lambda$, we shall have ${\cdot}8484 \frac{A}{\sqrt{B}}\lambda$ for the part supposed to be simply proportional to the velocity, whence, from Theorem H, we have ${\cdot}8484 \frac{A}{\sqrt{B}}\lambda$ for the corresponding diminution of the vibration; that is, $2{\cdot}6653 \frac{A}{\sqrt{B}}\lambda$. But it has been observed, in the preceding corollary, that the *place* of the pendulum will not be at all affected by any subordinate vibration after any entire number of complete semivibrations; and the slight effect of the *velocity* left in consequence of these subordinate vibrations may here be safely neglected, so that $2{\cdot}6653 \frac{A}{\sqrt{B}}\lambda$ may be considered as the whole effect of the resistance with respect to the space described, which differs only by $\frac{1}{2000}$ of

Tides. the whole from $2{\cdot}666\frac{A}{\sqrt{B}}\lambda$, the result of the more direct computation of Theorem G.

Scholium. An experimental illustration of the accuracy of the theorem may be found in the sympathetic vibrations of clocks, and in that of the inverted pendulum invented by Mr Hardy, as a test of the steadiness of a support (art. PENDULUM, vol. xvii. p. 218); for since the extent of the regular periodical vibration is measured by $\frac{M}{FF-B}$, it is evident, that however small the quantity M may be, it will become very considerable when divided by $FF-B$, as F and $\sqrt{B}$ approach to each other; and accordingly it is observed, that when the inverted pendulum is well adjusted to the rate of a clock, there is no pillar so steady as not to communicate to it a very perceptible motion by its regular, though extremely minute, and otherwise imperceptible change of place.

THEOREM K. In order to determine the effect of a periodical force, with a resistance proportional to the velocity, the equation $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t}+A\frac{\mathrm{d}s}{\mathrm{d}t}+Bs=M\sin. Gt=0$, may be satisfied by taking $s=\alpha\sin. Gt+\beta\cos. Gt$, α being $=\frac{GG-B}{(GG-B)^2+AAGG}M$, and $\beta=\frac{AGM}{(GG-B)^2+AAGG}$; s being also $=\sqrt{(\alpha^2+\beta^2)}\sin.\left(Gt+\text{arc ta.}\frac{\beta}{\alpha}\right)=\frac{M}{\sqrt{([GG-B]^2+AAGG)}}\sin.\left(Gt-\text{arc ta.}\frac{AG}{B-GG}\right)$.

Since $s=\alpha\sin. Gt+\beta\cos. Gt$, $\frac{\mathrm{d}s}{\mathrm{d}t}=\alpha G\cos. Gt-\beta G\sin. Gt$, and $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2}=-\alpha G^2\sin. Gt-\beta G^2\cos. Gt=-G^2s$; consequently the equation becomes $(B-G^2)(\alpha\sin. Gt+\beta\cos. Gt)+\alpha AG\cos. Gt-\beta AG\sin. Gt+M\sin. Gt=0$, and $(B-G^2)\alpha-\beta AG+M=0$, and $(B-G^2)\beta+\alpha AG=0$; whence $\frac{\beta}{\alpha}=\frac{AG}{GG-B}$, also $\beta=\frac{M-(GG-B)\alpha}{AG}=\frac{\alpha AG}{GG-B}$ and $(G^2-B)M-(G^2-B)^2\alpha=\alpha A^2G^2$; consequently $\alpha=\frac{(GG-B)M}{(GG-B)^2+A^2G^2}$, and $\beta=\frac{AGM}{(GG-B)^2+A^2G^2}$. And since, in general, if $b=$ ta. B, $\sin. x+b\cos. x=\sqrt{(1+b^2)}\sin.(x+\text{B})$; $\sin.(x+\text{B})$ being $=\sin. x\cos. \text{B}+\sin. \text{B}\cos. x=\cos. \text{B}(\sin. x+\text{ta. B}\cos. x)$, and therefore $\sin. x+\text{ta. B}\cos. x=\frac{\sin.(x+\text{B})}{\cos. \text{B}}=\sin.(x+\text{B})\sec. \text{B}=\sin.(x+\text{B})\sqrt{(1+b^2)}$: it follows that $\alpha\sin. Gt+\beta\cos. Gt=\alpha\left(\sin. Gt+\text{arc ta.}\frac{\beta}{\alpha}\right)\sqrt{\left(1+\frac{\beta\beta}{\alpha\alpha}\right)}$; and $\alpha\sqrt{\left(1+\frac{\beta\beta}{\alpha\alpha}\right)}=\sqrt{(\alpha^2+\beta^2)}=\sqrt{\frac{(GG-B)^2+A^2G^2}{([GG-B]^2+A^2G^2)^2}}M=\frac{M}{\sqrt{([GG-B]^2+A^2G^2)}}$.

Corollary. If we put $M\cos. Gt$ instead of $M\sin. Gt$, we shall have $s=\alpha'\sin. Gt+\beta'\cos. Gt$; α' being $=\beta=\frac{AGM}{(GG-B)^2+A^2G^2}$ and $\beta'=-\alpha=\frac{B-GG}{(GG-B)^2+AAGG}M$, and $s=\sqrt{(\alpha'^2+\beta'^2)}\sin.\left(Gt+\text{arc ta.}\frac{\beta'}{\alpha'}\right)=\sqrt{(\alpha^2+\beta^2)}\sin.\left(Gt+\text{arc ta.}\frac{B-GG}{AG}\right)$. Tides.

Scholium 1. Supposing B to approach very near to G^2, a case very likely to occur in nature, because the effects which are produced, where it is found, will predominate over others, on account of the minuteness of the divisor; we may neglect the part of the denominator $(G^2-B)^2$, in comparison with A^2G^2, and the co-efficient determining s will then become $\frac{M}{AG}$, the extent of the vibrations being inversely as A the co-efficient of the resistance; and, indeed, when the whole force of the periodical vibration is expended in overcoming a resistance proportional to the velocity, it may naturally be imagined that the velocity should be inversely as the resistance. It follows also from the proposition, that in this case the arc ta. $\frac{AG}{B-GG}$ approaching to a quadrant, the greatest excursions of the periodical motion and of the free vibration will differ nearly one fourth of the time of a complete vibration from each other.

Scholium 2. Since s is a line, and B its numerical co-efficient, making it represent a force, and since $\sin. Gt$ is properly a number also, the co-efficient M, both here and in Theorem J, must be supposed to include another linear co-efficient, as μ, which converts the sine into a line, to be added to s, the distance from the middle point; that is, M must be considered as representing $B\mu$, in which μ is the true extent of the periodical change of the centre of suspension, and $B=\frac{2g}{l}$, as in other cases; so that M is $=\frac{2g}{l}\mu=32\frac{\mu}{l}$, and $\mu=\frac{Ml}{2g}=\frac{1}{32}Ml$.

Corollary. In order to obtain a more general solution of the problem, we may combine the periodical motion thus determined with the free vibrations, as computed in Theorem H, the different motions, as well as the resistances, being totally independent of each other; but the most interesting cases are those which are simply periodical, the free vibration gradually diminishing with the multiplier e^{-mt}, and ultimately disappearing.

THEOREM L. If there are several periodical forces, the equation $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2}+A\frac{ds}{\mathrm{d}t}+Bs+M\sin. Gt+N\sin. Ft+\ldots=0$, may be satisfied by taking $s=\alpha\sin. Gt+\beta\cos. Gt+\alpha'\sin. Ft+\beta'\cos. Ft+\ldots=\frac{M}{\sqrt{([G^2-B]^2+A^2G^2)}}\sin.\left(Gt-\text{arc ta.}\frac{AG}{B-GG}\right)+\frac{N}{\sqrt{([F-B]^2+A^2F^2)}}\sin.\left(Ft-\text{arc ta.}\frac{AF}{B-FF}\right)+\ldots$

For, the equations expressing the space described being simply linear, the different motions and resistances are added or subtracted without any alteration of the respective relations and effects.

Scholium. A free vibration may also be combined with this compound periodical vibration, by means of Theorem H; but it will gradually disappear by the effect of the resistance.

Lemma. For the addition of the arcs a and b, beginning with the well-known equation $\sin.(a\pm b)=\sin. a\cos. b\pm\sin. b\cos. a$, we have, by addition, $\sin.(a+b)+\sin.(a-b)=2\sin. a\cos. b$, and $\sin. a\cos. b=\frac{1}{2}\sin.(a+b)+\frac{1}{2}\sin.(a-b)$. Then, if $c=b+90°$, $\cos. b=\sin. c$, whence $\sin. a\sin. c=\frac{1}{2}\sin.(a+c-90°)+\frac{1}{2}\sin.(a-c+90°)$; but $\sin.(x+90°)=\cos. x$ and $\sin.(x-90°)=-\cos. x$, consequently $\sin. a\sin. c=\frac{1}{2}\cos.(a-c)-\frac{1}{2}\cos.(a+c)$.

Tides. Again, if $c = a - 90°$, cos. c = sin. a, and cos. c cos. $b = \frac{1}{2}$ sin. $(a+b) + \frac{1}{2}$ sin. $(a-b) = \frac{1}{2}$ sin. $(c + 90° + b) + \frac{1}{2}$ sin. $(c + 90° - b) = \frac{1}{2}$ cos. $(c+b) + \frac{1}{2}$ cos. $(c-b)$. Also, since cos. a cos. $b = \frac{1}{2}$ cos. $(a+b) + \frac{1}{2}$ cos. $(a-b)$, and sin. a sin. $b = \frac{1}{2}$ cos. $(a-b) - \frac{1}{2}$ cos. $(a+b)$, we have, by subtraction, cos. $(a+b)$ = cos. a cos. b — sin. a sin. b, and, by addition, cos. $(a-b)$ = cos. a cos. b + sin. a sin. b.

Corollary. If $a + b = c$ and $a - b = d$, cos. c + cos. $d = 2 \cos. \frac{c+d}{2} \cos. \frac{c-d}{2}$; and cos. d — cos. $c = 2 \sin. \frac{c+d}{2} \cos. \frac{c-d}{2}$; also sin. a + sin. $b = 2 \sin. \frac{a+b}{2} \cos. \frac{a-b}{2}$; and sin. a — sin. b = sin. a + sin. $(-b) = 2 \sin. \frac{a-b}{2} \cos. \frac{a+b}{2}$.

THEOREM M. The equation, $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2} + A\frac{\mathrm{d}s}{\mathrm{d}t} + Bs + R$ sin. Ft sin. $Gt = 0$, may be solved by taking $s = \alpha$ sin. $([F-G]t + p) - \beta$ sin. $([F+G]t + q)$; α being

$$\frac{\frac{1}{2}R}{\sqrt{([(F-G)^2 - B]^2 + A^2(F-G)^2)'}}$$

$$\beta = \frac{\frac{1}{2}R}{\sqrt{([(F+G)^2 - B]^2 + A^2(F+G)^2)'}}$$

p = arc ta. $\frac{B-(F-G)^2}{A(F-G)}$, and q = arc ta. $\frac{B-(F+G)^2}{A(F+G)}$.

For since sin. Ft sin. $Gt = \frac{1}{2}$ cos. $(F-G)t - \frac{1}{2}$ cos. $(F+G)t$, the equation becomes $\frac{\mathrm{d}\mathrm{d}s}{\mathrm{d}t^2} + A\frac{\mathrm{d}s}{\mathrm{d}t} + Bs - \frac{1}{2}R$ cos. $(F+G)t + \frac{1}{2}R$ cos. $(F-G)t = 0$; whence we obtain the solution by comparison with Theorem K and its corollary.

SECT. IV.—*Astronomical Determination of the Periodical Forces which Act on the Sea or on a Lake.*

In order to compute, by means of the theory which has been laid down in the two preceding sections, the primitive tides of any sea or any portion of the ocean, we must compare its spontaneous oscillations with those of a narrow prismatic canal, situated in a given direction with respect to the meridian, which in general must be that of the greatest length of the sea in question, neglecting altogether the actual breadth of the sea, which, if considerable, may require to have its own distinct vibrations compounded with those of the length, each being first computed independently of the other. Now, supposing the time required for the principal spontaneous oscillation of the sea or lake to be known, we must find the length of the synchronous pendulum, and taking $B = \frac{2g}{l} = \frac{32}{l}$, we must next find a series for expressing the force in terms of the sine, or cosines of multiple arcs, increasing uniformly with the time.

Now the force is measured, for the direction of the meridian of the spheroid of equilibrium, by sin. cos. z (Theorem A), z being either the zenith distance or the altitude; and it is obvious that, when the canal is situated obliquely with respect to the meridian of the spheroid, the inclination of the surface, and with it the force, will be diminished as the secant of the obliquity increases, or as the cosine of the obliquity diminishes; so that the force will vary as sin. cos. *Alt.* sin. *Az.* if the canal be in an easterly and westerly direction; or if it deviate from that direction in a given angle, as sin. cos. *Alt.* sin. (*Az.* + *Dev.*): and it is obvious that this force will vanish both when the luminary is in the horizon, and when it is in the vertical circle, perpendicular to the direction of the canal; that is, if we consider the force as acting horizontally on a particle at the middle of the length of the given canal; and the same force may be considered as acting vertically, with a proper reduction of its magnitude, at the end of the canal; for the horizontal oscillations at the middle must obviously follow the same laws as the vertical motions at the end. Tides.

The case, however, of a canal running east and west, admits a very remarkable simplification; and since it approaches nearly to that of an open ocean, which has been most commonly considered, it will be amply sufficient for the illustration of the present theory. For, in general, sin. *Az.* $= \frac{\text{cos. } Decl. \text{ sin. } Hor. \angle}{\text{cos. } Alt.}$, and the expression, sin. cos. *Alt.* sin. *Az.*, becomes in this case sin. *Alt.* cos. *Decl.* sin. *Hor.* $\angle$. But sin. *Alt.* = sin. (*Lat.*) sin. *Decl.* + cos. (*Lat.*) cos. *Decl.* cos. *Hor.* $\angle$, and calling sin. (*Lat.*) for the given canal L, and cos. (*Lat.*) L′, the force becomes L sin. cos. *Decl.* sin. *Hor.* $\angle$ + L′ cos.^{2} *Decl.* sin. cos. *Hor.* $\angle$. Now, sin. *Decl.* = cos. *Obl. Ecl.* sin. *Lat.* + sin. *Obl. Ecl.* cos. *Lat.* sin. *Long.*; and since cos. $\varphi = 1 - \frac{1}{2}\sin.^2 \varphi + \frac{3}{8}\sin.^4 \varphi - \frac{5}{16}\sin.^6 \varphi + \ldots$, the true value of cos. *Decl.* might be expressed, if required, by means of this series, and its second and fourth powers would in general be sufficient for the computation.

But it will be more convenient to suppose the sun and moon to move in the ecliptic, and the ecliptic to be at the same time so little inclined to the equator, that the longitude may be substituted for the right ascension; a substitution which will cause but little alteration in the common phenomena of the tides. Then, if the sun's longitude be ☉, and the moon's ☽, the horary angles t and t', and the sine of the obliquity of the ecliptic α, we shall have sin. *Decl.* = α sin. ☉, or α sin. ☽; and cos. *Decl.* = $1 - \sin.^2 Decl. + \frac{3}{8}\sin.^4 Decl. = 1 - \frac{1}{2}\alpha^2 \sin.^2 ☉ + \frac{3}{8}\alpha^4 \sin.^4 ☉ \ldots$, and sin. cos. *Decl.* = α sin. ☉ $- \frac{1}{2}\alpha^3 \sin.^3 ☉ + \frac{3}{8}\alpha^5 \sin.^5 ☉ \ldots$; also cos.^{2} *Decl.* = $1 - \alpha^2 \sin.^2 ☉$; whence the sun's force becomes L sin. t (α sin. ☉ $- \frac{1}{2}\alpha^3 \sin.^3 ☉ + \frac{3}{8}\alpha^5 \sin.^5 ☉ \ldots$) + L′ $\frac{1}{2}$ sin. $2t$ ($1 - \alpha^2 \sin.^2 ☉$) = L sin. $t \left(\alpha \text{ sin. } ☉ - \frac{1}{2}\alpha^3 \left(\frac{3}{4}\text{sin. } ☉ - \frac{1}{4}\text{sin. } 3 ☉\right) + \frac{3}{8}\alpha^5 \left[\frac{5}{8}\text{sin. } ☉ - \frac{5}{16}\text{sin. } 3 ☉ + \frac{1}{16}\text{sin. } 5 ☉\right]\right) + \frac{1}{2}$L′ sin. $2t(1 - \frac{1}{2}\alpha^2 + \frac{1}{2}\alpha^2 \text{ cos. } 2 ☉) = $ L sin. t (α' sin. ☉ + α'' sin. 3 ☉ + α''' sin. 5 ☉) + ($\frac{1}{2}$ L − $\frac{1}{4}$ L′ α^2) sin. $2t$ + $\frac{1}{4}$ L′ α^2 sin. $2t$ cos. 2☉; α' being $= \alpha - \frac{3}{8}\alpha^3 + \frac{15}{64}\alpha^5 \ldots$; or about ·3645; $\alpha'' = \frac{1}{8}\alpha^3 - \frac{15}{128}\alpha^5 \ldots =$ ·0078, and $\alpha''' = \frac{3}{128}\alpha^5 \ldots =$ ·00002, and $\alpha^2 =$ ·1585. But sin. t sin. ☉ = $\frac{1}{2}$ cos. $(t - ☉) - \frac{1}{2}$ cos. $(t + ☉)$, and sin. 2 t cos. 2 ☉ = $\frac{1}{2}$ sin. 2 $(t + ☉) + \frac{1}{2}$ sin. 2 $(t - ☉)$. Hence the sun's force becomes S $\left(\text{L } \alpha' [\frac{1}{2}\text{ cos. } (t - ☉) - \frac{1}{2}\text{ cos. } (t + ☉)] + \text{L } \alpha'' [\frac{1}{2}\text{ cos. } (t - 3☉) - \frac{1}{2}\text{ cos. } (t + 3☉)] + \text{L } \alpha''' [\frac{1}{2}\text{ cos. } (t - 5☉) - \frac{1}{2}\text{ cos. } (t + 5☉)] + \frac{\text{L}'}{2}(1 - \frac{1}{2}\alpha^2) \text{ sin. } 2t + \frac{\text{L}'}{4}\alpha^2 [\frac{1}{2}\text{sin. } 2(t + ☉) + \frac{1}{2}\text{ sin. } 2(t - ☉)]\right)$; and that of the moon may be expressed in the same manner, by substituting M, t', and ☽, for S, t, and ☉.

Tides. The effect of that part of the hydraulic resistance, which is proportional to the square of the velocity, must be expressed by an approximation deduced from the periodical character of the force, as depending on that of the primitive forces concerned; taking, however, the precaution to use such expressions only as will always represent this resistance in its proper character as a retarding force: for if we simply found for it an equivalent expression, denoting accurately the square of the velocity, this square, being always positive, would imply a force acting always in the same direction. Now, we have already seen (Theorem J, Cor. 3), that $\sin.^2 x$ may be considered, with respect to its principal effect, as equivalent to ·8484 sin. x: and if we neglect, in the determination of the resistance, the effect of the smaller forces, and compute only that of the principal terms $\frac{1}{2}$ L′ sin. $2t$, and $\frac{1}{2}$ L′ sin. $2t'$, we may call the velocities depending on these forces S' cos. $(2t + s')$ and M' cos. $(2t' + m')$; S' and M' representing not exactly the proportion of the primitive forces of the sun and moon, but that of the tides depending on their combination with the conditions of the given sea or lake. The resistance will then be as the square of S' [cos. $(2t + s')$ + cos. $(2t' + m')$] + $(M' - S')$ cos. $(2t' + m')$; and when least, it will be $D(M' - S')^2$, and when greatest, $D(M' + S')^2$, the difference being $4DM'S'$; so that the difference may be sufficiently represented by $4DM'S'$ [cos. $(2t + s')$ + cos. $(2t' + m')$] × ·8484, or rather × $(\cdot 8484)^2$, because the value of cos. t + cos. $t' = 2$ cos. $\frac{t + t'}{2}$ cos. $\frac{t - t'}{2}$, which is to be squared, requires the reduction from 1 to ·8484 for each of its factors; and in this manner we obtain a perfect representation of the period and quality of the resistance, and a very near approximation to its magnitude.

It will, however, be still more accurate to consider the resistance thus determined as comprehended in the value of the co-efficient A, substituting for it, in the case of the solar tide, $A' = A + 2{\cdot}88\ DM'$, and for the moon $A'' = A + 2{\cdot}88\ DS' + {\cdot}8484\ D(M' - S')$; this latter part expressing that portion of the resistance D which observes the period of the lunar tide, and which may therefore be considered as added to the resistance A for that tide only.

Hence, collecting all the forces concerned into a single equation, the expression will become $\frac{dds}{dt^2} + A''' \frac{ds}{dt} + Bs +$

$$S\Big(\text{L}\ \alpha' \left[\tfrac{1}{2} \text{cos.}\ (t - \odot) - \tfrac{1}{2} \text{cos.}\ (t + \odot)\right] + \text{L}\ \alpha'' \left[\tfrac{1}{2} \text{cos.}\ (t - 3\odot) - \tfrac{1}{2} \text{cos.}\ (t + 3\odot)\right] + \alpha''' \left[\tfrac{1}{2} \text{cos.}\ (t - 5\odot) - \tfrac{1}{2} \text{cos.}\ (t + 5\odot)\right] + \frac{\text{L}'}{2}(1 - \alpha^2) \sin. 2t + \frac{\text{L}'}{4} \alpha^2 \left[\tfrac{1}{2} \sin. 2(t + \odot) + \tfrac{1}{2} \sin. 2(t - \odot)\right]\Big) + M\Big(\text{L}\ \alpha' \left[\tfrac{1}{2} \text{cos.}\ (t' - \mathfrak{D}) - \tfrac{1}{2} \text{cos.}\ (t' + \mathfrak{D})\right] + \text{L}\ \alpha'' \left[\tfrac{1}{2} \text{cos.}\ (t - 3\mathfrak{D}) - \tfrac{1}{2} \text{cos.}\ (t' + 3\mathfrak{D})\right] + \text{L}\ \alpha''' \left[\tfrac{1}{2} \text{cos.}\ (t' - 5\mathfrak{D}) - \tfrac{1}{2} \text{cos.}\ (t' + 5\mathfrak{D})\right] + \frac{\text{L}'}{2}(1 - \alpha^2) \sin. 2t' + \frac{\text{L}'}{4} \alpha^2 \left[\tfrac{1}{2} \sin. 2(t' + \mathfrak{D}) + \tfrac{1}{2} \sin. 2(t' - \mathfrak{D})\right]\Big) = 0;$$ and from each of these terms the value of the corresponding pair of terms in the value of s may be obtained independently, by comparison with the M sin. Gt or N cos. Gt of Theorem K, which gives us

$$\frac{(GG - B) \sin. Gt + AG \cos. Gt}{(GG - B)^2 + AAGG} M, \text{ and}$$

$$\frac{AG \sin. Gt + (B - GG) \cos. Gt}{(GG - B)^2 + AAGG} N, \text{ respectively.}$$

But without entering minutely into the effects of all the terms of the equation of the forces, it may be observed in general that their results, with regard to the space described, will not differ much from the proportion of the forces, Tides. except when their periods approach nearly to that of the spontaneous oscillation, represented by B. Thus, since $\frac{1}{2}$ cos. $(t - \odot) - \frac{1}{2}$ cos. $(t + \odot)$ is the representative of sin. t sin. $\odot$, and since these terms will afford results in the form $\frac{1}{2}\alpha$ cos. $(t - \odot) + \frac{1}{2}\beta$ sin. $(t - \odot)$, and of $\frac{1}{2}\alpha'$ cos. $(t + \odot) + \frac{1}{2}\beta'$ sin. $(t + \odot)$, and if we neglected the slight difference of α and α', which is that of $\left(1 - \frac{\odot}{t}\right)^2 - B$, and $\left(1 + \frac{\odot}{t}\right)^2 - B$, $\frac{\odot}{t}$ being $\frac{1}{365{\cdot}254}$ only, we should have $\frac{1}{2}\alpha$ [cos. $(t - \alpha)$ — cos. $(t + \odot)$] + $\frac{1}{2}\beta$ [sin. $(t - \odot)$ — sin. $(t + \odot)$ = α sin. t sin. $\odot$ + β cos. t sin. $\odot$ = sin. $\odot$ (α sin. t + β cos. t)]; which is the same as if we considered the effect of the force sin. t separately, and afterwards reduced it in the proportion of sin. $\odot$. Hence it is obvious, that for all modifications of the forces greatly exceeding in their periods the period of spontaneous oscillation, the effects may be computed as if the forces were exempt from those modifications, and then supposed to be varied in the same proportion as the forces; but we cannot be quite certain of the magnitude of the error thus introduced, unless we know the exact value of B, which determines the time of spontaneous oscillation.

Considering, therefore, in this simple point of view, the correct expression of the force L sin. cos. *Decl.* sin. *Hor.* $<$ + L′ cos.^{2} *Decl.* sin. cos. *Hor.* $<$, or $\frac{1}{2}$L sin. 2 *Decl.* sin. *Hor.* $<$ + $\frac{1}{2}$L′ cos.^{2} *Decl.* sin. 2 *Hor.* $<$, we may observe that the phenomena for each luminary will be arranged in two principal divisions, the most considerable being represented by $\frac{1}{2}$L′ cos.^{2} *Decl.* sin. 2 *Hor.* $<$, and giving a tide every twelve hours, which varies in magnitude as the square of the cosine of the declination varies, increasing and diminishing twice a year, being also proportional to the cosine of the latitude of the place, and disappearing for a sea situated at the pole. The second part is a diurnal tide, proportional to the sine of the latitude of the given canal, being greatest when the luminary is farthest from the equinox, and vanishing when its declination vanishes.

From these general principles, an attentive student may easily trace for himself the agreement of the theory here explained, with the various modifications of the tides as they are actually observed. It however remains for us to inquire more particularly into the cause of the hitherto unintelligible fact, that the maximum of the spring tides in the most exposed situations is at least half a day, if not a whole day, later than the maximum of the moving forces.

Now it is easy to perceive, that since the resistance observing the lunar period is more considerable than that which affects the solar tide, the lunar tide will be more retarded or accelerated than the solar; retarded when the oscillation is direct, or when $G^2 - B$ is positive, and accelerated when it is inverted, or when that quantity is negative; and that in order to obtain the perfect coincidence of the respective high waters, the moon must be farther from the meridian of the place than the sun; so that the greatest direct tides ought to happen a little before the syzygies, and the greatest inverted tides a little after; and from this consideration, as well as from some others, it seems probable that the primitive tides which affect most of our harbours are rather inverted than direct.

If we wish to apply this theory with precision to the actual state of the solar and lunar motions, we must determine the value of the co-efficients, from the tables of those luminaries. And, first, making the unit of time a whole solar day, in which the horary angle t extends from 0° to 360°, the sun's mean longitude $\odot$ will be $\frac{t}{365{\cdot}254}$ added to the longitude at the given epoch, and the moon's approxi

Tides. mate horary angle t' will be found from the variation, or the moon's age in space.

Now, in Burckhardt's Tables, p. 87, we find the variation for the midnight ending 1823, by adding the constant quantity 9° to the epoch for 1824, and (11ˢ· 14° 44′ 44″) + 9° = 11ˢ· 23° 44′ 44″, or — (6° 15′ 16″), according to the time of Paris. The movement for 12 hours is 6° 5′ 43″; consequently at noon, or 1824 Jan. 1, 0h. astronomical time at Paris, the variation is — (9′ 33″), corresponding to the movement of 18ᵐ· 49ˢ· in mean time, and the mean conjunction will take place at 18ᵐ· 49ˢ· Parisian time, which may be more compendiously expressed by calling it the true mean noon, in the time of the island of Guernsey or of Dorchester; and the movement in 24 hours being 12° 11′ 26·5″ = 12·19°, we shall have $t' = 360° - 12{\cdot}19°$ $= 347{\cdot}81°$ when $t = 360°$, or $t' = \frac{347{\cdot}81}{360}\, t = {\cdot}96614t$; and the moon's horary angle, considered in relation to the circumference as unity, will always be ·96614t, if t be the number of days elapsed from the noon of 1st January 1814 at Guernsey.

The sun's mean longitude for the same epoch is (279° 35′ 23·1″) = ·77666; his longitude for any other time will therefore be ·77666 + ·002738t = ☉, and that of the moon ☽ = ·77666 + ·03386t.

We may compute, with sufficient accuracy, the effect of the modifications produced by the change of the moon's distance, or the inequality of her motion in her orbit, or of the periodical change of the inclination of her orbit to the equator, which takes place from the revolution of the nodes, by simply considering the changes which will be produced in the forces concerned by these inequalities, and supposing the effects simply proportional to their causes. If, however, it were desired to determine these modifications with still greater precision, we might deduce approximate formulas for expressing them from the elements employed in the Tables.

The epoch of the moon's mean anomaly for 1824 is (4ˢ· 29° 25′ 23·3″) + 2° = 151° 25′ 23·3″; the movement for 12ʰ· 18ᵐ· 49ˢ· is (6° 31′ 57″) + (9′ 47·9″) + 27″ = 6° 42′ 12″, which gives 158° 7′ 35″ for the mean anomaly at noon in the island of Guernsey. The daily movement being 13° 3·9′ = 13·065°, the mean anomaly will always be 158·127° + 13·065°t, reckoning t from the supposed epoch or day. The principal part of the central equation will then be, according to Burckhardt, 22692·4″ sin. $An.$, or (6° 18·2′) sin. ($158\frac{1}{8}$° + 13·065°t), and its sine will be very nearly ·11 sin. (13·065°t + 158·127°), which will represent the principal inequality of the longitude and of the variation, so that the variation, instead of 12·19°t, will become 12·19°t + 6·3° sin. (13·065°t + 158·127°), and this subtracted from 360°t, leaves 347·81°t — 6·3° sin. (13·065°t + 158·127°), the sine of which is nearly sin. 347·81°t — cos. 347·81°t ·11 sin. (13·065t + 158·127°).

The equatorial parallax is nearly 57′ + 187″ cos. $An.$, or 57′ + 3·1′ cos. (13·065°t + 158·127°); and the disturbing force, which varies as the cube of the parallax, or of 57′ [1 + ·0544 cos. (13·065°t + 158·127°)], may be expressed, with sufficient accuracy, by 1 + ·1632 cos. (13·065°t + 158·127°).

The supplement of the node for 1824 is (2·10·56) + 2′ = 70° 58′, to which we must add (3′·10·6″) t for the time elapsed; and the longitude ☽ will be 279° 35′ 23·1″ + (13° 10′ 35″) t.

Although the value of the co-efficient B is not directly discoverable, we may still obtain a tolerable estimate of its magnitude in particular cases, by inquiring into the consequences of assigning to it several different values, equal, for example, to the co-efficient of the solar or lunar tide, or greater or less than either; while we assume, also, for the co-efficient of the resistance, A, a great and a smaller value, for instance $\frac{1}{2}$ and $\frac{1}{10}$, supposing D to be inconsiderable. Tides. We then find, from the expression $\sqrt{(\alpha^2 + \beta^2)}\, M = \sqrt{(\alpha^2 + \beta^2)}\, B\mu$ (Theorem K, Schol. 2) = $\frac{B(S,M)}{\sqrt{[(GG - B)^2 + AAGG]}}$, for the solar tide, G being 1, if

$B =$		$\frac{1}{2}$,	·93442,	1,	or 4;
$A =$	$\frac{1}{10}$;	— ·980,	— 7·550,	10,	1·3324,
	$\frac{1}{2}$;	— ·832,	— 2·742,	3,	1·3252;

and for the lunar, G being ·96614, and

$A =$	$\frac{1}{10}$;	— 1·122,	10,	8·197,	1·3036,
	$\frac{1}{2}$;	— ·913,	3,	2·942,	1·2968,

respectively.

Hence it appears, that the resistance tends greatly to diminish the variation in the magnitude of the tides, dependent on their near approach to the period of spontaneous oscillation, and the more as the resistance is the more considerable; and supposing, with Laplace, that in the port of Brest, or elsewhere, the comparative magnitude of the tides is altered from the proportion of 5 to 2, which is that of the forces, to the proportion of 3 to 1, the multipliers of the solar and lunar tides being to each other as 5 to 6, we have the equation $\frac{36BB}{(1-B)^2 + A^2} = \frac{25BB}{(n-B)^2 + A^2}$, whence we find that B must be either ·9380 or ·6328; and the former value making the lunar tide only inverse, we must suppose the latter nearer the truth; and the magnitude of the tides will become 1·663 and 1·998. And it appears from the same equations, that, n remaining = ·93442, A cannot be greater than ·632, and B would then be ·78540; and if $A = 0$, the values of B would be ·9617 or ·6091. It seems probable, however, that the primitive tides must be in a somewhat greater ratio than this of 2 to 1 and 5 to 3, when compared with the oscillations of the spheroid of equilibrium; and if we supposed B = ·9 and A still = $\frac{1}{10}$, we should have 7·071 and 9·756 for their magnitude. Now if B = ·6328, the tangents of the angular measures of the displacement, $\frac{\beta}{\alpha} = \frac{AG}{GG - B}$, become $\frac{1}{\cdot 3672}$ and $\frac{\cdot 96614}{\cdot 30160}$ respectively, giving us 69° 50′ and 72° 40′ for the angles themselves; and if B = ·9, these angles become 45° and 70° 24′ respectively; the difference in the former case 2° 50′, and in the latter 25° 24′, which corresponds to a motion of more than twenty-four hours of the moon in her orbit.

It appears, then, that, *for this simple reason only*, if the supposed data were correct, the highest spring tides ought to be *a day later* than the conjunction and opposition of the luminaries; so that this consideration requires to be combined with that of the effect of a resistance proportional to the square of the velocity, which has already been shown to afford a more general explanation of the same phenomenon. There is indeed little doubt, that if we were provided with a sufficiently correct series of minutely accurate observations on the tides, made, not merely with a view to the times of low and high water, but rather to the heights at the intermediate times, we might by degrees, with the assistance of the theory contained in this article, form almost as perfect a set of tables for the motions of the ocean as we have already obtained for those of the celestial bodies, which are the more immediate objects of the attention of the practical astronomer. There is some reason to hope that a system of such observations will speedily be set on foot by a public authority; and it will be necessary, in pursuing the calculation, on the other hand, to extend the formula for the forces to the case of a sea performing its principal oscillation in a direction ob-

Tideswell ‖ Tieck.

lique to the meridian, as stated in the beginning of this section.

For such a sea, the calculations would be somewhat complicated, except in the case of its being situated at or near the equator. We should then obtain, by proper reduction, for the volume of the force, putting D the sine of the duration, or of the angle formed by the length of the canal with the equator, and D′ its cosine, the expression D sin. cos. *Decl.* cos. *Hor.*< + D′ cos.² *Decl.* sin. cos. *Hor.*<; and the order of the phenomena would be less affected by the alteration of the situation of the canal than could easily have been supposed, without entering into the computation. This expression, when D = 0 becomes, as it ought to do, identical with the former, making L = 0. (T. Y.)

Tieck.

TIDESWELL, a market-town of England, in the county and 29 miles N.N.W. of Derby. It stands amid wide moors, and consists of small, mean houses, chiefly occupied by miners and cotton weavers. There is here a fine parish church, places of worship for Wesleyans and Roman Catholics, and several schools. Pop. of the parish, 3411.

TIDOR, or TIDORE, an island of the Eastern Archipelago, belonging to the Dutch, west of Gilolo and south of Ternate; N. Lat. 0. 40., E. Long. 127. 25. Its form is nearly circular, and its circumference about 18 miles. An active volcano rises in the centre, and occupies nearly the whole of the island. Its sides are densely covered with forests. The principal productions are sago, rice, cocoa-nuts, and bananas. The capital, Tidor, stands on the east coast. It is walled, and contains a mosque, and the residence of a sultan tributary to the Dutch.

TIECK, CHRISTIAN FRIEDRICH, a famous sculptor of Germany, was the brother of the distinguished writer Ludwig Tieck, and was born at Berlin on the 14th of August 1776. He studied successively under Schadow in Germany and David in Paris, and afterward returned to Berlin in 1801, and went subsequently to Weimar, where he found a warm friend in the poet Goethe. Tieck executed busts of Goethe, Voss, and Wolff, during his residence at Weimar, as well as of many noblemen and princes resident in the neighbourhood. Having joined his brother Ludwig on his journey to Italy in 1805, he was fortunate enough to make the friendship of Madame de Staël, and of the Crown-prince Ludwig of Bavaria. He made statues of Madame de Staël and her friends, as well as executing busts of Ludwig, Jacobi, Schelling, Ludwig Tieck, Lessing, Erasmus, Grotius, Herder, Wallenstein, &c., for the Valhalla. While on a second visit to Italy in 1812, he had the good fortune to make the friendship of Rauch, which lasted unbroken till Tieck's death. On his return to Germany in 1819, he set up his studio in Berlin, where he became a prominent agent in all the artistic undertakings of the next thirty years. He was employed on the theatre-royal, the cathedral in Berlin, and the royal museum, as well as on many other pieces of statuesque sculpture, where he had ample scope to satisfy the requirements of his genius on statues of memorial art. He died on the 14th of June 1841. Kiss, the sculptor of the "Amazon," was a pupil of Tieck's.

TIECK, *Ludwig*, one of the most distinguished writers which Germany has known during the past half-century, was born at Berlin on the 31st of May 1773. He pursued his studies with great ardour and success at the universities of Halle, Göttingen, and Erlangen. Poetry and history formed his favourite pursuits; and, resolving to beat the metal while it was glowing, he published three spirited, though immature, novels at the early age of twenty-two. Unlike the classicists of his time, these books gave evidence of a much loftier, as well as a much deeper intellect, than had ordinarily been exhibited to the German public. The *Almansur*, in 1790; the *Alla Moddin*, in 1790–91; and the *Der Abschied*, in 1792, gave evidence as distinct, through their eastern garniture, of the middle-age spirit of chivalry and romance which informed them, as his *Abdallah* in 1792, or his more expressly mediæval tale of *Das Grüne Band*, published during the same year. These were as yet but the outpourings of a strong, rich nature, greatly perturbed by the vast shadows which often deepened into something exceedingly like realities, as they crossed and re-crossed the high vault of the spacious prison-house in which he was inclosed. Tieck evidently regards with passionate scorn the false and base maxims and life led by the world; but he does not yet sufficiently indicate the pilotage of that vexed, narrow, winding stream, which all humanity are engaged in navigating. It was only in his more mature efforts, as indeed it ever is, that he surveyed with a calm and steady eye all the creeks and bays, the rapids and the shallows, which beset the sea of life. It was only in his later attempts, that by combining the accountableness of man with the noble and worthy in nature, he succeeded in forming his ideal of poetic—of purely artistic beauty, which he has devoted his whole life to disclose, and the best part of his leisure to illustrate. His *William Lovell* and *Peter Leberrecht*, both published in 1795, still give evidence of that crudity of purpose and imperfection of moral development which characterised his earlier productions. The next six years (1795–1800) was a period of great activity and growth with Tieck. He visited Jena, where he formed a lasting friendship with the Schlegels, Novalis, and Schelling. At Weimar he became acquainted with Herder. The friendship of these men widened and deepened his views of poetical truth. In his *Volksmährchen*, including his *Gestiefelte Kater* (Puss in Boots) and *Blaubart* (Bluebeard), published in 1796, he endeavoured to combine the simplicity of the old legends with the dramatic situations which were suggested to him by the animated form which his poetical conceptions assumed. He opened a new vein to the public in these works, of a grotesque Aristophanic raillery, in which he rained down on the elegant classical gentry whole torrents of quiet sarcasm. This evidence of a broad joyous humour was among the first indications of the steady attainment of Tieck's full powers. The more sagacious of his readers marked this change with much inward delight, and now that he had reached the full possession of his powers, the alteration in his manner is striking. This is observable in his drama of *Verkehrte Welt* (or, World Turned Topsy-turvy), in his tale of *Prinz Zerbino*, and in his *Poet. Journal*, Jena, 1800. In 1799–1801, he was engaged on a German translation of *Don Quixote*, which stands unrivalled in any language for extraordinary freedom and spirit, and a fine comprehension of the meaning of Cervantes. His *Genoveva*, *Fortunat*, and *Kaiser Octavianus*, were published in 1804. The last of these works, in particular, is much admired by his friends in Germany as one of the finest specimens of his romantic powers. Passing over those works in which the lamented Wackenroder had a share, we come to 1801, when he made a journey to Italy with his brother the sculptor. Having been seized with a violent attack of gout on his return next year, he occupied his leisure from the paroxysms of that torturing disorder in publishing his *Phantasus*, in collecting the old songs and ballads of his native country, which he brought out in 1803 and in 1815. In 1812 he gave to the German public the *Alt-Englisches Theater*, consisting of translations of many of the old plays which were current in Shakspeare's time. He afterwards made a thorough study and a tolerably

complete collection of those plays when on his visit to England in 1817. His next work illustrative of this period was his *Shakspeare's Vorschule*, 1823–29, in which he showed great sagacity in endeavouring to establish that Shakspeare began to write much earlier for the stage than is ordinarily supposed. Tieck took an active part about this time in completing the translation of Shakspeare's *Works*, which August Schlegel had begun. He completed this task in 1829. In 1828 appeared his *Dramaturgische Blätter*, and his *Dichtersleben* (or Poet's Life), in which he has not hesitated to introduce Shakspeare, Marlow, and others of their time, as playing a part in the imaginary scene which the author's fancy has drawn. He relates the melancholy fate of the poet Camöens, in his *Der Tod des Dichters*, which appeared in 1829; and in 1836 and 1840 appeared the last, and some say the worst of his novels, *Der Tischlermeister* (the Cabinetmaker), and *Victoria Accorombona*. Tieck was now living in Dresden, where he took an active share in the management of the Dresden theatres, and gave grand evening readings of his tales and poems, which attracted all the celebrities of Germany, who strove to gain an introduction to this genial old artist. In 1840 he was invited to Berlin by King Friedrich Wilhelm IV., where he was made a privy councillor, and passed the remainder of his life in his native city and at Potsdam, chiefly engaged in revising his numerous works, which were published at Berlin in 20 vols, 1828–1846. He likewise edited the works of Novalis, in conjunction with F. Schlegel, 1802; of Von Kleist, in 1826; of Solger, with Von Raumer, in 1826; and of Lenz, in 1828. Tieck died after a long period of suffering, heroically endured, in his native city, on the 28th of April 1853. Tieck was one of the earliest, as he was certainly the ablest, defender of the romanticist school of poets in Germany.

TIEDEMANN, DIETRICH, a laborious if not a profound philosopher, was born near Bremen on the 3d of April 1748. He early displayed a love of letters at the Athenæum of Bremen, and, on his entering the university of Göttingen, he read classics and philosophy rather than theology. Jurisprudence fared no better, and he resolved at last to pursue his own inclinations. This last act having cut off his resources, after spending some years as a tutor, his friend Heyne obtained for him a professorship of ancient literature in Cassel. He was removed to Marburg in 1786, where he lectured on almost every subject connected with history, literature, and philosophy. As a philosopher he is obscure, and deficient in depth and accuracy. Tiedemann has written many works, of which the best known is his *Geist der Speculativen Philosophie*, 6 vols., 1791–97.

TIEN-TSIN, a town of China, in the province of Chi-li, at the junction of the Pei-ho with the Grand Canal, 70 miles S.E. of Pekin, of which it is the port. It is walled, and built nearly in the form of a square, each side of which is about a mile in length, and has a massive gateway in the centre. From these gates the principal streets of the town proceed in straight lines, meeting in a kind of pagoda in the middle. The streets, unlike those of the southern towns in China, are broad and well paved; but the houses are mean, built in general of unburned brick, and in many cases only of mud. The only public buildings are some temples of no great architectural pretensions, and a few official residences. The Pei-ho is crossed by a bridge of boats, and its banks are lined on both sides with the suburbs of the town. The chief traffic in the streets is in water and fuel; and the whole place has a very decaying and impoverished aspect. It is said to have been formerly a place of much opulence and trade; but as it depended mainly on the trade carried on between the capital and the other parts of the empire by the great canal, it has declined in prosperity since the inundation of the Yellow River has broken the banks of the canal, and forced this trade into other channels. A treaty was concluded at Tien-tsin in 1858 by Lord Elgin, on behalf of England, with the celestial empire; and at the same time separate treaties were executed by the plenipotentiaries of France, Russia, and the United States. The chief provisions of the British treaty were, the residence of a minister at Peking, permission to travel and trade in all parts of the empire, the opening of several new ports, and the settlement of the question of transit dues. The population of Tien-tsin and its suburbs is stated at 500,000. (See Oliphant's *Narrative of the Earl of Elgin's Mission to China and Japan*, Edinburgh and London, 1859.)

TIERRA- (or TERRA) DEL-FUEGO (*The Land of Fire*), an island, or rather a group of islands, off the southern extremity of South America, separated from the mainland by the strait of Magellen; between S. Lat. 52. 40. and 56., W. Long. 63. 40. and 75. It consists of one large island called Eastern Tierra-del-Fuego, or King Charles' South Land; two smaller islands to the south, Navarin and Hoste, separated from the former by Beagle Strait; and two to the west, Clarence Island and Santa Ines Island, or the Land of Desolation; besides a number of much smaller size, the most important of which is that containing Cape Horn, at the extreme south of the group. The largest island may be regarded as a prolongation of the continent of South America, and it resembles in most of its characteristics the neighbouring country of Patagonia. The eastern part is low and level, the coast sandy and little indented with bays and creeks; while the west coast is rugged, mountainous, irregular in its outline, intersected by long arms of the sea, and lined with a multitude of small islands and isolated rocks. It seems almost as if the current that sweeps round from the Pacific to the Atlantic had worn and frittered away the edge of the continent into the form it now has. The principal summits in Tierra-del-Fuego are—Mount Sarmiento, 6900 feet, and Mount Darwin, 6800 feet high; and the general height of the chains is between 4000 and 5000 feet. Their lower slopes are covered with stunted forests of beech and birch, above the limits of which there is an expanse covered with small alpine plants, while the extreme summits are covered with perpetual snow. In some places large glaciers descend to the water's edge, contrasting in their deep-blue colour with the pure white of the snow and the dark masses of the forests. The climate is exceedingly inclement; the temperature is low; and wind, rain, snow, and sleet succeed each other in an almost unvaried round. The vegetables and the animals of the country are few in number. Among the former, such plants as fuchsia and veronica flourish and grow to a much larger size than in England, and a sort of fungus that grows on the beech-trees forms a principal article of food to the inhabitants; and of the latter, guanacoes, deer, foxes, otters, bats and mice are, besides whales and seals, the only specimens of mammalia. Birds, however, are numerous, especially sea-fowl. The natives in the north-east part of the large island resemble those of Patagonia; those of the rest of Tierra-del-Fuego are of much less stature, ill-proportioned, and very ill-looking. They live in wretched wigwams, and support a miserable existence by hunting and fishing. Tierra-del-Fuego was discovered in 1520 by Magalhæns, who named it "the land of fire," from the number of watch-fires visible by night along the coast.

TIFLIS. See TEFLIS.

TIGRIS, a river of Asiatic Turkey, in the pashalics of Diarbekir, Mosul, and Bagdad. It rises by two principal sources in the range of Anti-Taurus in Armenia, not far from those of the Euphrates, and flows first for a short distance N.E., then S.E. to Diarbekir. From this town it flows eastwards, parallel to Anti-Taurus, for 105 miles, till its confluence with the Bitlis from the left. Here its direction becomes S.E. as far as Mosul and the ruins of

Tilbury ‖ Tillotson.

Nineveh, shortly below which it receives the Upper or Great Zab. At this point the Tigris takes a more direct southerly course as far as Bagdad, receiving from the north-east the Lower or Lesser Zab. At Bagdad its distance from the Euphrates is only 30 miles; and the two rivers flow for some distance nearly parallel. A little way below Bagdad the Tigris receives the Diyalah, and about the same point a canal joins it with the Euphrates. About 80 miles farther down it takes a curve to the east, and finally, after a total course of 1150 miles, joins the Euphrates at Korna, forming together with it the Shat-ul-Arab. (See EUPHRATES.) Between Mosul and Bagdad, a distance of about 220 miles, the average breadth of the river is 200 yards; but it varies considerably in different seasons, attaining its greatest height about the end of May. The neighbouring country is but thinly peopled and only partially cultivated, but it contains some extensive tracts of rich pasture land. The Tigris is navigable for rafts as far as Mosul, and at certain seasons as far as Diarbekir. Goods are conveyed down the stream, sometimes with great rapidity, on large rafts supported on inflated skins.

TILBURY, a parish of England, Essex, on the Thames, opposite Gravesend. There are still to be seen some traces of the camp formed here by Queen Elizabeth in 1588. Tilbury Fort, which was first erected in the reign of Henry VIII., was made a regular fortification in 1667, and has since been much strengthened, so as to be now a formidable work, especially on the side of the river. Pop. 573.

TILLICOULTRY, a village of Scotland, Clackmannanshire, on the Devon, 9 miles E. of Stirling. It is for the most part substantially built of whinstone, and contains places of worship belonging to the Established Church, the Free Church, the United Presbyterians, and the Independents, besides numerous schools. It is chiefly remarkable for its manufactures of tartan shawls and plaids, which consumed in 1850 about 1,200,000 lbs. of wool, and employed 1780 hands. Pop. 3217.

TILLOTSON, JOHN, Archbishop of Canterbury, was the son of Robert Tillotson of Sowerby, in the parish of Halifax, in Yorkshire, clothier; and was born there in the year 1630. He studied at Clare Hall, Cambridge, and in 1651 became a fellow. In 1656 he left the university, in order to become tutor to the son of Edmund Prideaux, Esq. of Ford Abbey, in Devonshire. He was afterwards curate to Dr Hacket, vicar of Cheshunt, in Hertfordshire. In 1663 he was presented by Sir Thomas Barnardiston to the rectory of Ketton or Keddington, in the county of Suffolk; but was the next year chosen preacher to Lincoln's-Inn, when he procured Ketton to be bestowed on his curate. He was greatly admired in London for his sermons; and in the same year was chosen Tuesday-lecturer at St Lawrence's Church, where his lectures were frequented by all the divines of the city, and by many persons of quality and distinction. In 1666, he took the degree of D.D. at Cambridge; in 1669, was made prebendary of Canterbury; in 1672, was admitted dean of that cathedral; and three years afterwards was made a prebendary of St Paul's cathedral. In 1679, he became acquainted with Charles earl of Shrewsbury, whom he converted from popery; and the next year he refused to sign the clergy of London's address of thanks to King Charles II. for not agreeing to the bill for excluding the Duke of York. In 1683, he visited the unfortunate Lord Russell when under condemnation, and attended him in his last moments on the scaffold. In 1689, he was installed dean of St Paul's; made clerk of the closet to King William and Queen Mary; and appointed one of the commissioners to prepare matters to be laid before the convocation, in order to a comprehension of all Protestants, as well dissenters as churchmen; but this attempt was frustrated by the bigotry of those members of that body who refused to admit of any alteration in things confessedly indifferent. In 1691, Dr Tillotson, notwithstanding the warmest remonstrances and entreaties on his part, was consecrated archbishop of Canterbury, and four days after was sworn one of the privy council; their majesties always reposing an entire confidence in his prudence, moderation, and integrity. In 1694, he was seized with a palsy, of which he died, in the 65th year of his age. He was interred in the church of St Lawrence, Jewry, where a handsome monument is erected to his memory. This learned and pious divine, while living, was greatly inveighed against by the enemies of the Revolution. After his death there was found a bundle of bitter libels which had been published against him, on which he had written with his own hand, "I forgive the authors of these books, and pray God that he may also forgive them." It is remarkable, that while this truly great man was in a private station, he always laid aside two-tenths of his income for charitable uses. Lord Macaulay, in his *History* (vol. ii. p. 407, ed. of 1856), says of Tillotson, that he was "the most popular preacher of that age, and in manners the most inoffensive of men." One volume in folio of Dr Tillotson's sermons was published in his lifetime, and corrected by his own hand. They were translated into French by Barbeyrac. Those which were published after his death by his chaplain, Dr Barker, form two volumes in folio, the copy of which was sold for L.2500. This was the only legacy he left to his family, his extensive charity having consumed his yearly revenues as constantly as they came to his hands. King William, however, gave two grants to his widow; the first of which was an annuity of L.400 during the term of her natural life, and the second of L.200 as an addition to the former annuity. (Birch's *Life of Dr John Tillotson, Lord Archbishop of Canterbury.* Lond. 1752, 8vo.)

Tilsit

TILSIT, a town of the Prussian monarchy, East Prussia, in the government of Gumbinnen, on the left bank of the Niemen or Memel, which is here joined by the Tilse, 60 miles N.E. of Königsberg. It consists of one principal street, long, wide, and lined with well built houses; and it contains a castle, erected in 1537, a handsome Lutheran church, with a lofty spire, a Calvinistic church, a gymnasium, and several hospitals. Manufactures of woollen cloth, hosiery, leather, hardware, and arms are carried on here; and there is an important trade in corn, butter, timber, hemp, and flax. The river is navigable up to the town, and is crossed by a bridge of boats 1150 feet long. Tilsit is historically memorable for the peace concluded here in 1807 between Napoleon, the Emperor of Russia, and the King of Prussia. The three monarchs met on a raft moored in the river a little below the town. Pop. 13,748.

TIMBER.

Timber.

Definition of the term.

THE term *Timber* is applied to wood of sufficient size to be adapted for building or engineering purposes, whether it be standing in the forest or after it is felled. While the timber forms part of the growing tree, it is called standing timber; when felled, it is called rough timber. After the rough log is converted—that is, sawn into the various forms for which it appears best adapted—the products are then known as sided timber, balk, thick-stuff, plank, or board, according to the shape and dimensions of the pieces.

It is proposed in the following article to consider this subject in three or four principal lights; as, the growth and cultivation of timber; its use for constructive purposes; the supply of timber from foreign sources; and the most efficacious means for arresting its decay. In the articles SHIP-BUILDING and STRENGTH OF MATERIALS much additional information regarding timber will be found.

Growth of the tree.

If we examine the cross-section of the trunk of a tree, we shall find it to consist of three principal parts—namely, the pith, the wood, and the bark—the perfect or heart-wood occupying the larger portion. As all timber trees belong to the *exogenous* tribe of plants, which gain their increase by addition to the external surfaces, it therefore follows that the wood of oldest growth is found in the centre of the tree, and that the several concentric layers are younger in proportion as they recede from the centre. Around the perfect wood there is seen a concentric belt of younger growth, which has not yet attained to the maturity of the heart-wood. This belt is called the alburnum or sap-wood; around it is another concentric belt, called the liber or inner bark, surrounded again by the outer bark. The centre of the heart-wood is occupied by the pith; and there is a communication between the pith and the bark that is maintained by what are called the medullary rays, which, as their name expresses, radiate from the pith, in the centre of the perfect wood, to the external coating of the tree, the bark. From their hardness and compactness the medullary rays may serve, in some measure, to resist the pressure of the accumulating annual rings, and to keep open the tubes for the passage of the sap in the interior of the tree. When cut in a sloping direction, they produce the beautifully-varied appearance called *figure* in ornamental woods. The pith, which seems to perform an important part in the growing economy of the tree while it is still young, appears afterwards to lose its utility; for as the central portions of the tree become indurated and formed into heart-wood, the pith is then nearly or altogether obliterated.

Early authorities on timber.

The first English writer on timber was the celebrated Evelyn, who published his *Sylva, or Discourse of Forest Trees*, in 1664. This book still continues one of the standard works on the subject in our language. In 1774 a new edition of it, with most extensive notes, and also engravings of the trees mentioned in the text, was published by the celebrated Dr Alexander Hunter of York. The last edition with these notes was published in 1825. In France the two celebrated philosophers, Buffon and Du Hamel, have each devoted a great portion of their useful lives to the investigation of the physiology of timber, and their writings on the subject have long been the text-books of arborists. In modern times, the phenomena of the growth of plants have occupied the attention of many men, some of whom have eminently distinguished themselves in this particular branch of natural history.

The experiments on the physiology of trees so successfully prosecuted by Mr Knight, president of the Horticultural Society, deserve especial notice. He removed a ring of bark, about half an inch in breadth, from a number of trees, and then compared the growth of these trees with that of others not so treated. This was done early in the spring, and in every case he found the result to be the same; namely, that those parts of the stem and branches which were *above* the incision, and had a communication with the leaves through the bark, increased rapidly in size, while those *below* the incision scarcely grew at all, until a new communication was obtained with the leaves through the bark; the increase of the timber thus evidently depending upon the growth of the leaves.

Timber.

Mr Knight's experiments on the physiology of trees.

Mode of increase of the timber.

These experiments were so far conclusive as to establish that the current of sap which ran upwards from the roots, was not impeded in its passage by the annular incisions and the removal of the belt of bark; but that it was probably the downward current which was interrupted, and also that it was this downward current by which the annual increase of the tree was effected. By a series of experiments with coloured infusions, Mr Knight traced the upward current through the pores of the wood beyond the annular incisions in the bark, and found that it had neither coloured the bark nor the sap between it and the wood. He traced the coloured infusion along the leaf-stalk into the leaf, through one series of vessels; and he observed another series of vessels which were conveying a colourless fluid in an opposite direction, that is, out of the leaf. He traced this second series of tubes downwards, and found that they entered the inner bark, and, without having any communication with the tubes of the wood, descended through the inner bark from the very extremities of the leaves, apparently to the points of the roots. Mr Knight considers that there are two series of these descending tubes, one of which forms the new annual layer of alburnum, and the other the new annual layer of internal bark. It thus appears that the sap is conveyed upwards, through the pores of some part of the wood, into the leaves, and that when there, probably by its exposure to light and air, and by the evaporation which takes place, it undergoes some peculiar process of elaboration which fits it for contributing to the sustenance and growth of the tree. It also appears that the cause of the growth is the deposition which takes place in the downward passage of this perfected sap. The sap, after this curious preparation in the leaves, is called *cambium*.

The same persevering physiologist then pursued his investigations a step farther. He took trees, and not only removed a ring of bark, but also a ring of the younger wood, to such a depth as to cut through and remove the whole of the alburnum. These trees did not exhibit the slightest symptom of vegetation in the ensuing spring; which fact evidently proved that the ascent of the sap had been prevented by the removal of the alburnum; for the previously-mentioned experiment had shown that the removal of the bark was not attended with such an effect.

Hardening of the sap-wood.

It is the generally-received opinion, that the ascent of the sap through the alburnum is the reason why this gradually becomes perfect wood, in consequence of the deposition of matter which then takes place and fills up its pores; so that the *rationale* of the process seems to be, that the sap of each year deposits a certain amount of nourishment in its upward passage, which goes to strengthen and solidify the sap-wood (or alburnum) of previous years; that then, after being elaborated in the leaves, this same sap becomes *cambium*, and in its decent adds bulk both to the alburnum and the bark. It must, however, be observed, that there is not in timber any appearance of a gradual change from alburnum to perfect wood. On the

Timber.

contrary, in all cases the division is most decided; one concentric layer being perfect wood, and the next in succession being sap-wood. Mr Knight gives it as his opinion, that towards the conclusion of summer, the true sap—that is, the cambium—simply accumulates in the alburnum, and thus adds to the specific gravity of winter-felled timber. He thinks that the true sap descends through the alburnum as well as through the bark—that is, that "the superabundance of true sap is there deposited, and enriches the upward current of aqueous sap, or the sap of the ensuing spring." In confirmation of this, he tested the ascending current of spring sap, extracted from the trunks of trees at various heights, and found that the specific gravity increased with the height, and that the taste also very sensibly altered. He argues from the foregoing facts, that by girdling trees in the spring, and suffering them to grow until the ensuing winter, the wood above the girdling would be increased in specific gravity. In one experiment, in which the belt of bark had been abstracted for several years, he found that the specific gravity of the wood above was 0·590, while below it was only 0·491; and also that the alburnum had acquired a greater degree of hardness, and consequently of durability. This is important, as Du Hamel has very conclusively established by experiment that the strength of timber of the same species varies very nearly as its weight.

Nature of the circulation of the sap.

Function assigned to the leaves of a tree.

The leaves of a tree perform the important office of inhaling and fixing in a solid form the gaseous food contained in the atmosphere. In the day-time they absorb carbonic acid from the air, which then becomes decomposed, and the oxygen is given off; this process being reversed at night, although in a slower degree. About one-third of the entire carbon of which the tree is composed is believed to be thus extracted from the atmosphere.

Formation of the annual rings.

As the sap descends, it forms a layer or ring of sap-wood and inner bark, by which the circumference of the tree is gradually increased year by year. By counting the number of these so-called "annual" rings, which are very distinct in some species, it is generally supposed that the age of a tree can be ascertained. It is now believed, however, that this is not always a true indication of the age of a tree, a "ring," more or less distinct, being formed in the wood by any sudden augmentation of growth, consequent upon a track of warm weather succeeding a colder season, or a moist period succeeding to extreme drought in summer. It may thus happen that several rings are formed in the wood during one year's growth only. Although the sap of a tree is most active in the spring, and during the season of vegetation, it has been ascertained that it is never altogether stationary, except during severe frosts.

When the tree should be cut down.

When the induration of the sap-wood has reached its extreme limits, the proper time has arrived for the tree to be cut down. This may arise, however, from other causes than mere old age. Ungenial climates and situations check the free circulation of the sap, and the new layers of wood and inner bark are thus imperfectly formed or greatly attenuated in substance, and the tree shows all the symptoms of premature old age at a period of its growth, when, had it been reared under more favourable circumstances, it would have been still young and vigorous. External injury, by which water is admitted into the substance of the tree, will equally induce premature decay in a tree otherwise sound and flourishing. Hedge-row timber is particularly exposed to accidents of this kind, and the practice of planting valuable trees in such situations should either be sparingly adopted, or avoided altogether, more especially as the growing crops are much injured by them. At the same time, waste corners and outlying pieces of ground, perfectly suitable for trees, and indeed only profitable when planted, are too often left vacant in their native barrenness; for a wise Providence has so constituted the majority of trees, that they will flourish upon, and indeed prefer situations which are altogether unfit for the production of corn and other crops. This is chiefly owing to the small proportion of mineral nutriment which trees require in comparison with grain. For several remarks of much practical value occurring in this portion of our article, the author is indebted to the professional knowledge and sagacity of Mr John Blenkarn, who has recently published an excellent treatise on British timber trees. A certain portion of the article TIMBER, written for the preceding edition of the *Encyclopædia Britannica*, has also been incorporated in the present article.

Situations for planting timber.

Timber.

Mineral constituents of timber.

The mineral constituents of timber vary with the nature of the soil on which it is grown, but these consist chiefly of the carbonates of potash, soda, lime, and magnesia, with generally a small portion of the sulphates, chlorides, and phosphates of the same substances. The following table exhibits the weight of mineral ash remaining after the combustion of 1000 lb. weight of different woods, all equally dry when weighed:—

1000 lb. of	elm	yielded	19 lb. of ash.
„	poplar	„	20 lb. „
„	willow	„	4½ lb. „
„	beech	„	2 to 6 lb. „
„	birch	„	3½ lb. „
„	oak	„	2 lb. „
„	pine	„	1½ to 3 lb. „
„	ash	„	5 to 6 lb. „

Influence of soil on the growth of timber.

Although in most parts of England there is soil favourable to the growth of timber, it may well be supposed that all soils are not equally favourable to all kinds of timber, nor will they produce timber of equally good quality. Thus, while England is, *par excellence*, the country of oak timber, the Sussex oak has always been celebrated as superior to all others. In France, the oak of Provence enjoys a similar reputation. Still, an oak-tree grown in a soil but ill adapted for it, as, for instance, a marshy soil, will retain its superiority of species over the inferior timbers, such as willow and poplar, to which such a soil is less unfavourable, although in quality it will fall far short of the standard of perfection for oak timber. In fact, oak grown on such soils will, in some measure, partake of the qualities of the timber to which they are better adapted, and be of more open texture, of softer fibre, and of less durability, than average oak timber. Oaks of slow growth, those for instance from the mountains of Scotland, and from Cumberland and Yorkshire, are proverbially hard and durable. The oak from marshy soils is often of a dull-red colour, or has "foxey" stains in it, as this incipient decay is called. These stains are generally around the heart of the tree. Timber grown in loose soils is often what is termed "quaggy;" that is, the centre of the tree is full of shakes and clefts. Sometimes a shake will extend around a great portion of the trunk, between two of the annual concentric layers, so as to divide them from each other. This is called a cup-shake, and the timber is said to be "cuppy." It is not attributable to the soil, but is supposed to originate in the effect of frosts on the aqueous sap in its ascent. When the alburnum of a tree has been wounded, or a branch improperly lopped or damaged, the subsequent growth of the tree will cover it, and it is then called a rind-gall, which, should the injured part have had time to become decayed, or partially so, or even sodden with the rains, will frequently cause an extensive rottenness in the plant. This is remarkably the case with elm timber. "Doatiness," probably dottiness, which is a spotted or speckled appearance, like small stains in the wood, is most commonly a disease of beech timber; it is, however, occasionally seen in all, and frequently in the American oak. These diseases are in general incidental to the soil.

Diseases and accidents to which growing timber is liable.

In treating of soils in connection with the qualities of the

Timber.

timber which grows upon them, it may be necessary to remember that the object is not to compare various sorts of timber, but to compare the differences in the same species in connection with the soils which produced them. It may also be observed, that as oak is by far the most valuable timber of English growth, the general inquiries we may enter into in the course of this article principally apply to it, unless other species of timber are particularized.

Effects of a marshy soil.

We have already casually adverted to marshy soils, and to the state of the timber grown on them. The grain of such timber is open, its colour of a deep yellow, sometimes with a tinge of red, especially towards the heart; the texture is soft, and the fibre coarse. The quantity of alburnum, and also of bark, is large in comparison with the quantity of perfect wood, and the outer surface of the bark is very coarse and rough. The wood splits easily, and when split it has not the same bright and varnished appearance possessed by the best timber. The chips from the axe do not cling well together, but fall into separate fragments; and a shaving or a small splinter may be easily crumbled between the finger and thumb. When such timber is weighed, although it is far more saturated with moisture, it is of less specific gravity; and when weighed after seasoning, the weight lost will be comparatively greater. Such timber, it is evident, will be more subject to decay, and to become worm-eaten, the softness of its texture inviting the attacks of insects.

These peculiar characteristics attach more or less to timber grown in all soils which are of a moist nature, whether they are marshy, or wet from long continued periodical inundations. They also apply to timber grown in deep sandy soil, in which almost the only nutriment for the roots is the water which percolates downward, and the bottom damps which rise upward through it. In all these soils the timber is of rapid growth, and the trees attain early to a large size. A similar result attends the timber grown in sandy soils on a clay bottom, for the water which falls, not being able to penetrate the clay, cannot escape, and the roots of the trees are therefore virtually in the same circumstances as if they were growing in marshy land. As a general axiom, timber trees have an antipathy to stagnant waters; and, therefore, these observations on marshy soils, and on sandy soils with clayey bottoms, refer themselves to this fact.

The most favourable soil for timber.

The soil generally the best adapted for the growth of timber appears to be a rich loam. This may have a considerable admixture of sand, without any apparent detriment to the timber. In such soils roots can penetrate and spread without difficulty, while the loam is capable of retaining sufficient moisture to dissolve and hold in solution the various substances that are found combined with it, so as to fit them to be absorbed as food by the roots of the plants. If the soil be too sandy, it neither retains the moisture sufficiently long in it, nor does it contain adequate nutriment. If, instead of a loam, some of the very stiff clays be mixed with the sand, they do not counteract this quality; for although such clay is capable of combining with a great quantity of water, it will not easily absorb and mix with it; and the tender roots have great difficulty in penetrating the masses of clay. For these reasons, soils composed wholly of stiff clay are not favourable to the growth of good timber, but the lighter clayey earth produces very fine oaks. As has been before stated, sand or gravel, with a large mixture of rich loamy earth, is precisely that sort of dry generous soil which affords ample nourishment to the roots of trees, and allows of their spreading themselves freely in search of it.

Growth of the oak.

Of all timber oak accommodates itself most easily to soil; growing in almost every thing but sterile sand, if there be sufficient depth of stratum. Wherever oak will grow, even in those soils the least genial to its growth, it is a valuable timber. This fact cannot be too often pressed upon the attention of landholders. It is well adapted for planting in hedge-rows between arable fields, because it is found to be less destructive to the undergrowth than almost any other timber; and as its roots seek their nourishment deep in the soil, they not only do not impoverish the ground for the growing crop, but are themselves protected from any injury which they might otherwise sustain from the tillage. Oaks so planted require, however, to be protected during several years, as their early growth is slow. The timber grown in such exposed situations is seldom large; the trees are stunted and crooked; but this rather increases their value for ship-building purposes, as they convert as compass or knee timber. The timber of hedge-row oak is very close grained; that of park-grown oak is more open, and the trees being better protected, spread more freely, and grow to a very large size, with strong lateral branches; while forest-oak will frequently grow to a great height without pushing out any lateral shoots. Forest-oak is invariably inferior in quality to that which grows singly; and in forests the trees that grow on the skirts are always the best timber. The oak flourishes in variable climates, which is probably the cause of the superiority of the English oak. The roots of the oak strike very deep into the soil, at the same time those of no other tree, perhaps, take so wide a range. The top root of an oak has been known to descend to a depth equal to the height of the tree.

Timber.

Connection between the roots and the branches.

A curious fact has been established in connection with the supply of food for trees, which proves that there is not only a proportion between the spread of the roots and that of the branches of a tree, but that the branches on any one side of the trunk of the tree are dependent for their support on the roots which protrude from the trunk on that same side. Both Buffon and Du Hamel found experimentally, that when the limbs and branches of any part of a tree showed symptoms of decay, the corresponding roots were invariably in a diseased state. They also found, that on that side of a tree from which the roots had pushed most vigorously, the annual concentric layers of wood were thicker, and that, consequently, the form of a section of the tree would be excentric towards that side.

The roots will seek out for themselves the best soil.

The determination with which the roots of trees seek out for themselves the best localities is surprising. If trees of different species be growing on the edge of a marshy place, that tree which requires most moisture will push its roots towards the marsh, while that which requires a dry soil will push its roots into the dry firm ground. Du Hamel relates an instance in which he dug two trenches, crossing each other at right angles; he then returned the soil into these trenches, and planted a tree at the point of their intersection. Some years after, upon examining the roots, it was found that they had invariably pushed into the four lines of trenches, leaving the intermediate undisturbed earth wholly untouched.

Depth of soil required.

An equally important consideration with the quality of the soil is its quantity—that is, its depth below the surface. In speaking of soils in connection with the growth of timber trees, it must of course be understood that it is not merely the surface-soil which is meant, but that soil in which the roots of the trees would push and spread, the soil for several feet in depth. It often happens, indeed, that the surface-soil may be well adapted for tillage and for vegetation in general, and yet the sub-soil, that which is essential to the growth of timber trees, may be totally incapable of supplying them with nourishment. Trees which grow singly, as in hedge-rows or in parks, do not require an equal depth of soil with those that grow in forests, because they have facilities for spreading their roots in search of food. But for forest-trees, whether oak, chestnut, or birch, a depth of at least 4 feet of appropriate soil is absolutely necessary for the production of fine

Timber.

timber trees. Elm and ash do not require so great a depth.

The depth of soil determines the age of the tree.

Buffon has given a scale for the ages at which it is desirable to fell timber, dependent upon the depth of soil in which it grows. He says that a depth of from 2 to 3 feet of soil will not support a tree in a thriving condition for a longer period than fifty years. From 3 to 4 feet of soil will enable the tree to go on improving till about seventy years of age; and in soil from 4 to 5 feet deep it will flourish for a century. These periods are for strong and favourable soils. In lighter soils, at least ten years must be taken from each period, and the timber will then also be inferior in quality. As a general rule, the more generous and favourable to the growth of the timber the soil may be, the longer it is advantageous to wait before felling it. Trees should never be allowed to become stag-headed—that is, to have their upper branches bare of leaves. It is in the top branches that the first symptoms of the decline of the tree are to be perceived. The leaves there acquire a faded, weakly appearance, gradually diminish in number, and finally the branches become barren of foliage, and decay. The least appearance of want of vigour in the top of a tree should be the signal for its being cut down; and even then it is a sure token that the timber is past its prime.

How to judge of the goodness of the soil.

The nature of the soil in a track of country may be ascertained either by opening it, or by observing the plants which grow upon its surface. Thus, if plants which flourish only on marshy land are found at all times of the year on any particular track, we may assume that track to be marshy land, whatever its temporary appearance may be. The nature of the subsoil may often be ascertained by examining the ditches. The goodness of earth may be tested, approximately, in the following way. If a hole be dug out, and the whole of the excavated earth can be afterwards returned into the hole, the soil is poor; but if, on the contrary, there is an excess, its quantity is a criterion by which to judge of the richness of the soil.

Deficiency of moisture must be guarded against.

Although, as we have seen, too much moisture is unfavourable to the growth of good timber, a deficiency of it must equally be guarded against, the timber then suffering, not in quality indeed, but in size. Wood grown under such circumstance—as, for instance, the Scotch mountain-oak—is extremely heavy, hard, and dense, and when not "overgrown," or allowed to attain too great an age before being felled, is very durable, and little liable to shrink or warp. Mountain-oak is therefore well adapted for furniture and panelling, &c. As a general rule, the quicker the growth of the tree, the more it will shrink when converted into timber.

These general remarks afford an idea of the difference in the appearance and qualities of timber grown on good soil from that produced on bad soil. It may, however, be desirable to enter a little more into detail. An oak-tree, grown on the soil adapted to the development of its best properties, not only has its concentric rings thin and close together, but they are also of very uniform thickness, and the texture of the grain is fine. When the wood is split, it has a glossy, varnished appearance, and is of a very pale yellow or straw colour. There is sometimes as much as one-fourth difference in weight between samples of oak timber; and the heaviest loses a much less proportion of its weight in drying, and will also, if immersed in water, absorb less than the lightest. The amount of sap-wood in the best timber is comparatively small, and the bark is thin and of a smooth, even texture. In breaking such wood, it produces a sharp, decided noise. Having but little moisture in its composition, and being less hygrometric in its nature than wood of more open texture, it is little subject to decay; and its grain being hard, it is not easily pierced by insects.

Properties of the best oak timber.

The great size to which oak-trees will attain, when favourably situated as to soil and locality, is truly astonishing. The celebrated Chapel Oak of Allonville, in the Pays de Caux in France (which is still standing, we believe), measures at its base 35 feet in circumference, and at 6 feet above the level of the ground it is 26 feet in girth. It is hollow, the interior having been fitted up as a chapel in 1696, and being still employed in that capacity. The computed age of this tree is between eight and nine centuries. A very large oak was felled in Monmouthshire in 1791; when converted, it produced the following enormous quantity of timber:—

Timber.

The largest oaks on record.

The main stem, 91 feet long, when sided	330	cub. ft.
A branch, 29 feet long, sided 17 inches	58	„
„ 24 „ „ 19 „	60	„
„ 19 „ „ 17 „	38	„
The two main slabs produced 86½ feet of 3-inch plank, making, with other conversions	216	„
13 sided knees, taken together	217	„
Other minor but useful conversions	276	„
Total	1195	

The weight of useful timber in this tree was nearly 30 tons. The bark weighed 3 tons, 17 cwt., 3 qrs. But the largest oak on record, known as Damory's Oak, grew in Dorsetshire, and was used as an ale-house. It was 68 feet in circumference, and the room formed in it was 16 feet in length. This tree was blown down in 1703. The Cowthorpe Oak, near Wetterby, in Yorkshire, measured (in 1768) 40½ feet in circumference at 4 feet from the ground, the height of the tree being 85 feet. The Bentley Oak measured (in 1759) 34 feet in circumference at 7 feet from the ground. The Boddington Oak, in the Vale of Gloucester, measures, at 3 feet from the ground, 42 feet, and at 6 feet from the ground, 36 feet in circumference.

Different species of oaks.

There are not less than 140 species of oak known, and although there are many sorts cultivated and growing in England, botanists and arborists agree that there are principally two varieties; these are, the Durmast oak, and another, which is commonly called the old English oak, although both are supposed to be indigenous. In the Durmast oak, the *Quercus sessiliflora*, the acorns grow in clusters close to the twig, and the leaves are set on short leaf-stalks, while in the old English oak the *Quercus Robur*, or *Quercus pedunculata*, the acorns grow generally singly, at most two together, on stalks of from 1 to 2 inches in length, and the leaves are close to the twig, without the intervention of any length of leaf-stalk. These are the principal distinguishing marks between the two varieties. Many writers attempt to draw distinctions from the colour and shape of the leaves, and the colour and appearance of the bark; but it is doubtful whether these may be depended upon, as, from a careful examination of the evidence, it is more than probable that the colour and appearance vary much with the soil and locality. There is no doubt, however, as to the comparative inferiority of the timber of the Durmast oak. Almost all the English writers on timber have asserted it, and both Buffon and Du Hamel corroborate their assertions, and give a most decided preference to the oak bearing large acorns on separate stalks over the oak bearing acorns in clusters; which characteristics are just those which distinguish the English from the Durmast oak.

Proportion of sap-wood to heart-wood in different trees.

In favourable soils, the old English oak has seldom more than 12 to 15 concentric rings of sap-wood; but in the Durmast oak there are frequently from 20 to 25, or even 30. This seems to prove the inferiority of the Durmast oak; for it is an established fact, that the best hardwood timber is that in which the proportion of heart-wood to sap is the largest. The Spanish chestnut has usually but 5 or 6 rings of sap-wood; English elm, about 10; white larch, 15; Scotch fir, 30; yellow Canada pine, 42; Memel fir, 44; and red Canada pine as many as 80 to 100.

Timber.

Size of oak timber.

As a general average of the size of oak timber, 56 cubic feet for each end or log of rough timber, and 30 cubic feet for each end of sided timber, may be assumed as tolerably correct. In order to convert rough timber into sided timber, about two-thirds the diameter of the rough log, in the middle of its length, is assumed as the most advantageous siding; and, on an average, it is estimated that not above one-third of each log or end of rough timber is used in the principal conversion from it, and this principal conversion is estimated to be about three-fourths of the total conversions.

With reference to the size that an oak will attain in a given number of years, much must depend upon the soil and the situation. The plan adopted by the late Duke of Portland of planting tablets of iron or stone with the trees, with the date inscribed upon them, will probably throw much light on this subject. Mr Blenkarn adduces the following case:—Three thriving oaks, growing on a hard, gravelly, and poor soil, were felled in Nottinghamshire, which, on an average, girded 15 feet at 3 feet from the ground, and each tree contained about 430 cubic feet of timber. These trees were known to have been planted in 1692 or 1693, and they were above 149 years old (say 150 years) when they were felled. As they were perfectly sound, and were yearly increasing in size, it is probable that had they been allowed to remain another century, their bulk and cubic contents would have increased at least one-half.

Value of oak timber.

The value of these trees when cut down was more than L.120, a sum equal to 30s. per acre (without taking interest into account) for the land they occupied during the 150 years of the growth,—a reply to those who assert that timber will not pay the rent of the ground it occupies, or injures by its shade. For the first 50 years the land would not be much injured by those trees; and as they grew older the acorns, as food for swine, would compensate for the loss of herbage under the trees. But the land on which these trees grew was not worth 15s. an acre when they were felled, and of course was much less valuable when the trees were planted.

"It frequently happens," says Mr Blenkarn, "that proprietors of large estates have not the slightest idea of the value of the timber growing upon them, regarding the trees on the property as merely an ornamental accessory, little supposing that they may be worth more than half of the value of the estate estimated on the basis of the rental. It may be further affirmed that, on most large estates, a great portion of the timber could be cut down to the benefit of the trees which are left standing. An acre of oak woodland, containing 100 loads of timber (which is a low estimate), is worth L.650 at a moderate computation; and 50 acres of such property would therefore yield L.32,500 worth of timber." This calculation, offered by a professional surveyor, certainly holds out a strong incentive to planting, without taking into account the beauty imparted to the landscape, the shelter obtained for cattle, the cover for game, and other advantages. It is a well known fact that estates abounding with timber will command a high price in the market, and are eagerly sought after, in preference to others possessing a better soil but destitute of trees.

The Duke of Portland's plantations at Welbeck.

Few proprietors have been more successful in their planting operations than the late Duke of Portland, at Welbeck in Nottinghamshire. The greatest part of his plantations occupy rough "forest-land," undulating in a succession of hill and dale. The soil is a mixture of sand and gravel, the hills abounding with gravel and the valleys with sand; and it is the hilly grounds that have been planted. This has increased the value of the low grounds for cropping, by the shelter afforded by the trees. The following was the *modus operandi* adopted by his Grace. After fixing upon the portion of the forest-land to be planted, some well-sheltered valley near the centre of the intended plantation was chosen in which to form a nursery. A few acres of this were surrounded with a close fence to keep out hares, deer, &c.; and the whole was then trenched to the depth of about 20 inches, excepting a broad road in the middle for carting away the young trees. The gravelly soil of the nursery was afterwards treated with lime, and a crop of turnips or cabbages taken from it, which was eaten off by sheep. This brought the land into good order for all sorts of tree-seeds; the oak, however, being the species of timber almost exclusively planted at Welbeck. After the turnips were eaten off in the autumn, the ground was again well dug. So soon as the acorns fell, a good quality was selected, and they were then sown in drills so thickly as nearly to touch each other. The rows were 1 foot apart, and between every fifth row an alley of 2 feet in width was left. While the acorns, or other tree-seeds, are in the ground, great care must be taken to keep them from vermin. After the seeds come up, the beds will require only to be kept clean from weeds until the plants want thinning, and as they will grow more in one wet season than in two dry ones, the time for doing this is best known by watching when the tops of the young trees in the adjoining rows meet. They should then be thinned by taking away one row on each side of the centre row, which leaves the remaining three rows at the same distance apart as the breadth of the alleys, the trees in each row being spaced to about the same distance, or 2 feet apart. They may remain at this distance till their tops again meet, when every other row should be taken up, the remainder now standing 4 feet asunder. When these arrive at the height of about 5 feet, they should be finally planted out. In taking up the last two sizes from the nursery, the Duke's gardener dug a trench 2 feet in depth at the end of each row, he then undermined the plants, and let them fall gently into the trench with their roots entire. Very much of the future success of the plantation depends upon the young plants being well taken up and re-planted without injury to the roots, as much earth being retained about the roots as possible. While in the nursery they require pruning every winter by shortening the strong side-shoots, and taking off one head from all such as have two.

Timber.

His method of planting.

The nursery.

Thinning.

Taking up.

In commencing to form the plantations, these must be at first proportioned in size to the stock of young trees in the nursery. "We always plant thickly," writes Mr Speechly, the Duke of Portland's forester, "as well as sow plentifully at the same time, provided it be a season in which acorns can be had; so that all our plantations answer in a few years as nurseries to succeeding plantations.

The plantations.

"If the ground to be planted has not been already prepared for that purpose, it should be fenced in at least a year before it is wanted, and immediately got into order for a crop of turnips. The addition of two chaldrons of lime per acre will be of great service to sandy soils, as it will not only ensure a better crop of turnips, but it will bind the light soil and prevent its being blown from the roots of the young trees when it comes to be planted. For this reason, also, the land should be planted within two years after being ploughed up from pasture, and before the turf is too far decayed. It will be necessary to have a part of the turnips eaten off soon in the autumn, to get the ground ready for early planting, as the trees succeed best which have been put in early in the winter. The turnips having been eaten off by sheep, the ground is ploughed with a sub-soil plough to the depth of 12 or 13 inches. This ploughing is of great service to the plants when young, and, besides, it saves much trouble in digging the holes.

Preparing the ground.

"After the ploughing is finished," continues Mr Speechly, "we divide the ground into quarters for the planting by ridings. It will be a difficult matter to describe the laying out of the ground for this purpose, so much depending upon the taste of the person employed in this office. Between

Laying out the ground for planting.

Timber.

the hills, towards the outsides of the plantations, we frequently leave the ridings from 60 to 100 yards in breadth, and contract them towards the middle of the woods to the breadth of 10 or 12 yards; and on the tops of the hills, where there are plains, we frequently leave lawns of an acre or two, which makes a pleasing variety. In some of them we plant the cedar of Lebanon at good distances, so as to form irregular groves; and this tree seems to thrive to admiration on the forest-land. On the outsides of the woods, next to the ridings, we plant evergreens—as hollies, laurels, yews, junipers, &c.; and these we dispose of in patches, sometimes keeping the several sorts entire. At other times we intermix them for variety, but not so as to make a regular screen or edging. Our design in the distribution of these plants is to make the outsides of the woods appear as if scalloped with evergreens, intermixed sometimes with rare trees, as the tulip-tree, &c., &c.

Planting clumps.

"After the ground is laid out into quarters for planting, we assign certain parts to beech, larch, Spanish chestnut, &c. These we plant in irregular patches here and there throughout the plantations, which, when the trees are in leaf, has the most pleasing effect, on account of the diversity of shades. After these patches are planted, or marked out for that purpose, we then proceed to the planting in general. We always begin by planting the largest young trees of every sort, and end our work with those of the smallest size: were we to proceed otherwise, the making a hole for a large-sized tree, after the small ones are thickly planted, would cause the greatest confusion. Birch is generally the sort of tree we make our beginning with, which we find will bear to be removed with the greatest safety at the height of 6 or 7 feet, though we commonly plant rather under than at that size. This sort of tree we are always supplied with from our plantations of five or six years growth. But before I proceed to the taking them up, it will be proper to inform you that, in the planting season we divide our hands into four classes, which we term takers-up, pruners, carriers, and planters; and now I shall describe the several methods of doing this work.

The planting in general.

Taking up thinnings from the plantation.

"First, in taking up, we have the same care to take up with good roots in the plantations as was recommended in the nursery, though we cannot pursue the same method; but in both places, so soon as the plants are taken up, we bed them in the ground in the following manner:—Dig a trench at least 15 inches deep, and set the young trees therein, with their tops aslant, covering the roots well as you go along, and almost half-way up the stem of the plants, with the earth that comes out of a second trench, which we fill in like manner, and so proceed until we have a load (more or less) ready to be carted away. In our light soil this trouble is not great, and we have always our plants secure both from their roots drying and from their suffering by frost. We have a low-wheeled waggon to carry them from the heaps where they are bedded to the pruners, and we generally take two loads every other day. When they arrive, the planters, pruners, &c., all assist to bed them there in the same manner as already described. We have a portable shed for the pruners to work under, which is also convenient for the rest of the work people to take shelter under in stormy weather. From these heaps the plants are taken only so fast as they are wanted for pruning, which work we thus perform:—Cut off all the branches close to the stem to about half the height of the plant, shortening the rest of the top to a conical form in proportion to the size of the plant; and in pruning the roots we only cut off the extreme parts that have been bruised by the taking up, or such as have been damaged by accident, wishing at all times to plant with as much root as can be had.

Pruning.

Planting the trees.

"As soon as they are pruned they are taken to the planters by the carriers, who are generally a set of boys, with some of the worst of the labourers. The planters go in pairs, one makes the holes, and the other sets and treads the plants fast, which work they commonly do in turns. In making the holes, we always take care to throw out all the bad soil that comes from the bottom. If the planting be on the side of a hill, we lay the bad soil on the lower side of the hole, so as to form a kind of basin, for without this care our plants would lose the advantage of such rains as fall hastily. We at all times make the hole sufficiently large, which is done with great ease after one deep ploughing. Before setting the plant, we throw a few spadefuls of the top soil into the hole, setting the plant therein with its top rather inclining to the west; then fill up the hole with the best soil taken from the top, taking care that it closes well with the roots, leaving no part hollow. When the hole is well filled up, one of the planters treads and fastens the tree firmly with his feet, while his partner proceeds to make the next hole. The fastening a tree well is a material point in planting, for if it once becomes loose, the continual motion which the wind occasions is sure to destroy the fibres as fast as they are produced, which, if not prevented, must end in the destruction of the tree. It is to guard against this mishap that we take off so much of the top, as has been described while speaking of pruning.

Timber.

Proportions of the different kinds of trees.

"We plant about three or four hundred birches of the large size to every acre, and nearly the same number of the first-sized oaks; we also plant here and there a beech, larch, Spanish chestnut, &c., exclusive of the patches of these sorts of trees before planted. We then proceed to plant plentifully of the second and lesser-sized oaks, and last of all, a great number of the small birches, which are procured from the woods at a cheap rate. These we remove into the succeeding plantations after the term of five or six years. Of the several sizes of the different kinds of trees, we generally plant upwards of 2000 plants upon an acre of land, all in an irregular manner.

Acorns to be sown in the plantations.

"After the planting is finished, we then sow the acorns (provided it be a season that they can be had) all over the plantation, except among the beech, larch, &c., in the aforesaid patches. Great care should be taken to preserve the acorns intended for this purpose, as they are very subject to sprout, especially soon after gathering; the best method being to lay them thin in a dry airy place, and give them frequent turnings. We sow these acorns in short drills of about a foot in length, which work is done very readily by two men, one with the acorns, another with a hoe for making the drills and covering the seed. We are of opinion that the plants grown from these acorns will at last make the best trees, though oaks, transplanted small, grow equally well for a number of years. It is probable, however, that a tree with its top root undisturbed will in the end grow to a much larger size. When the whole is finished to a convenient distance round the pruners, their shed is then removed to another station, and the work is proceeded with as above.

Best season for planting.

"It is preferable to have the planting all finished by the end of February, especially for trees of the deciduous kind, but from disappointments occasioned by the weather we are sometimes detained to a later season. Towards the end of April, when the ground is moist, it will be of great service to go over the whole of the plantations, and fasten all such trees as have become loose since their planting; after this, nothing more will be required till the month of June, when we again go over the whole with hoes, cutting off only the tall-growing weeds, for the sooner the ground gets covered with grass in our light soil so much the better. I own there is something slovenly in the appearance of this method; and on some lands I would recommend keeping the ground clean-hoed for some time at first, as also planting in rows, which in that case would be necessary. More than once I have tried this method on our forest-hills, and

Cleaning.

always found, after every hoeing, that the soil was taken away by the succeeding winds into the valleys. The evaporation from sandy soil is so rapid, that we find the plants stand a dry season much better when protected by grass; and whoever thinks that the latter will choke and destroy seedling oaks will, after a few years' trial, find himself agreeably mistaken. I have even recommended sowing the poorer parts of the hills with furze or whin-seed as soon as they are planted. We have sometimes permitted the furze to grow in the plantations by way of shelter for the game, which, though it seems to choke and overgrow the oaks for some time, yet, after a few years, we commonly find the best plants in the strongest beds of whins. This shows how acceptable shelter is to the oak while young, and experience teaches us that the oak would make but slow progress on the forest-hills for a number of years at the first, were it not for some kind nurses. The birch seems to answer best for this purpose, and therefore it is that that tree is so plentifully introduced in oak plantations. For although the several kinds of fir-trees would appear to promise greater shelter, they neither grow so fast on the forest-land as the birch, nor will the oak thrive under them. When a plantation is on a plain, a screen of fir-trees for its boundary is highly beneficial.

Protection for the young trees desirable.

Management of the young plantation.

"We continue to cut down the tall growing weeds two or three times the first summer; and perhaps the next once, which is all we do in respect of cleaning. The next winter, after planting, we fill up the places with fresh plants where they have miscarried; after which there is little to be done till about the fourth or fifth year, by which time the small-sized birch and seedling oaks will be grown to a proper size for transplanting. In the thinning of these, due care must be had not to take too many away in one season, but when properly managed there will be a supply of plants for at least half a dozen years to come. About the same time that the lesser-sized birch wants thinning, the large ones will require to have their lower branches taken off, so as to keep them from injuring the oaks; and this is the first profit of our plantations, the birch-wood being readily bought up by the broom-makers. This pruning we continue as often as required, till the birches are grown to sufficient size to make rails for fencing; we then cut them down to make room for their betters.

"By this time the oaks will be grown to the height of 12 or 14 feet, when they draw themselves up exceedingly fast; each plant seems, as it were, at strife with its neighbour, and, in a strict sense, they are so, and on no other terms than life for life, since he whose fate it is to be once overtopped, is soon after compelled to give up the contest for ever. After the birches are cut down, there is nothing more to be done but thinning the oaks from time to time, as may be required, and cutting off the dead branches as often as may be necessary. We are very cautious in doing the former, knowing well that if we can but once obtain *length* of timber, time will bring it into *thickness*; therefore we let them grow very close together for the first fifty years.

Progress made by the oak.

"And here it may not be improper to observe the progress the oak makes with us at Welbeck by describing them in two of our plantations, one of twenty-eight, the other of fifty years' growth. In the former they are in general about 25 or 26 feet in height, and in girth about 18 inches; the trees in the latter are something more than 60 feet in height, and in girth a little above 3 feet, these trees being in general about 50 feet in the bole, from which it will be seen that their tops are comparatively very small."

Although this excellent paper on the cultivation of timber was written nearly a century ago (being published in Dr Hunter's edition of Evelyn's *Sylva*, 1775), it may be said still to embody the best practice of the present day; and the flourishing appearance of the woods at Welbeck certainly attest the value of Mr Speechly's instructions. It should be remarked, however, that much doubt exists as to the propriety of *transplanting* the oak, since from the great length of its top-root (or tap-root, as it is frequently called), it is all but impossible to do this without injury, and trees thus treated are found not to thrive so well as those which have never been moved. The best season for planting on light ground is as soon as possible after the beginning of October, and for heavy, moist land, in February and March. When the quality of the ground varies very much, which is almost sure to be the case in extensive plantations, the species of the trees should be varied accordingly, and the appearance of the wood will be much more beautiful than if uniformly planted with trees of one kind. As the oak, however, fortunately thrives on almost any soil, no portion of the wood should be destitute of them.

Artificial drainage.

Where artificial drainage becomes necessary, open drains are preferable to close ones, as being less liable to get choked up with the fibres of the roots. Strong clay soil (of which a great portion of wood-land consists), when so overshadowed by trees that the natural evaporation from the surface is much impeded, becomes almost impervious to water, and the stunted growth of trees, particularly the oak and the ash, and the dead branches in the tops of the oaks, called *stag-heads*, are mostly attributable to this cause. Good drainage has also the effect of increasing the temperature of the soil.

Open glades should be left.

In large woods which are planted on nearly level ground, it is recommended to leave occasional open spaces or glades, in the thickest parts most remote from the boundaries, unencumbered with brush-wood. These tend greatly to encourage the free circulation of air through the wood, a point of considerable importance in the economy of vegetation. These glades may be rendered very beautiful by planting in them a few choice specimens of ornamental trees, which will generally thrive well in such a situation in consequence of the protection afforded by the surrounding wood.

Thinning woods.

In thinning woods, care should be taken to remove such trees as show any signs of decay, or when one tree interferes with the growth of another, the cleanest, straightest, and those with well-formed compact heads being alone reserved for timber. The oak and chestnut, as the most enduring trees, should be chiefly left to posterity; the beech, ash, and others being cut down as they arrive at maturity.

Best season for felling timber.

In consequence of the great value of the bark of oak, it is the practice to fell the timber in the spring of the year, because then the bark is easily detached from the tree, while the bark of winter-felled timber is lost. There can be little doubt, however, that the durability of the wood is much deteriorated by this practice. It was a received opinion among the ancients that timber should be felled in the fall of the year; and not only do modern experiments confirm this opinion, but modern discoveries as to the flow and return of the sap, and its nature at various seasons, tend to show the reason for its correctness. The practice which almost all the eminent arborists have recommended, and supported by their experiments, is to bark trees standing in the spring, and then allow them to remain in this state at least one twelvemonth. This was not an uncommon practice in some of the midland counties of England, and was first strongly recommended in the reign of James the Second by Dr Plott, an arborist of great celebrity at that time. Buffon presented a memoir in 1738 to the Royal Academy of Sciences in Paris, "On increasing the Solidity, Strength, and Durability of Timber;" for which purposes it was recommended to strip the tree of its bark during the season of the rising of the sap, and then to leave it to dry completely before being felled. Du Hamel gives most minute accounts of experiments made by himself, all tending to the same conclusion; and Dr Hunter, in his notes on

Timber. Evelyn's *Sylva*, says, "that by stripping off the bark, and allowing the tree to stand and die before it is cut, the sappy part becomes as hard and firm as the heart." Here is a collection of opinions, of such weight, that the general fact which they assert must be considered to be established beyond contradiction. Buffon also says that he caused pines, firs, and other species of evergreens, to be barked standing; and as he found them live longer after the operation than oaks which had been also stripped, he considered their wood acquired proportionately greater hardness, strength, and durability. He recommended the practice for fir-trees destined to be converted into ships' masts.

We shall now notice a few of the peculiarities of other trees most esteemed in this country for their timber.

Elm timber. The ELM, of which, like oak, there are two principal varieties, will not bear a damp soil with stagnant waters, but it thrives well in moist declivities, provided the land be not too rich. The trees grown on too damp a soil either die prematurely, or their timber is of a soft spongy nature, and prone to decay. There are two British varieties of this timber, the *Ulmus Montana*, or Wych elm, and the *Ulmus Campestris*, or, as they are sometimes called, the Scottish and the English elms. Of these the Wych elm is decidedly the most valuable as timber, and, when used in situations where it is kept constantly moist, is extremely durable; but no elm timber will bear the trials of change of temperature and moisture to which oak in all its varieties is comparatively insensible. The close and interwoven grain of elm, the absence of decided longitudinal fibre, and its power to resist rending from exposure to the heat of the sun, and the alternations of weather, cause its timber to be very useful for small articles, such as the blocks used in the rigging of a ship. It is valuable in many parts of the millwright's machinery, where the wood is subjected to cross strains or great friction. It is also valuable and much used both for the timbers and for the planking of ships below the surface of the water; and the planks of clinker-built boats are very generally of elm. There is one peculiarity about elm timber, namely, that the alburnum or sap-wood is possessed of nearly equal power to resist decay with that which is matured; that is, when both are used in situations where they are not exposed to alternations in moisture. A variety of timber has of late years been introduced into the market under the name of Canada elm, or American rock elm. It is a smooth, even textured, pale-coloured, and strongly fibrous wood, almost devoid of knots, and admirably adapted for boat-building, and all works which require a flexible and close-textured wood. The Canada elm appears to have many of the peculiarities of toughness and flexibility which distinguish the ash. The elm-tree, which is much to be admired for the stateliness of its growth, sometimes arrives at an enormous bulk. King Charles' elm at Hampton Court measures 38 feet in circumference, at the height of 8 feet from the ground. The Wych elm at Field, Staffordshire, is 25 feet in girth.

Chestnut timber. The CHESTNUT, *Fagus castanea* (called Spanish, or sweet chestnut), is a very valuable timber tree, its wood being equally durable with that of oak. It was much used for building purposes in former times, both in this country and on the Continent, but its cultivation has been too much neglected of late in England. Chestnut timber may be seen in a state of perfect preservation in many parts of ancient ecclesiastical buildings, Pugin having specially distinguished it by name in the engravings of some of his works.

This tree, as well as the beech, appears to suffer less than any other of the timber trees from being planted in a moist sandy soil; but as the roots of the chestnut extend far downwards, they require a proportionate depth of soil. It grows with frequent twists and contortions of the stem, which, while it adds to its picturesqueness for ornamental purposes, certainly detracts from its value as a timber tree. Some of the largest chestnuts in Europe are found on the flanks of Mount Etna. The largest known in this country is at Tortworth in Gloucestershire. As their shade is detrimental to other trees, they should either be planted in clumps by themselves, or be given full room to spread. When the timber of the chestnut has been some time in use for roofs or joinery, it is difficult to distinguish it from oak. Timber.

Beech timber. The BEECH, *Fagus*, is a timber that easily adapts itself to, and flourishes in, almost any soil. Even among rocks its roots will, like those of firs and larches, insinuate themselves into the smallest fissures, and find means to extract sufficient nourishment to produce a useful timber. Beech timber, when used shortly after being felled, and for works where it will always remain in a damp state, is a long-enduring wood. It is largely applied in the mercantile navy for the lower planks of the bottoms of ships. The best variety has its wood of a yellow tinge. It is much used for making cheap furniture; also by railway contractors and others for temporary purposes, and by coopers. The symmetrical shape of the beech, and its bright glossy leaves, render this tree highly ornamental in the park or shrubbery, and the varying hues which its leaves assume as the autumn approaches are a great additional recommendation. As no tree suffers more from injudicious pruning of the roots or branches than the beech, it is better raised from seed in the situation it is intended permanently to occupy.

Ash timber. The ASH, *Fraxinus Excelsior*, will also accommodate itself to all soils. It will grow in marshy grounds, and in arid land, in deep or in shallow soil. The value of its wood for general purposes is second only to the oak in the list of British timber trees. The ash timber from very poor soils is brittle, wanting the elasticity which is the valuable peculiarity of this wood. It is a very useful timber for carts and implements of husbandry, for machinery, for tools of almost all trades, and it supplies oars to our shipping. When planted in a genial situation, it attains to a very great size, specimens being sometimes found which measure 30 feet in circumference, and 100 feet in height.

Fir timber. We have hitherto confined our remarks to the hard-wood timber trees, without noticing the numerous FIRS which are so valuable to us. Their timber is admirably adapted by its manner of growth, its lightness, and strength, to supply our navies with masts and spars; while from its comparatively small cost, and the ease with which it is worked, it is used very largely for all purposes of building. Indeed, it is questionable whether fir is not more generally useful to us than any other species of timber. Du Hamel, in his treatise *Du Transport et de la conservation des Bois*, has drawn a distinction between firs and pines, although it is usual to designate the timber of both as fir timber. Pines, he says, have the leaves thready and slender, growing in clusters from the same leaf-stalk, while firs have straight leaves, each growing separate, but many growing on the same leaf-stalk like the teeth of a comb. Trees of the pine tribe have one principal root growing straight down like a carrot, with few fibres, while the roots of the fir are more lateral and superficial. The pines grow with their trunks much less tapering towards their tops than the firs; they are, therefore, from shape, more adapted for masts than firs. Their wood is also more resinous, and the resin is of a more glutinous nature, and therefore less easily evaporated. This quality enables the timber to resist better the absorption of water or moisture. The pine is more durable than the fir, and its fracture is, even when partially decayed, much more fibrous, and takes place with more previous warning. The timber of the pine, when healthy, is close-grained, even-textured, and of a bright yellow colour. The fir, although frequently little inferior in appearance in other respects, is always of a much paler shade of colour.

Timber.

Riga or red pine.

The most valuable of all the varieties of fir timber is that which is called RIGA FIR. It is the red-wood pine of the north of Europe, the *Pinus Silvestris*, which, although spread over a very large portion of the globe, appears to flourish in its greatest perfection in the forests of Lithuania and Poland, where the cold is severe and the soil generous. Riga fir is not only extremely flexible and elastic, but is by far the most durable of all the pine timbers; and as long as it could be procured of sufficient size, it was generally used in the royal navy, not only for topmasts, but also to build the lower or standard masts. At present, from the difficulty of procuring large sticks, the use of it is confined to topsail-yards and the smaller description of spars. The American continent also produces this red pine timber of good quality, although much inferior to that of the north of Europe. It is imported from Canada and from Virginia. The Canadian red pine is of small size, seldom exceeding 14 hands. The Virginian pine is large, sticks of 24 and 25 inches in diameter not being uncommon. It is a resinous and flexible wood; but the sticks are more subject than the Canadian red pine to the defect of large knots, which, from not being firmly united to the surrounding timber (technically, "well-collared"), injure its value. The

Scotch fir.

red pine thrives extremely well in Scotland, where it is called Scotch fir, but is not equal in quality to that imported from the north of Europe. The French dockyards are supplied with mast-timber from the red pine of the Pyrenees and of the island of Corsica, but neither of these is of first-rate quality. Indeed, a climate of low temperature appears to be essential to the growth of superior fir timber. The firs on the northern sides of hills and mountains, in all temperate climates, thrive better than those growing on the southern slope; and even the timber of the northern side of an exposed fir-tree is much superior to that of its southern side.

Yellow pine.

YELLOW PINE, the *Pinus Strobus*, which is imported from Canada, is the principal timber now available for large masts and yards, and is very generally used both in the royal and mercantile navies, as well as for building purposes. It has neither the flexibility nor the elasticity of the red pine, nor is it so durable, but it is much lighter. Its great recommendations are its large size and its comparatively small cost. Sticks of this timber run from 16 to 27 or 28 inches in diameter; and for bow-sprits they are sometimes received in the royal yards as large as 29 and 30 inches in diameter; but sticks of these large dimensions are becoming very scarce. This timber grows also in Great Britain, where it was first introduced by an Earl of Weymouth, whence it is called the Weymouth pine; but it does not appear to thrive well in this climate.

Spruce fir.

The SPRUCE FIR, *Pinus Abies*, grows in Scotland, Norway, and other northern countries. It is very generally used in the mercantile navy for yards and top-masts, and also in the royal navy for the smaller description of spars and boats' masts. They are tough, close-grained, and elastic, but are very full of large knots; and care is therefore required in selecting them. The timber also is soft and far from durable, it having very little appearance of resin. The Norwegian spruce grows frequently to a large size.

Cedar.

CEDAR, *Pinus Cedrus*, would be among the most valuable of all timber trees, were it sufficiently common to be available for building purposes. It is almost indestructible from time, and no insects will ever attack it. It thrives well in this climate, but hitherto has only been planted either as an object of curiosity or of ornament. It requires a more generous soil than any other of the tribe of pines, and is considered to be a timber of very slow growth. Pitch-pine is also a very valuable timber for building purposes, but it is too heavy for spars.

Fir sticks, the Riga hand-masts especially, are very liable to have serious defects in them, which it is often impossible to discover until the stick is worked. They are technically called "upsets." The grain appears to be partly separated, so that a shaving from the stick at that place would bend to a sharp angle at the upset, as if partly broken. There always appears to be a greater or less accumulation of the turpentine about the injury, as if it had originally exuded at the wound, and become congealed around it. These defects are most frequently found in the smaller sticks, those especially that are more resinous and knotty than others; and they sometimes are so numerous as to extend, at very short distances apart, for a great portion of the length of the stick. Mr Cradock, who long superintended the mast-making at Portsmouth dock-yard, considers them to be the effect of violent winds on the more exposed trees of a forest. He founds this opinion on the facts that they are most common in the most flexible timber; that they are not perceived in sticks of large diameter; and that in the firs of little flexibility, as the yellow pine, they are seldom or never found; although the sticks of this fir, from being cut in every variety of direction, to form the components of made-masts, are more searched than any other. The cowdee, a New Zealand timber, lately introduced both in the royal and mercantile navies, is, he says, much subject to this defect; and he has observed it once in a poon topmast. The defect seldom or never appears in the outer layers of the timber, but only after some of these have been removed by the axe, and the older timber laid bare of the sap-wood.

Timber. Defects in fir timber.

Sap-wood in fir timber.

The sap-wood in all fir timber is useless, and very generally there is a large proportion of it in comparison to the quantity of heart-wood. It is rather a curious fact, that there appears to be a difference between the pines and the generality of the hard-wood timber in this, that a small proportion of sap-wood in fir is indicative of the inferiority of the timber. Thus the red pine of Scotland has fewer layers of sap-wood than either the red pine of Canada or of the Baltic. As a general remark, it may be stated, that the greater the quantity of sap-wood there is about a tree of any description of fir timber, the better will be the quality of the "spine," which is the technical name given to the mature wood.

Cowdee.

The COWDEE, which is now largely imported into this country, is a close and even-grained timber, almost entirely free from knots. It grows to so large a size as to be available for the topmasts and other principal spars of the largest classes of vessels; but from its want of elasticity, and its liability to warp and rend, it is not so suitable for small conversions. It varies greatly in its quality, even so much as often to be of different colours, grain, and texture, in the same stick. It is about the same average weight as Virginia red pine.

Larch timber.

LARCH timber, *Pinus Larix*, formerly unknown in Great Britain, has, within the last century, been very extensively planted. The first plantations of it were made on the vast estates of the Duke of Atholl, in the Highlands of Scotland. The following account, which is extracted from Knowles *On Preserving the Navy*, was, as the author of that work states, furnished to him by the late duke, and it contains, consequently, the results of the longest experience as to the growth of larch timber in Britain which can be obtained. The account is interesting, because plantations of larch are becoming very numerous, as they are found to be very profitable. The returns from a larch plantation during the time the trees are arriving at their full growth, are estimated to be at least double what they would have been from an equal plantation of any other timber. "Seedlings of larch were probably first brought into Scotland in the year 1738 by Mr Menzies; but it has been asserted by some, that they were introduced into that part of this country in 1734 by Lord Kames. Some were left at Dunkeld, and some at Blair-Athole, by the former gentleman; and

Timber. being exotic plants, were placed by the gardeners in greenhouses. Not thriving in those situations, they were planted in the pleasure-grounds, where they grew luxuriantly. When the present duke succeeded to the titles and estates (in 1774), there was a considerable number of trees in a thriving state; and on a general survey of his estates in 1783, there were found to be 900 Scottish acres of plantation, 600 of which were of larch; since which time his grace has planted extensively every year, and in the spring of 1820, 10,820 Scottish, or about 12,984 English acres, were covered with trees. The different species were, of—

	Scotch Acres.
Oak	800
Scottish firs	1500
Spruce firs	500
Mixed plantations in the pleasure-grounds	200
Birch	200
Larch	7620
	10,820

"The larch thrives in very exposed situations. The lower range of the Grampian Hills, which extends to Dunkeld, are at an altitude there of from 1000 to 1700 feet above the level of the sea. The larch-trees are planted as high as 1200 feet up these hills, and grow exceedingly well; a situation where the hardy Scottish firs cannot rear their heads. The spruce fir, however, thrives equally well as the larch on high and exposed hills. The growth of the larch-trees is very rapid, and Scottish fir of the same age will measure only half the quantity; and so much is the wood esteemed in Scotland, that while the former is worth 2s. 6d. per cubic foot, the latter brings only 1s. 3d. The following account of a larch-tree, planted in the year 1738, and measured February 1819, will give some notion of its growth:—1 foot above the ground, girth 17 feet 8 inches; 2 feet, 14 feet 6 inches; 3 feet, 12 feet 7 inches; 5 feet, 11 feet 5 inches; 10 feet, 10 feet 4 inches; 20 feet, 9 feet 7 inches; 50 feet, 6 feet 3 inches; 70 feet, 3 feet 2 inches; 75 feet, 1 foot 10 inches.

"The top was fifteen feet in height, making the whole height 90 feet; and the tree measured 300 feet, or 6 loads, in cubical contents. The white and red larch-trees are those chiefly planted. The duke has made trial of the black or American, and also of the Russian larch, but has found that they do not thrive well. The timber in question has been used for many years in Scotland for almost all local purposes, such as posts, rails, mill-wheels, fishing and ferry boats; and in all these situations has been found to be very durable. The author has seen part of a ferry-boat twenty-three years old, which remained very sound, and the iron nails driven into it as perfect as when they first came from the forge. This, perhaps, was occasioned by their being constantly covered with an insoluble varnish, with which the larch abounds. One of the qualities of larch for building merchant-ships is its great lightness, a cubic foot, weighing, when seasoned (which it does rapidly), only 34 lb. Although it is not so strong as many sorts of wood, it has great resilience. Cabinet-work of great beauty has been made from larch; it polishes well, and when seasoned is not found to warp or shrink. A most important fact in agriculture has arisen from planting larch-trees on rocky ground; the vegetable compost formed thereon by the falling of the leaves has been the cause of producing herbage for feeding cattle, and made that land, which, on the average, did not formerly bring more than 8d. or 9d. per acre, now to be worth from 12s. to 14s. per acre annually."

Cultivation of the larch. Larch timber, although so generally planted, and so generally thriving, requires considerable attention in the selection of proper soil for it. It is very subject to a heart-rot, which seizes on the roots, and rapidly proceeds up the centre of the stem of the plant, the latter swelling considerably for several feet above the surface of the ground. Timber. Larch cannot bear a cold damp soil, or any stagnation of water, or even the moisture of the rich vegetable moulds. Nor will it thrive in the light sandy soils; for although it dislikes marshy stagnant waters, its roots require to be preserved from the droughts of summer. Sandy and gravelly soils, if situated so as to receive from declivities the moisture percolating through them, will produce excellent larch timber; as will also the sides of rocky hills and mountains, in which no moisture can stagnate, and into the fissures and clefts of which the roots easily penetrate and find ample nourishment. Larch-trees attain to a very great height. In some of the public buildings of Venice there are said to be single-pieced beams of larch which are 120 feet in length. It must be very durable, for it is almost the only wood which was used in the palaces and public buildings of that city.

The timber imported from Canada under the name of *hackmatack* is believed to be identical with the Scottish larch. The timber of America in general is very inferior to that grown in the north of Europe, being much softer in its nature, not nearly so durable, and more liable to the dry-rot. American timber is therefore seldom used in ship-building, except for deck-deals, and but sparingly also in the construction of first-class houses. American timber.

In consequence of the immense consumption of timber for the maintenance of our fleets, we are obliged to import much from abroad. We obtain oak of excellent quality for planking from Poland and the shores of the Baltic; while from Italy, and from both sides of the Adriatic, sided timber and plank are imported in large quantities. American oak and rock-elm are both valuable timbers, and are now coming into very general use in this country, being introduced in considerable quantity. The former is used by cabinet-makers and carriage-builders, principally on account of its great size, uniform texture, straightness of grain, and little tendency to warp. Its specific gravity is somewhat less than that of English oak. Rock-elm is becoming much used for engineering purposes. It is remarkably uniform in texture and growth, and perfectly straight and free from knots. Its great length and uniform siding render it extremely useful for longitudinal ties, piles, and other purposes, which require great length, combined with uniformity in dimension. For example, a baulk of rock-elm, 54 feet long, was found to taper only 1¼ inch, and when slabbed, was 12½ inches square in section, and 51½ feet long. A specimen cut from this baulk weighed 50 lb. per cube foot, its specific gravity being equal to that of English oak. Foreign timber. Oak. Rock-elm.

One of the most largely imported woods of tropical countries, and one of the most valuable, is teak. It grows to an enormous size, is particularly straight and free from knots, and has the peculiar property of resisting the attacks of insects. It possesses greater toughness than almost any other wood of equal weight, and is little liable to dry-rot or other disease. The great durability of teak is to be attributed to the large amount of oleaginous matter contained in this timber. Like all other woods, it varies much in quality, according to the locality where it is grown. The finest teak comes from Malabar; then follow the importations from Travancore, Ceylon, Java, the Malayan Peninsula, from Pegu and Moulmein. The two last descriptions of teak are very inferior to the Malabar variety, being comparatively coarse, porous, and open-grained; but this inferiority is believed to be due rather to the low swampy locality from which it is cut for the foreign market, than to any inherent bad quality of the timber. Its weight, when moderately seasoned, may be stated to be 42 lb. per cubic foot, while the weight of Malabar teak, on an average, is from 45 to 52 lbs. per cubic foot. The forests of Tonga and Irrawaddy supply the whole of the Teak.

Timber. Pegu teak. That of the Tonga forests is of the best quality, the country being high, and not flooded during the rainy season; whereas the forests of the Irrawaddy are always in a swampy state, and are part of the year covered with water sufficient to allow of the trees being floated from where they are felled. The Birmans are in the habit of tapping the teak-trees, particularly those which are straight grown, to extract a varnish or oil, which is highly prized by them, and used chiefly for protecting their pagodas or temples from the weather, for which purpose it is very effectual. These edifices are built entirely of untapt teak, as the Birmans consider the timber to be much injured, both in its strength and its durability, by being deprived of this oil. The principal parts of these temples are sunk in the ground, and although so fixed, the timber remains perfectly sound, notwithstanding many of them have stood nearly a century.

Saul. Inferior as the Pegu and Moulmein teak is to the Malabar or Bombay teak, it is still preferable to the saul, which is now imported to this country in considerable quantity. This is a hard heavy wood, growing in Behar, Oude, and the inexhaustible forests skirting the hills that form the northern boundaries of Bengal. It varies much in quality, the best timber being found occupying the rocky ground at the foot of the hills, while that grown in the alluvial plains is very inferior. As a rule, it deteriorates in quality the further it is produced to the westward. Sauls of large dimensions are now becoming very scarce, as the whole of the forests within a reasonable distance of the navigable streams are quite exhausted; but it is hoped, that as the Indian railways extend into the interior of the country, a further supply of valuable timber will thus become available for exportation. The best description of saul, if well seasoned, may be classed, in point of durability, with the best sort of African timber, now so extensively used by ship-builders in this country. The greatest care is necessary in the selection of saul for immediate use, on account of its requiring a long time to season, and it must not be employed in ship-building for any part exposed to the sun, as it shrinks very much. Saul is used for the frame, beams, shelf-pieces, breast-hooks, and inside planking of ships built in Calcutta.

Indian woods. The principal woods used in India for ship-building are, besides teak and saul, sissoo, jarrol, poon, and toon, teak being the most durable of them all. Indeed, from the great length of time which several vessels built of Malabar teak have lasted (from thirty to fifty years, and in some particular instances nearly a century), this may be said to be the most valuable timber for ship-building purposes yet known. It is, however, like every other kind of wood, liable to premature decay, if not properly and gradually seasoned by exposure to a moderate current of air, after being felled. Java teak is of very superior quality, little if at all inferior to that from the Malabar coast, and is extensively used for ship-building at Calcutta. "The teak which is grown on high, dry, and open land," says Mr Leonard Wray, in a paper read to the Society of Arts, "is generally of a fine quality, close and compact, and abounding in a mild oil, which exerts no injurious effect upon the iron bolts which may be driven into it. That grown in the dense forests of the wet, low-lying alluvials, on the contrary, is lighter, coarser grained, and contains an acrid oil, which not only affects iron very materially, but even, to a certain extent, poisons and inflames the hand which has been pierced by its splinters."

As a test of the durability of a Calcutta-built ship, we may cite the Hastings, 74 gun frigate, built at Calcutta in 1818. The hull is composed of saul, sissoo, Pegu and Java teak, all of the best kind. So great was the expense incurred in the building of this ship, that when completed, the account, after giving credit for her freight, exhibited the cost of the hull for sea, 1,163,754 Sicca rupees, or, ten rupees to the pound, L.116,375 sterling. It is usual in Calcutta-built ships to convert the frame, with the knees, breast-hooks, &c., from sissoo timber; the beams and inside planking being of saul, and the bottoms, wales, topsides, decks, keels, stem, and stern-post, of the Pegu teak.

Timber. Durability of Indian woods.

Mahogany. Mahogany is the produce of America and the West Indies, being principally imported from Honduras and Campeachy. That imported from the islands is called Spanish mahogany. It differs very much in quality according to soil and locality, the weight of a cubic foot varying from about 53 lb. to 35 lb.

Although mahogany may be stated to be a durable and valuable timber both for ship-building and general purposes, it varies so very much in texture and quality, that the utmost care and judgment are necessary in its selection. There are many well authenticated instances of the extraordinary strength and durability of ships built almost exclusively of mahogany, the most famous being that of the Spanish 80 gun ship Gibraltar, captured by the English in 1757, and broken up at the age of 100 years, when all her timbers were found to be perfectly sound. This, however, only proves the excellent quality of carefully selected Spanish mahogany (the Gibraltar having been built at Havannah), it being equally well known that light, porous, "swamp mahogany," or indeed any of inferior quality, is highly treacherous and unsafe when employed for the timbering of a ship. It is an error to suppose that all Honduras mahogany is light and spongy, the best quality of this timber being as heavy as Malabar teak or English oak, and only the inferior qualities of mahogany being so very light and buoyant. Mahogany is highly prized for the paddle-beams and deck-beams of steam-vessels, in positions where these are exposed to the moist heat of the engine-room, which is very destructive to most other species of timber.

Classification of timbers at Lloyds. According to "Lloyd's" classification of timbers, those in the first class are the following only:—English oak, African oak, the live oak of America, the morra and greenheart of British Guiana, the teak and saul of India, and the iron bark of Australia. These are all close-grained, compact woods, hard, heavy, strong, and durable, being more or less impregnated with certain oily, resinous, or astringent matters. Mahogany of hard texture, though treated as a second-rate timber, is so far admitted in the construction of A 1 ships, as to include beams and hooks, knees, rudder, and windlass, main-pieces, outside planking to light mark, and the whole of the inside planking.

Greenheart. Greenheart, the produce of British Guiana, is a very valuable timber. It is a hard, close-grained wood, containing a considerable quantity of oil, like teak. Its specific gravity is about equal to that of African oak, but it is decidedly superior to it in strength, toughness, and durability. These, however, are not its chief advantages, its great value consisting in its complete exemption from the attacks of marine worms. It is therefore an excellent timber for sluice-gates, piles, and all marine engineering works, which would be exposed to their ravages. It is imported in logs of from 12 to 16 inches square, and from 20 to 40 feet in length. It has been used in some instances for the planking of ships. Mr Wray, from whose interesting paper "On Timber for Ship-Building" we have already quoted, says, that greenheart is very abundant within 100 miles of the coast of British Guiana, and can be had almost to any extent.

Morra. Another excellent timber of British Guiana, still more abundant than the last, is morra. This tree grows to a very great size, often attaining the height of 100 to 150 feet, the lowest branches being 60 feet from the ground. The wood is extremely tough, close, and cross-grained, which properties make it difficult to split, and render it peculiarly applicable to ship-building purposes. It is stated to be little subject to dry-rot. The other British possessions

Timber. from which we might readily draw a supply of excellent timber are Assam and Tenasserim in the north of India, Supply of colonial timber. our settlements in the Straits of Malacca, and Western Australia. From the latter country we have the iron-bark, a first-class timber; the tuart, the jarrah, the blue-Tuart. gum, and the morell. The tuart is a noble timber tree, growing in tolerable abundance on the coast. Planks are sometimes obtained of it 10 feet wide; and it is said to be peculiarly adapted to the building of ships of war, as it is difficult to split, and not liable to splinter. In colour it is pale-yellow, or white. Its timber is remarkably cross-grained, hard, and tough, and very strong and durable. Blue-gum. The blue-gum is also an enormous tree, "sometimes," says Mr Wray, "yielding planks 14 feet wide, and more Jarrah. than 120 feet long." The jarrah of Western Australia is frequently confounded with mahogany, to which some species of it bear a certain resemblance. Mr Reveley, a government engineer in Australia, thus describes the jarrah:—"First, in colour, there is every variety of shade, from almost crimson to reddish brown, and pale brown, inclining to white. In the second place, as to grain, there is almost every variety, from the perfectly straight fibre to every species of curl, including the zebra and satin specimens. The length of the stem of this tree, taking the average, may be 65 feet (many being much longer), without a branch or a knot in all that length, and very nearly equal in size all the way up. It is not attacked by insects of any kind, nor has it any tendency to dry-rot, and is scarcely affected in any way by damp or moisture." There are forests of this wood in Western Australia of more than 4 miles in depth, and which are known to extend for a length of 150 miles. Here, then, is timber enough to maintain our navy for a hundred years to come, if we would only avail ourselves of the resources of this valuable colony, and encourage the exportation of its timber, by providing a ready means of access to a shipping port.

We shall now mention a few other species of timber trees, of minor importance to the preceding, but still useful for many purposes of construction.

Acacia, is of small dimensions, seldom exceeding two feet in diameter; but when used in house-carpentry is very durable. It is harder, tougher, and more elastic than the best oak. It is a valuable timber for tree-nails for ship-building; also, for posts and rails for fences, in which capacity it is very enduring.

Alder.—The wood of this tree lasts a long time under water, which renders it valuable for piles, water-pipes, &c. It has a close texture, a fine colour, and works well under the plane, which makes it a favourite with the cabinet-maker. The best charcoal for gunpowder is made from this wood. When burned in the open air, 1000 lbs. of the ashes yield 65 lbs. of potash.

Birch.—This wood is hard, but not very durable. It is chiefly used for making cheap furniture, and for firewood.

Box is a valuable wood, being very close-grained, hard, and heavy, and cuts very clean under the chisel or graving-tool, being therefore used almost exclusively by the wood-engraver. Being susceptible of a fine polish, it is much used by the turner, mathematical instrument-maker, &c. It is also very durable.

Cedar (Cedrus pinus) grows to a great size; the timber is resinous, of a reddish-white colour, light and spongy in its texture, easily worked, but apt to shrink and warp if great attention be not paid to the seasoning. It was much valued by the ancients for its durability and preservative properties. The wood is odoriferous, and admirably adapted for joiner-work, being light and easily worked. Although a resinous wood, it contains but a small quantity of that substance. It resists the attacks of insects.

Cedar, Indian (Cedrus deodara), is also a very large tree. The wood is very compact, highly impregnated with resin, and possessed of a hard and fine grain. Its durability when exposed to the weather is very great, some bridges constructed of it in India having lasted for five hundred years. It is much used by the Hindoos in their buildings. Timber.

Chestnut (Castanea) has been already mentioned as a very excellent timber for building purposes. The *Horse Chestnut*, on the other hand, is a soft, inferior wood of but little strength or durability. It resists moisture, however, and may be advantageously used for water-pipes under ground.

Cypress is a fine-grained wood, remarkable for its great durability, and its freedom from injury by worms or insects. Owing to this property, it was employed in Egypt for mummy-cases.

Hornbeam is a hard, heavy, tenacious wood, very close grained. It is much used for cogs of wheels and other engineering purposes, where the material is exposed to friction.

Lignum vitæ is a very hard, dense wood, much used by millwrights and turners; its chief use, however, is for the sheaves of blocks. It is also employed by the engineer for lining the sockets of shafts, which are found to revolve in it with little friction and wear.

Lime, though a highly ornamental tree, and growing to a great size, is not of much value for its timber, which is soft and light, and deficient in strength and durability. Being close grained and smooth in its texture, however, it is well adapted for carving and cabinet-work.

Maple is a clean, white wood, prized for its lightness, and is used by the turner for making dishes, bowls, and trenchers; and by the joiner for common furniture. As it is not liable to warp or split, it is readily stained to imitate mahogany and other woods.

Plane.—The wood of this tree much resembles the beech. It is used by the joiner and cabinet-maker, but is not remarkable for strength or endurance. It keeps best under water, and is used in America for quays and other marine works.

Poplar.—The wood of this tree (of which several kinds are grown in this country) is much used by builders for floors, especially, as it does not easily split by driving nails into it, and it has the property of not readily catching fire. When used for this purpose, however, it requires from two to three years' seasoning, as it shrinks much in drying.

Sycamore, when kept dry, is durable; but is readily attacked by the worm. It is a species of maple, and is possessed of similar qualities.

Walnut is one of the most valuable of English timbers. The wood is solid and compact, easy to work, not liable to crack or warp, and handsome in appearance; it is therefore much used for the better class of furniture. The screws of presses and gun-stocks are generally made of it. The black Virginia walnut is the most prized. It prefers hilly, calcareous soils.

Willow is a soft, smooth, light wood, of little value; but, if kept dry, it will last a long time in situations where much strength is not required.

Yew was principally used of old for the making of bows, and is now a favourite wood with turners from the smoothness and toughness of its grain, and from its taking a high polish. It sometimes attains an extraordinary bulk. At Gresford, near Wrexham, there is a yew 29 feet in circumference at a little distance below the branches; and in Dibdin churchyard, New Forest, there is a yew-tree measuring 30 feet in girth at the ground; while others, of large size, occur at Iffley, Hampton Court, Dorly-in-the-Dale, Tisbury, and other places. When found growing in churchyards, they may be generally reckoned as coeval with the church itself.

As the strength of timber has been already treated of in the articles, STRENGTH OF MATERIALS, and SHIP-BUILDING,

Timber.

we have little to add here upon this important subject. It may be observed, however, that the weight or density of a timber is in general a sure index to its strength, the densest wood being at the same time the strongest and the most durable. The oak, as well as all other timbers, varies in its specific gravity according to the soil which produces it, the density mainly depending upon the length of time occupied in the formation of the wood. Those trees which grow fast from being located on moist, sandy soils, never produce such strong timber as others of slower growth. It has been found by experiment, that the bottom part of the trunk, with the corresponding branches, is denser and stronger than the upper part of the same tree. Those trees which are suffered to complete their full term of growth before being cut down, have their heart-wood throughout of the same weight and strength, taking a cross section of the trunk at any one place, whilst those that are felled prematurely are found to possess these qualifications in the central portion of the wood only, which is then considerably harder than that immediately surrounding the sap-wood. In trees which have been over-grown, on the other hand, the central portion of the wood is the weakest, the process of natural decay always commencing in the heart of the tree. It is a common thing to see the heart of some fine tree (blown over by the wind, perhaps), which, to an untrained eye, looks perfectly sound and flourishing, to be already disintegrated by the spreading filaments of dry-rot, which have attacked it so soon as its vigour began to flag. The age at which oak timber is at its prime, is generally supposed to be from eighty to a hundred years, although this depends, as we have before explained, upon the nature of the soil on which it is grown. The weight of good oak timber is about 60 lbs. in the green state; and, when seasoned, about 50 lbs. If the seasoning is carried beyond this by artificial desiccation, the strength of the timber is impaired.

Strength of timber is as the density.

Position of the strongest wood.

Over-grown timber.

Dry-rot.

The decay of wood by the growth of fungus, denominated dry-rot, may be traced to the putrifying of the sap, when this has been left within the pores of the timber in the same condition as it exists in the living tree. The various means which are employed to arrest this destructive fermentation are, either to wash out the sap by long soaking in water, aided by the action of the sun; to dry up the sap, either naturally by exposure to the sun and wind, or artificially by *baking*, or by heated currents of air; or else by injecting into the pores of the wood some metallic salt to combine with the albumen and render it insoluble, or some antiseptic substance to preserve the vegetable tissue. The processes of natural seasoning and artificial desiccation, being those most in use for the preservation of ship-timber, will be found amply described in the article SHIP-BUILDING; also, the best mode of *creosoting*, although the latter process, from the increased inflammability and the strong smell it imparts to timber, is scarcely applicable to the building either of ships or houses. For the preservation of railway-sleepers, and other wood-work out of doors, which is not particularly liable to danger from fire, the creosoting process has been proved to be most valuable. Its efficiency depends, in a great measure, upon the mode of operation, and the quantity of creosote injected into the timber, which should be done under pressure in a closed cylinder. The process is most applicable to fir and other soft woods, which should imbibe, at least, 7 lbs. of the creosote oil per cubic foot, oak imbibing not more than 2 or 3 lbs., even under a pressure of 120 lbs. per square inch. This substance seems to act, *firstly*, by coagulating the albumen; *secondly*, by furnishing a water-proof covering to the fibre of the wood; and, *thirdly*, by preventing the putrefaction of the sap by its antiseptic properties.

Preservation of timber; by creosoting;

The various processes for the preservation of timber by the absorption of metallic salts, have all more or less failed in practice, and are now very generally abandoned. These are known by the names of the inventors, as Kyan's, Margary's, Burnett's, and Payne's processes. The object sought by each of the three first of these methods was to coagulate the albumen in the capillary tubes of the timber, and thus prevent, or retard, the putrefaction of the sap. Kyan used chloride of mercury for this purpose, dissolving, at first, 1 lb. of the salt in 4 gallons of water; but as it was found that the wood absorbed about 6 or 7 lb. of this costly salt per load, more water was added to lessen the expense, until the solution became so weak as, in a great measure, to lose its effect. This process has, therefore, been entirely abandoned. The salt employed by Margary was sulphate of copper, which, being much cheaper than chloride of mercury, could be used as a stronger solution. Its efficacy, however, has proved doubtful in many cases, while in not a few instances it has failed altogether. Better than either of the preceding is Sir William Burnett's plan of injecting a solution of chloride of zinc, in the proportion of about 1 lb. of the salt to 4 or 5 gallons of water. This process is still in use, and has certainly proved beneficial in a great many cases, but it cannot always be relied upon. Payne's process consisted in the successive injection of two substances in solution—the first, a metallic or earthy solution, and the second a decomposing fluid—the consequence being that the capillary tubes of the timber became filled with an insoluble substance. The process of creosoting timber, already referred to, was first patented by Mr Bethell in the year 1848. One great advantage of creosoted timber is, that it perfectly resists the attacks of marine worms and insects, as well as the white ant of India, which is more than can be said for timber prepared with solutions of metallic salts. Even that prepared with corrosive sublimate (as in Kyan's patent) has no immunity in this respect, the albumen appearing to neutralize the poisonous property of the salt.

Timber. by absorption of metallic salts. Kyan's process. Margary's. Burnett's. Superiority of creosoted timber.

For ship-building purposes such chemically prepared, or "salted," timber is scarcely to be recommended, as it attracts much moisture, and is very destructive to the metal fastenings. Empyreumatic oils and resinous solutions, although these certainly render the wood impervious to moisture, and preserve the iron or metal bolts from oxidation, are still very objectionable from the increased inflammability which they impart to the structure. The time necessarily required in preparing the wood with the preservative substance is also a great drawback to its employment in ship-building, where a delay of even two or three days, more especially in repairing, is often of serious consequence; and it should be remembered, the timber must be operated upon after it has been shaped or "converted." Timber may be very perfectly preserved from subsequent decay by long submergence in shallow salt water, or, which is still better, in salt mud. When thus treated for a period of from ten to twenty years, the sap gets thoroughly washed out of the pores of the wood by the alternate absorption and expulsion of air or other gases, caused by successive variations of temperature. It need scarcely be hinted, however, that such a mode of procedure, though sometimes adopted in government dockyards, would be ruinously expensive to the private ship-builder.

Artificially prepared timber not suitable to ship-building. Soaking timber.

Having pointed out the fatal objections generally attending the use of chemically-prepared timber for ships or houses, it remains to show what means can be employed (and that with tolerable certainty) for preserving the timber of these structures from premature decay. The means at our command for this purpose are summed up in the two words, "seasoning" and "ventilation:" namely, thorough seasoning or drying of the timber on shore, when this is practicable; but, by all means, good ventilation on board. If these well-known and universally approved principles were but carried out in an honest and common-sense

Importance of good ventilation for preserving timber.

Timber.

fashion, we should hear but little of rotten gun-boats, or heavy repairs to frigates after a first commission. Though it is undoubtedly true that the closely-packed timbers and double planking of a vessel of war present great obstacles to a thorough ventilation of the bottom, much may still be done by conducting currents of air down into the hold, and between the timbers, by means of wind-sails, or, if necessary, by fanners worked either by steam or hand, and by so arranging the internal accommodation that there may be as little stagnation of air as possible. However well seasoned and dry the timber may be when the ship is launched, it will rapidly absorb moisture from the damp atmosphere of the hold, unless evaporation from its surface be kept up by a forced circulation of air.

Cheaply-built ships often last the longest.

It is certainly unbecoming the scientific character of the age that ships built hurriedly and cheaply, and of very inferior timber, by what are contemptuously called "slop" builders, are known to resist the ravages of dry-rot much better than the expensively and elaborately-constructed ships of Her Majesty's dockyards; nay, more, that these same "slop-built" ships, even when constructed entirely of green timber (as they frequently are), will last longer than a government ship built with the best seasoned oak! The whole secret is, of course, the internal ventilation of the holds and frame of the ship. In a cheaply-built merchant-ship the timbers are spaced at some distance apart, and the ceiling planks are not placed so close together as hermetically to seal the spaces between the timbers, the consequence being that good ventilation is maintained amongst the planks and timbers of the bottom and sides. Even when such a ship is built of green wood, the circulation of air is generally sufficient to season the timber in its place and prevent its decay, for the dry-rot fungus will not thrive in an atmosphere less moist and stagnant than that of an underground cellar. The shrinkage of green timber in such a case would also conduce to its preservation by admitting the air between the ceiling planks.

Necessity for systematic ventilation.

These remarks are not intended to excuse the use of unseasoned timber in ship-building, a practice which should be resorted to only from dire necessity, but rather to show that if ships built of green timber can be preserved by what may be termed accidental ventilation, those built of seasoned timber should, *á fortiori*, be still more easily preserved by systematic ventilation. The action of heat in causing an upward current of air naturally suggests itself as a ready means of effecting this object on board ship. The dry-rot has been frequently arrested in a ship by thoroughly drying the timbers, holes having been previously cut in the ceiling planks to promote circulation. Yachts and other small vessels, when not in use, may be preserved from dry-rot by hauling them up out of the water in an exposed situation where the wind will get to them, keeping skylights and hatches open, and if a plank be removed from the bottom they will be all the safer. Should they be entirely closed up, on the other hand, the dry-rot will flourish within like mushrooms on a hot-bed.

Timber.

Sap-wood should always be removed from the timbers and planks of a ship, as from its spongy texture and imperfect development, it is more liable to dry-rot than the heart-wood (besides being much weaker); and when the dry-rot has once commenced either in a ship or a house, it is rapidly propagated by contagion. The process of seasoning timber quickly by a current of heated air will be found amply detailed in the article SHIP-BUILDING.

Sap-wood should be removed

Measurement of timber.

Timber is bought and sold by solid measure, according to the number of cubic feet in the tree or log. The measurement of timber is therefore the operation by which these cubic contents are determined; that is, multiplying together the three dimensions, or the mean length, the breadth, and the depth, of each log. If the log should vary much in size in different parts, then the length, breadth, and depth of each of these parts must be multiplied together, and the contents of the log will be the sum of the products. When the log tapers, a mean breadth or depth is taken; the object in every case being to attain the most correct approximation to the contents of the log. In measuring rough logs, it is however usual to gird the log at the measuring place with a string, and then, folding the string into four equal parts, to assume this fourth part of the girth to be one side of the square area at the measuring place; which area, when multiplied by the length, will give the solid contents of the log. The arithmetical operation, simple as it is, is universally superseded by the more simple and far more correct plan of referring to published tables of contents, calculated for every foot in length of a log, and every quarter of an inch in the side of the square. Those most generally used for this purpose are in Hoppus's *Practical Measurer*.

In measuring standing timber, the length is taken as high as the tree will measure 24 inches in circumference, less than which measurement is not considered as timber. At half this height, the measurement for the mean girth of the timber in the stem of the tree is taken; one-fourth of this girth is assumed to be the side of the equivalent square area. The buyer has in general the option of choosing any spot between the but-end and the half height of the stem as the girding place. All branches, as far as they measure 24 inches in girth, are measured in with the tree as timber. An allowance, which varies according to circumstances, is generally deducted for the bark. In oak it is from about one-tenth to one-twelfth of the circumference at the girding place; in other sorts of timber it is less. In all, however, this allowance depends much upon special agreement.

It is usual to speak of timber by the load, which means 50 cubic feet of squared timber, or 40 cubic feet of rough timber. A load of plank is dependent upon its thickness. Thus it will require 200 square feet of 3-inch plank to make the load of 50 cubic feet; therefore the load of plank is the number of square feet of its respective thickness, which is necessary to make the load of 50 cubic feet. Deals are measured, according to their thickness and lengths, by the hundred, reckoning 120 to the hundred. (R. M—Y.)

TIMBUCTOO, a celebrated city in the interior of Africa, on the slope of a hill about 8 miles north of the Niger, near the most northerly part of its course, N. Lat. 18. 4., W. Long. 1. 45. It has been recently visited by Dr Barth, who set out from Kuka in the end of November 1852; and after a toilsome journey, during which two of his six camels died of fatigue, reached Timbuctoo, September 7, 1853, the distance being about 2000 miles. After some difficulty he succeeded in gaining admission to the city, and remained till 8th July 1854. The city is triangular in form, and closely built, for the most part of clay and stone. Many of the houses are two stories high, and have their fronts tastefully ornamented. There are several mosques, some of them of considerable size and antiquity. Timbuctoo is a place of considerable trade, as it is a central meeting-place for all the caravans that traverse this portion of Africa. As the country about the town is very barren and unproductive, it requires to be supplied with millet, rice, butter, cloth, &c., from Jenné in Senegambia; firewood, timber, and provender for cattle from Cabra, a town on the Niger, not far off; cattle from the Tuariks and other nomadic tribes in the vicinity. By means of Cabra,

Time ‖ Timoleon.

which serves as the port of Timbuctoo, some trade is carried on by the river, which is navigable for about four months in the year, but the principal commerce is by land. The merchandise of Timbuctoo is less in quantity than that of Kano, but superior in quality and value. Timbuctoo is and has long been the capital of a separate state. It is said to have been built by Mansa Suleiman about 1214; but it probably occupies the site of the ancient town mentioned by Ptolemy under the name of *Nigeira Metropolis*. Under Suleiman and his successors, all bearing the name of Mansa, it became a powerful state; but at length, in 1396, it was made tributary to the Arab rulers of Morocco and Fez, and thus brought into more close connection with Northern Africa. The expulsion of the Arabs from Spain, in the fifteenth century, diminished their power, and, about 1500, Timbuctoo became independent. In 1672 it was a second time made subject to Morocco, and remained in that condition till 1727. Since then it has been sometimes independent, and sometimes subject to the rulers of the neighbouring states; and at present it is governed by a sultan of the Moorish race, who acts as a sort of pope, with authority both in religious and in political affairs. The population is estimated at 20,000.

TIME. See ASTRONOMY, THEORETICAL, sect. iv.

TIME, in *Music*. See MUSIC.

TIMOLEON, a celebrated statesman, and general of ancient Greece. He was a native of Corinth, and descended from one of the highest families in that city. His father was Timodemus; and he had an elder brother named Timophanes, who had led the troops of his country with success in a war against Argos; and when a fresh danger threatened the state, was again appointed to the command of 400 soldiers. With the power thus obtained, Timophanes endeavoured to destroy the then existing oligarchical government, and make himself tyrant; but this scheme was frustrated by Timoleon, who, either with his own hand, or by means of assassins, put his brother to death. The people were divided in their opinion of this deed, and the senate had given no decision, when ambassadors arrived from Syracuse in 344 B.C., requesting assistance against the tyrant Dionysius. Both parties probably seized on this as a favourable opportunity of gaining their ends; the one of getting rid of Timoleon, and the other of saving him from the punishment of murder. He was accordingly appointed to command the expedition to Sicily; although, singular to say, the charge against him was not repelled, but left to depend on his conduct in his new command. This, as far at least as success could do so, amply vindicated his honour. Though but scantily supplied with troops from Corinth, he soon received the submission of Dionysius, and made himself master of Syracuse. He afterwards carried on the war with the Carthaginians, who had from the first opposed his movements; and after gaining several great victories, obtained the liberty of all the Greek cities in Sicily. (See CARTHAGE and SYRACUSE.) From all these cities Timoleon expelled the tyrants who had formerly ruled them, and established democratic constitutions; and by this means he himself, though holding no public office or station, virtually exercised almost unlimited power. At Syracuse he was opposed by a party who endeavoured to defend the rights of the original citizens against the Corinthians and others whom he had introduced; but this effort was overpowered by the bringing in of fresh bodies of new citizens to outvote the old. Timoleon died at Syracuse in undiminished power and popularity, though he had been for some time blind, in 337 B.C. He was buried with great public honours in the market-place of the city. Timoleon was certainly one of the ablest generals that Greece produced; and if his character did not deserve the extravagant laudations of Plutarch, but was stained with many glaring crimes, it ought not on the other hand to be judged by too severe a test, for the standard of political morality was then not high, and tyrannicide was universally praised. His life has been written by Plutarch and Cornelius Nepos.

Timon ‖ Timor.

TIMON the *Sceptic*, who is not to be confounded with Timon the *Misanthrope*, was a Phliasian, and lived in the time of Ptolemy Philadelphus about 270 B.C. He studied under Stilpo at Megara, and Pyrrho in Elis; after which he removed to the north of the Ægean, and taught with success at Chalcedon. Finally, he came to Athens, where he spent the rest of his life, and died at the age of ninety. He is said to have written epics, tragedies, comedies, and satyric dramas; but his most celebrated work was three books of *Silli*, or satirical pieces. His prose writings, probably philosophical, were voluminous. He is said to have been fond of rural retirement, and was much addicted to wine. Like Lucian, he wrote with sarcastic humour against the whole body of dogmatic philosophers. The fragments of his *Silli*, often quoted by the ancients, have been carefully collected by Stephanus in his *Poesis Philosophica*, by Brunck in his *Analecta*, by J. F. Langenrich, by F. A. Wölke, and by F. Paul, in their several Dissertations. (See SCEPTICISM).

TIMOR, an island in the East Indian Archipelago, stretching from S.W. to N.E., separated on the N.W. from the island of Ombay by the Ombay Strait, having on the N. the Banda Sea, S.E. and S. the Indian Ocean. S. Lat. (of the S. point), 10. 24.; E. Long. 123. 32. Its length is about 300 miles, and its average breadth 45. The coast is generally rocky, and indented with few bays and creeks. There are two good harbours; Coopang, on a bay of the same name, at the south-west extremity, and Delli on the north coast. A mountain-chain traverses the length of the island; and one of its summits in the north attains the height of 6000 feet. From this central chain many branches diverge on both sides; so that the island is almost entirely occupied with steep mountains and hills and narrow valleys. There are some considerable plains, as that at the head of Coopang Bay, which is about 10 miles square. The rivers are small and rapid, frequently dry in summer, and not navigable beyong the tidal point. The prevalent geological formations in the island are limestone and chalk; and traces of volcanic agency are everywhere apparent. The mountains are generally bare, but in some places there are extensive forests. The chief crops raised are rice, maize, millet, pulse, sweet potatoes, and cotton. Various kinds of palm-trees, tobacco, indigo, sandal-wood, and many kinds of fruit, such as oranges, lemons, pine-apples, and melons abound. Horses, oxen, buffaloes, sheep, pigs, and fowls, are among the domestic animals; and of the wild beasts, deer, buffaloes, hogs, wild cats, and apes, are the most numerous. Gold and copper are the chief mineral productions of the island. The former is found in the rivers, and the latter chiefly in the Philaran mountains, near the centre of the island. The inhabitants are of low stature, very dark in complexion, and with bushy hair. They are divided into three parts, the Timorese, who inhabit the west coast, and came originally from Ceram; the Belonese, on the east coast, from Gilolo; and the independent tribes in the interior. They live chiefly by hunting; agriculture is little attended to; and though fish is abundant round the coasts, very little advantage is taken of it. The women weave the cloth that is needed; and the only manufactures the men condescend to engage in are those of canoes and ornaments for their horses. The chiefs on the west and south coast acknowledge the authority of the Dutch, who have their chief settlement at Coopang; those along the east and north are subject to the Portuguese, whose head quarters are Delli. A considerable trade is carried on, chiefly by the Chinese, at Coopang. Pop. estimated at 200,000.

Timotheus ‖ Timothy.

TIMOTHEUS, an Athenian general, was the son of Conon, of the demus of Anaphlystus, and belonged probably to the priestly family of the Eumolpidæ. He inherited a large fortune, and received a good education; being on terms of intimacy with such men as Plato and Socrates, the latter of whom is said to have turned his mind from an inordinate love of display to a more honourable ambition. In 378 B.C. he was appointed, along with Chabrias and Callistratus, to command an expedition to reduce Eubœa, in which they were successful. In 375 he was intrusted with the sole command of a fleet which was to sail round the Peloponnese, and, by annoying the Spartans, prevent them from invading Bœotia. In the course of this expedition, Timotheus not only ravaged the Laconian coast, but gained over to the side of Athens the Corcyræans, Cephalonians, and Acarnanians, as well as Alcetas, king of Epirus; and defeated the Spartan fleet under Nicolochus. Next year a peace was concluded and Timotheus recalled; but in 373 the Corcyræans, being hard pressed by the Spartans, applied to Athens for help; and Timotheus was despatched with sixty ships to their assistance. But the state of the public finances were such, that he was obliged to spend some time in raising men and money among the allied states. Meanwhile, the danger of Corcyra grew daily more imminent; the Athenians began to get impatient; and at the instance of his rivals, Iphicrates and Callistratus, recalled Timotheus, and ordered him to stand a trial for his conduct. By the influence of Alcetas and Jason of Pheræ, he was acquitted; but he did not again receive the command of the Athenian forces till the recall of Iphicrates in 361. In the intermediate time he entered the service of the Persian monarch, Artaxerxes II., for whom he conducted a war against Nectanabis in Egypt. Without openly breaking with his master, he secured for the Athenians the island of Samos, and the towns of Sestos and Crithote on the Hellespont; and these benefits probably led the Athenians to appoint him to succeed Iphicrates in the command of the army in Macedonia. In this quarter, he directed his arms against the Olynthians, from whom he took Potidæa and Torone; and soon after the other cities in Chalcidice submitted to Athens. An attempt against Amphipolis, however, was unsuccessful. About this time Timotheus had reached the highest degree of power and popularity, and greatly strengthened his influence by a marriage between his daughter and Menestheus, the son of his rival Iphicrates. When the social war broke out in 357 B.C., the two rivals, now reconciled, along with Menestheus and Chares, were put in command of a fleet of 60 sail against the revolted allies of Athens. The expedition proved unsuccessful, and Chares accused his colleagues of treachery. Iphicrates and Menestheus were first tried, and acquitted; but Timotheus was condemned, and fined 100 talents (about L.25,000). Being unable to pay the fine, he retired to Chalcis in Eubœa, where he died in 354 B.C. Nine-tenths of the fine was afterwards remitted, and the remainder expended in repairing the city walls, which Timotheus' father, the great Conon, had built. Timotheus was a man of mild and amiable character, and no less distinguished for eloquence and learning than for military skill. Far from enriching himself at the public expense, he spent his private means in the service of the state; and thus he frequently involved himself in debt, and died in poverty.

TIMOTHY, a young Christian of Lystra, grandson of Lois, and son of Eunice a Jewess, by a Greek father, who was probably a proselyte. He was brought up with great care in his family, and profited well by the example of the "unfeigned faith" which dwelt in his mother and grandmother. The testimonials in favour of this young disciple which Paul received when he visited Lycaonia, about 51 A.D., induced the apostle to make him the companion of his journeys and labours in preaching the Gospel, and he became his most faithful and attached colleague. He had probably been converted by Paul on his former visit to Lystra, and is frequently named by him with truly paternal tenderness and regard. At a later period he was left by the apostle in charge of the Church at Ephesus; but the precise time of this event depends on the date we assign to the 1st Epistle of Paul to him. We know that Timothy was a prisoner with Paul at Rome (Phil. i. 1) at the time referred to in Acts xxviii. 30, 31; that he was afterwards liberated (Heb. xiii. 23), and that shortly before his martyrdom the apostle requested him to come to him at Rome (2 Tim. iv. 9, 21). The tradition is, that Timothy retained the charge of the Church at Ephesus till his death, and eventually suffered martyrdom in that city (97 A.D.).

Epistles to Timothy:—To Timothy the Apostle Paul addressed two of his epistles. That these are the work of the author whose name they bear there is no reason to doubt; and it remained for the hypercriticism of modern Germany to question their authenticity. Their genuineness is attested by Irenæus, Theophilus of Antioch, Clement of Alexandria, Tertullian, and others. The first is dated by some soon after Paul's departure from Ephesus, mentioned in Acts xx. i., but most writers refer it to a later period, after his first imprisonment. The second epistle was written from Rome while Paul was a prisoner there; but whether during his first or second imprisonment has been much questioned, though the weight of probability seems to incline to the later event.

The design of the first epistle is partly to instruct Timothy in the duties of that office with which he had been intrusted, partly to supply him with credentials to the churches which he might visit, and partly to furnish through him guidance to the churches themselves. It may be divided into *three* parts, exclusive of the introduction (c. i. 1, 2), and the conclusion (c. vi. 20, 21). In the *first* of these parts (c. i. 3–20), the apostle reminds Timothy generally of his functions, and especially of the duties he had to discharge in reference to certain false teachers, who were anxious to bring the believers under the yoke of the law. In the *second* (c. ii.–vi. 2) he gives Timothy particular instructions concerning the orderly conducting of divine worship, the qualifications of bishops and deacons, and the proper mode of behaving himself in a church. In the *third* (c. vi. 3–19) the apostle discourses against some vices to which the Christians at Ephesus seem to have been prone.

The design of the second epistle is partly to inform Timothy of the apostle's trying circumstances at Rome, and partly to utter a last warning voice against the errors and delusions which were corrupting and disturbing the churches. It consists of an inscription (c. i. 1–5); of a series of exhortations to Timothy, to be faithful in his zeal for sound doctrine, patient under affliction and persecution, careful to maintain a deportment becoming his office, and diligent in his endeavours to counteract the unhallowed efforts of the false teachers (c. i. 6–iv. 8); and a conclusion in which Paul requests Timothy to visit him, and sends the salutations of certain Christians at Rome to Timothy, and those of the apostle himself to some believers in Asia Minor.

Timur.

TIMUR, or, as he is incorrectly called, TAMERLANE, one of the greatest conquerors the world has seen. He was born in 1335, at the village of Sebz, the ancient Alexandria Oxiana, in the district of Kesh, about 40 miles to the S.E. of Samarkand. His father, Taraghai Nowian, was hereditary chief of the tribe of Berlas, who occupied the district of Kesh; and his fifth ancestor had been vizier to Zagatai, son of Genghis Khan, and khan of Transoxiana, while Timur himself, by the female line, was connected with the imperial family. The time when he came into public notice was peculiarly favourable for daring and ambitious souls like his, for it was one of general anarchy and confusion in his native country. The line of Zagatai, which

Timur. had reigned over the kingdom of Transoxiana, also called Zagatai, had become extinct; and the contests of the several subject emirs were only quelled by the invasion and tyranny of the Getæ or Kalmucks, under the khans of Kashgar, from the N.E. At the age of 25, Timur, who had been from his 12th year engaged in war, appeared as the deliverer of his country, and was appointed chief of the Berlas tribe. At first he had only 60 followers; and that number was reduced by an encounter with the Kalmucks to 7, with whom he went through many hardships and hairbreadth escapes. In the course of these adventures he was wounded in the thigh, and thence received the surname of *Lenc*, or the Lame; whence the European Tamerlane. At length, after many vicissitudes, in 1363 he expelled the Kalmucks, and raised to the throne Husein, who rewarded him with the hand of his sister. But this state of affairs was of brief duration; the quarrels between Timur and his monarch led at length to an open conflict; Husein was defeated by Timur, and slain in 1366 by some of his servants, who perceived that his was the losing side. Timur was thereupon, in 1369, appointed khan of Zagatai by the *Kurultai* or general council of the nation. But even at this elevation, Timur was still far from the summit of his ambition. He first directed his arms against the kingdom of Khowaresm or Khiva, in the west of Turkestan; and after five campaigns, captured the capital and subdued the country in 1379. He then determined to execute vengeance on the Kalmucks of Kashgar; and in seven marches traversed and conquered the country, extending his victorious arms as far as the Irtish and the forests of Siberia, about 1000 miles to the N.E. of his capital. Persia was the next kingdom that fell before the conqueror, and the way for its fall was prepared by the conquest of Candahar and Khorassan. Hitherto his conquests had been justified by the desire of revenge, and of recovering the patrimonial possessions of Zagatai; and now, as he was about to invade the lawful territory of another branch of the family of Genghis, the divided state of the country since the extinction of the line of Hulaku afforded a seasonable pretext, and at the same time exposed the country to an easy conquest. Fars, Irak, Mazanderan, Azerbijan, and Shirvan, in succession submitted or were subdued; the Christian prince of Georgia adopted the faith of the conqueror; and the cities of Kars, Van, and Edessa fell before his arms. This conquest was concluded in 1393. An attack on the conqueror by the khan of Kipzak, or the steppes of the Volga, led to an invasion of that country, in the course of which the towns of Azov, Serai, and Astrachan were laid in ashes; the Russians trembled for their capital, and the merchants of Western Europe for their commerce. Unsatisfied even with these vast conquests, Timur next resolved on the invasion of India. After passing the range of Hindoo Koosh, he crossed the Indus at Attock; marched across the Punjab; defeated the sultan Mahmoud under the walls of Delhi, and entered that city in triumph. He then marched eastwards along the Himalaya range as far as the Brahmaputra; and it was on his return, while on the banks of the Ganges, in 1400, that he received news of the revolt of the Christians in Georgia, and the ambitious designs of the sultan Bajazet. After a few months repose at Samarcand, he set forth on a fresh expedition to the West. Success still followed the lame and now aged warrior: Syria was added to his conquests; Aleppo was taken by force, Damascus by treachery; and a pyramid of 90,000 heads was erected on the ruins of Bagdad. After two years thus spent, he entered Anatolia, crossed the Halys, and invested Angora. Here Bajazet encountered the Tartar, and in a great battle was totally defeated and taken prisoner. The story of his confinement in an iron cage by Timur is doubted by historians, but cannot be pronounced certainly false. Timur's conquests now extended from the Irtish and Volga to the Persian Gulf, and from the Hellespont to the Ganges; but his insatiable ambition planned adding to them China, and he had even set out on this expedition, and marched 300 miles from his capital, when he was cut off by a fever in the 70th year of his age. Timur was not insensible to the charms of learning and science; he employed secretaries to record the events of his reign, and is said himself to have written memoirs of his life and government. But undoubtedly he was one of the most terrible scourges of mankind whose name history records, and few men have ever shed such torrents of blood to so little purpose. A Life of Timour Beg has recently been written by C. R. Markham (Hakluyt Society), 1860.

Tin ‖ Tinnevelly.

TIN. See Mining.

TINDAL, Matthew, a well-known English writer, was the son of the Rev. John Tindal of Beer-Ferris in Devonshire, and was born about the year 1657. He studied first at Lincoln College, Oxford, but afterwards removed to Exeter College, and finally was elected to a fellowship at All Souls, which he retained to his death. In 1685 he was created LL.D., and soon after went over to the Church of Rome, at that time fashionable in the court of James II. In 1688, however, he reverted to the Church of England, according to his own account some months before the Revolution. After the Revolution he became an advocate, and sat as judge in the Court of Delegates, with a pension from the crown of L.200 per annum. He also published several pamphlets in favour of government and the liberty of the press; but the first work of his that attracted general attention was a volume entitled—*The Rights of the Christian Church asserted against the Romish and all other Priests who claim an independent power over it*, 1706. This work involved him in a violent controversy with the high church party, and replies to it were published by William Wotton, Dr Hickes, and others. *A Defence* of his work was published by Tindal in 1707, and a few months later *A Second Defence*; both of which he republished with additions in 1709. This and the following year he issued several pamphlets against the church; and from that time down to 1730, when his last great work appeared, he appears to have been principally taken up with politics. His *Christianity as old as the Creation; or the Gospel—a republication of the Religion of Nature*, is the work by which he is now chiefly remembered. As its title implies, it is an attempt to show that Christianity, properly understood, has always existed in the world; and that it contains nothing that human reason was not capable of discovering; thus denying the necessity of a revelation, and implying that no revelation had ever been made by God to man. The book made much noise, and called forth various replies from Conybeare, Foster, Chapman, Leland, Waterland, &c. Tindal vindicated himself in some later writings, but his health soon after began to give way, and he died on 16th August 1733. He left in manuscript a second volume of his *Christianity as old as the Creation*, the preface to which has been published.

Tindal, *Nicholas*, the nephew of the preceding, was born in 1687, and educated at Exeter College, Oxford, where he took the degree of A.M. in 1713. He afterwards became a fellow of Trinity College, and obtained several preferments in the church. In 1738 he was appointed chaplain of Greenwich Hospital; and here he died on the 27th of June 1774, at the age of eighty-seven. He was the author or translator of several works, but is chiefly remembered for his translation and continuation of Rapin's *History of England*.

TING-HAE. See Chusan.

TINNEVELLY, a district of British India, in the presidency of Madras, bounded N. and N.E. by that of Madura, E. and S.E. by the Gulf of Manaar, which separates it from Ceylon, S.W. and W. by the territory of Travan-

core. Length from N. to S. 122 miles; greatest breadth, 74; area estimated at 5700 square miles. The coast, which extends for about 95 miles N.E. from Cape Comorin, is generally low and level; with many dangerous shoals, reefs, and rocks, and few good harbours. Tuticorin is the principal place on the coast, and it has a good anchorage, protected by several small islands. The western boundary of the district is formed by the Ghauts, which have an elevation of more than 4000 feet. The ground at their foot is about 800 feet above the sea-level; and from that it gradually slopes downwards to the E. In this direction most of the rivers flow; the chief of them being the Tambaravari, the Chittaur, and the Vipar, with their affluents. North of the Tambaravari the country is level and fertile, being well irrigated by canals, but further south the soil is generally light, stony, and barren. Along the seacoast there are large salt-marshes. The climate is hot and dry, but generally healthy. Tinnevelly contains many forests of large timber-trees and palms of various kinds. Cotton is the most important production of the country; a considerable amount of rice is also raised, as well as various spices. Pop. 1,269,216.

The capital is Tinnevelly, a town on the Chindinthoora, 86 miles S. of Madura. It is the residence of the revenue collector, and has a population of about 20,000.

TINTERN. See MONMOUTH.

TINTORETTO, a celebrated painter, whose real name was JACOPO ROBUSTI, was born at Venice in 1512. His father, Battista Robusti, was a dyer (in Italian, *tintore*), for which reason the son was called *Il Tintoretto*, or "the little dyer," a name by which he has become famous. He entered the school of Titian at an early age, and exhibited proofs of genius by executing some striking drawings; but in ten days he was dismissed by his master for disobedience to his commands, an account by no means improbable, considering his impetuous and obstinate character; though the conduct of Titian is by some ascribed to jealousy of his pupil's merit. Undaunted by this check, the young painter pursued his art with redoubled energy, and on the wall of his humble lodgings, to which his studies were now confined, he had the hardihood to write, "Michael Angelo's design and Titian's colouring." He procured models of several statues by Michael Angelo, and laboured night and day in his ambitious design of uniting the excellences of the two great masters he had announced as his models. He also studied anatomy, and obtained a thorough knowledge of the human frame and muscles; and he employed many ingenious contrivances for varying the lights and shades of his models, by which he attained great skill in this part of his art. The first thing that brought him into notice was a picture he exhibited, containing portraits of himself and his brother; and a historical piece, which he placed on the Rialto for public inspection, raised him among the first painters of the day. From this time he obtained abundance of employment; and such was his love of art, that he made ample use of his opportunities, seldom refusing any commissions or offers, and painting pictures of all sorts and of all sizes. His rapidity of execution was very great; and sometimes he asked no more for his works than the mere price of the materials. Hence his pictures were very numerous, and hence he has been much censured for carelessness and want of finish; while even his greatest admirers do not altogether acquit him from these faults. Thus, as was remarked by Annibale Caracci, while in many pieces he is equal to Titian, in many he is inferior to Tintoretto. One of his finest pictures, called the "Miracle of the Slave," was painted for the friars of St Mark; and when it was finished and put up, as they could not agree about the price, he settled the matter by ordering it to be taken down and sent back to his studio, saying, that they should not have it at any price. Afterwards, however, he relented; and not only got his own price for the picture, but was commissioned to paint three others for the same friars from the life of their saint. On another occasion, the monks of San Rocco requested Tintoretto and four other painters to send them designs for a picture of the Apotheosis of San Rocco, that they might select the best. While the others were preparing designs, Tintoretto was at work on the picture itself; and when the day came for exhibition, the monks found to their surprise that his picture was finished and fixed in its place. On being remonstrated with, Tintoretto replied that that was his way of making a design; that it was the only fair way; and that if they did not choose to pay him, he would make them a present of the picture. It was thus ultimately allowed to remain. The same room contains "The Crucifixion," one of Tintoretto's masterpieces, executed in 1765; and the building in which they are forms a sort of gallery of his paintings. The government of Venice engaged Tintoretto to do many works for them, to adorn the council-hall and other parts of the Doge's palace; among which were one of the Battle of Lepanto, one of the Excommunication of the Emperor Barbarossa, and others. In his private character, Tintoretto seems to have made himself generally liked, though he was somewhat eccentric, and astonished every one by his boldness, originality, and utter disregard of the conventional rules and usages of his art. His enthusiasm was not confined to painting, but extended to all the arts; and he was especially fond of music, in which he was proficient. With Titian, or at least with his followers, he never seems to have been on very friendly terms. On one occasion, meeting Aretino, the satirist, who, in his admiration of Titian, had detracted from Tintoretto, he asked him to sit to him for his portrait. The poet consented, and on the day appointed repaired to his studio; but scarcely had he been seated, when Tintoretto suddenly drew a pistol from his pocket. Aretino started. "Don't be afraid," said the artist, "I only want to measure you. There: you are just two pistols and a half." From that day the two were good friends. Tintoretto died at Venice in 1594, and was buried in the Church of S. Maria dell Orto, where a monument has been erected to his memory. He had two children, a son, Domenico, and a daughter, Maria, surnamed Tintorella, both painters of some merit, especially in portraits, though without the genius of their father. Besides these, Tintoretto had few disciples, though he aspired to found a school of his own. (See ARTS, *Fine*, and PAINTING.)

TIPPERAH, including BULLOA, a district of British India, presidency of Bengal, bounded on the N. by those of Silhet and Mymunsing, W. by those of Dacca and Backergunge, S. by the Bay of Bengal, and E. by Independent Tipperah. Length 110 miles from N. to S.; breadth, 68; area, 4850 square miles. It is watered by the Brahmaputra, which forms its western boundary, and by its affluents, the Goomtee and others. It contains extensive forests, haunted by very large elephants and other wild beasts. Rice, cotton, and betel-nuts are the chief productions; and salt is also obtained near the Bay of Bengal. Pop. 1,406,950. The capital is a town of the same name, 48 miles E.S.E. of Dacca. Independent Tipperah is a mountainous region to the east, with an area of 7632 square miles, occupied by wild tribes.

TIPPERARY, an inland county in the province of Munster, Ireland, is bounded, N. by Galway and King's counties; E. by King's, Queen's, and Kilkenny; S. by Waterford and Cork; and W. by Cork, Limerick, and Clare. It extends from 52. 11. to 53. 10. N. Lat., and from 7. 23. to 8. 25. W. Long.; being about 70 miles in its greatest length, on a meridional line, from the confluence of the Lesser Brosna and Shannon, N. to the Knockmealdown Mountains, S. and 40 miles from O'Brien's

Tipperary. Bridge on the Shannon, W. to Urlingford, E., and comprehending an area of 1659 square miles, or 1,061,731 acres, of which 843,887 are arable, 178,183 uncultivated, 23,779 in plantations, 2359 in towns, and 13,523 are under water. In proportion to its extent, this county contains less unimproved pasture land than any other in the south of Ireland. These lands, as usual, are situated partly on the tops and declivities of mountains, particularly in the range of the Devil's Bit and Keeper Mountains, and partly in the form of bogs occurring in the low valleys near the margins of rivers and streams. Of the mountain pastures of the first class, the county contains above 111,000 acres, and of the latter about 67,000 acres. On the whole, it is probable that about 300,000 acres might be reclaimed for cultivation; 60,000 acres might be drained for pasture; and 88,000 acres may be considered as incapable of improvement. Tipperary ranks as the sixth county in Ireland as to its total extent, and the second as to its extent of cultivated land.

According to the statement of Ptolemy, this district was inhabited in the second century by the tribes of the Darini and Coriundi, but Whitaker attributes it to the Scoti. It was afterwards possessed by various native septs, the principal of which were those of O'Kennedy, O'Mulrian, O'Fogarty, O'Heffernan, O'Hickey, M'Egan, Everard, Mathew, and Woulfe. Subsequently to the year 1172, it was granted by Henry II., who obtained possession of it after several sanguinary contests, to Theobald Fitz-Walter, surnamed Butler, from the office which he held in the king's household. It was reduced to the form of an English county by King John in 1210, and in 1328 Edward III. erected it into a county palatine, in favour of the first Earl of Ormond; and though that king shortly after re-assumed the regal prerogatives, the county was re-granted in 1337, and in 1372 confirmed, to James the son of Theobald, and his heirs-male for ever. This grant affected only the lay lands of the county, those belonging to the Church being a separate jurisdiction, with its own courts and officers, under the name of the county of the Cross of Tipperary. The county continued to be thus divided both in fact and name until after the Restoration, when the grant of the regalities was not only confirmed to the Duke of Ormond by Charles II., but extended over the whole of the county. The jurisdiction continued in the family till the attainder of the last Duke of Ormond, in consequence of which the whole of the ducal property reverted to the Crown, the palatinal rights were abolished, and the records belonging to it deposited in the king's courts of chancery and common pleas, where they still remain. The county suffered greatly during the civil wars of 1641, in the course of which the town of Clonmel, after a gallant resistance, obtained honourable terms from Cromwell, who conducted the siege in person.

The surface is much varied. To the south it rises into the range of the Knockmealdown Mountains, the highest summit of which is 2150 feet above sea level. North of these are the Galtees, the highest of which, Galtymore, rises to an elevation of 3015 feet. Proceeding still farther north, are the Slievenamanagh Mountains, 2364 feet high; the Keeper, 2265; Arragh, 1558; and a portion of the Devil's Bit, 1572; the remainder of which last-named range extends north-easterly, forming the line of demarcation between King's and Queen's counties. The rest of the county presents an undulating surface, in some parts rising into hills of some elevation, the most considerable of which are the Slieveardagh Hills, bordering Kilkenny county, and Slievenamuck, near the base of which the town of Tipperary is situate. The Cashel Hills separated from the termination of the Slieveardagh by a north and south valley, about a mile and a half wide, form a small cluster, the highest point of which is 699 feet above the sea. The southern portion of the county drains into the Suir, the northern into the Shannon, by means of several small rivers. The only large river that passes through the county is the Suir, which has its source in the Devil's Bit Mountains, and after flowing in a southern direction, by Templemore, Thurles, and Cahir, to Ardfinnan, takes a western course by Clonmel, and, passing through Carrick-on-Suir, enters the county of Waterford, and discharges itself into the Atlantic through the estuary of Waterford harbour. The Shannon forms part of the western boundary of the county, from its most northern point, at the junction of this river with the Lesser Brosna, through its expansion called Lough Derg, and thence to O'Brien's Bridge. The Lesser Brosna is the northern boundary from Parsonstown to the Shannon. There are no lakes of any extent; three of small size, worthy of notice chiefly from their shape and romantic position, lie in the glens of the Galtees. Tipperary.

The mountains are mostly composed of clay-slate, surrounded by sandstone; those of Knockmealdown are also capped with horizontal strata of this latter mineral. The part of the Devil's Bit range which projects into the county is wholly sandstone, as are also the groups of the Galtees and Slievenamuck. The Slievenamanagh Hills are composed of the Silurian and Old Red Sandstone rocks, the central plain is underlaid by the carboniferous limestone, and the Slieveardagh Hills are composed of the coal measure shales and sandstones. The beds of the Slievenamuck range horizontally, so as to furnish large quantities of excellent flags from the quarries. Slates of good quality are raised, in the district adjoining the southern extremity of Lough Derg, and carried in large quantities to various distant places by the Shannon navigation. There is also a very extensive and valuable slate-quarry near Clonmel, which enjoys equal facilities of transport by the Suir. In the east of the county is a coal-field, generally considered to be an offset or continuation of that in Kilkenny, from which it is separated by a narrow intervening neck of limestone. It extends about 20 miles in length from Freshford to near Cashel; and is about 6 miles broad in its widest part; the towns of Killenaule and New Birmingham mark the centre. The seams, which lie between strata of sandstone and shale, are in some cases single, in others double, and even treble. The thickness of those in the Coalbrook mines, which have been long worked, is from 1 to 2 feet. The strata dip at a deeper angle than in Kilkenny, and undulate. The coal, therefore, lies in deep troughs, giving rise to a peculiar mode of working, the shaft being sunk in the centre of the trough, and the coal wrought by working upwards on both sides of it. The produce of these works consists of one-fourth coal and three-fourths culm. The former is in considerable demand for manufacturing purposes, being highly esteemed on account of the large portion of pure carbon contained in it; the latter is equally so for making lime, and is also used for culinary purposes when wrought up into balls with clay. The quantity of coal raised in the district has been estimated at 50,000 tons per annum. Ironstone, though found in large quantities in the Coalbrook works, is not applied to any profitable account. The village of Silvermines, on the northern side of the Keeper Mountains, derives its name from the quantity of silver obtained in its neighbourhood, which at a former period had been largely worked, as were copper-mines in the same neighbourhood. Copper is also raised at Lackamore, near Newport, from the lead mines, and at Holyford, near Thurles, but only in small quantities: the works have lately been suspended. Zinc, manganese, malachite, galena, sulphate of barytes, and white lead, have been found in various places. The natural stalactite caverns, discovered in 1833, on what was then part of the large Mitchelstown estate of Lord Kingsborough, are situated in a low limestone hill, near the southern base of the Galtee Mountains, about midway

Tipperary. between Cahir and Mitchelstown, and present a peculiar feature in the geology of the county. They are entered by a passage sloping downwards, about 200 feet in length, which opens into a subterraneous chamber nearly 80 feet long, and upwards of 30 at its greatest height; whence proceed other passages communicating with a number of interior caves of various sizes, that have obtained names chiefly from their discoverers, or from some peculiar resemblance, whether real or fanciful, to objects of general notoriety. Their roofs, sides, and floors are adorned with a great variety of stalactites of singular appearance, and in some parts there are small reservoirs of the purest water. The floor is strewed with large blocks of limestone. They are generally known by the name of the Mitchelstown caves, from their vicinity to the town of that name in the adjoining county of Cork. The level part of the county is chiefly limestone, constituting one extremity of the great field of that formation which spreads over all the central portion of Ireland. Its most striking peculiarity is the small abrupt hill known as the Rock of Cashel, on which are the celebrated ruins which form so striking a feature in the landscape. The hill consists of a mass of limestone, rising precipitously from the surrounding plain. The beds in the central portion of the hill are nearly horizontal for 200 feet, dipping at each end at a high angle from the hill; on the north side the rocks, from being horizontal, suddenly incline to the north at from 75° to 85°, and on the south side incline to the south at 80°. Extensive deposits of clay are described by Sir Richard Griffith as occurring between Cahir and Clonmel, nearly equal in quality to the pipeclay of Bovey. It burns purely white, only acquiring a buff tinge in the extreme heat of a porcelain furnace. Although largely exported to England, no use has been made of this substance at home. This clay is found on the edge of the coal district, but in the cavities of the lower limestone.

The soil in the plain country and in the extended valleys is a rich calcareous loam, capable of producing the finest crops with little aid from human industry. The town of Tipperary forms the centre of a tract of flat country lying between the Galtee and Slievenamanagh ranges, extending from the county of Limerick westward to Golden and the Slieveardagh Hills in the opposite direction, which, from its extraordinary fertility, has been called the Golden Vale. Another tract of similar character, but not so extensive, lies in the northern baronies of Ormond. The soil on the hills and mountain sides is light and poor, partaking much of the character of the substrata of clay-slate and sandstone on which it rests. The southern extremity of the great Bog of Allen spreads itself into this county in its north-eastern quarter, from Roscrea to Holycross, not, however, in one continuous sheet, but in detached portions. It appears to have owed its origin to the obstructions in the channel of the Nore, a small portion of which skirts the county here. The whole of these detached portions of bog contains 35,000 acres, the most elevated part of their surface being about 400 feet above the sea, and therefore perfectly capable of drainage. The timber found here is chiefly fir, yew, and oak, the latter perfectly black, from the action of the iron in the bog-water, or the gallic acid in the tree. The substratum is universally limestone or gravel. In one of these bogs three growths of timber have been found lying under one another; the upper about 5 feet from the surface, the middle about 2 feet lower, and the third, which is always in a more or less decomposed state, near the gravelly bottom. The land in the neighbourhood of the bog tract is generally swampy, producing little but reeds and other aquatic vegetables. The sides of the valleys, watered by the streams that pass through the bog and marshes, throw up a good herbage without any artificial aid, except that of setting fire to the surface in the heat of summer. The heath and moss are thus destroyed, and scope given to a spontaneous growth of grass, on which cattle feed eagerly in all seasons, but chiefly in summer, the cool and moist sward being peculiarly grateful to their feet. Several tracts near the margin of the bog have been reclaimed, and the process is extending. There is little, if any, native timber; but plantations, sometimes very extensive, are to be seen around all the gentlemen's seats and the residences of the wealthier farmers. The growth of timber thus raised is as yet by no means sufficient to remove from the landscape, otherwise abounding in natural beauties, the appearance of bareness which it still exhibits. Tipperary.

The increase or decrease of the number of inhabitants appears from the following table of the population as taken at different periods :—

Year.	Authority.	Number.
1760	De Burgo	101,370
1792	Beaufort	169,000
1812	Parliamentary census	290,531
1821	Ditto	346,896
1831	Ditto	402,563
1841	Ditto	435,553
1851	Ditto	331,487

The population to the square mile in 1841 was 263, and in 1851 had been reduced to 200. During the eight years ending December 1858, upwards of 75,000 persons had emigrated from the county. According to the census taken by the Commissioners of Public Instruction in 1834, calculated by dioceses, the total population amounted, in round numbers, to 413,000, of which 16,840 were of the Established Church, 660 Protestant dissenters, and the remaining 395,500 were Roman Catholics, who were then to the total Protestant population as 23 to 1. The number of children receiving instruction in the public schools, according to returns made under the Commission of Education in 1824–6, was 33,676, of whom 29,941 were males, 12,188 females, and 547 sex not ascertained. Of these, 2871 were members of the Established Church, 84 Protestant dissenters, 30,407 Roman Catholics, and 314 religion not ascertained,—giving an average of 30 Roman Catholics to 1 Protestant. The number of schools of each denomination, and of pupils attending them in 1851, was ascertained by the Census Commissioners to be as follows :—

Denomination.	No. of Schools.	No. of Children.		
		Males.	Females.	Total.
National	130	5231	4890	10,121
Church Education	12	174	168	342
Endowed	10	182	131	313
Boarding	9	99	197	296
Private	182	3308	2444	5752
Parochial	40	954	686	1640
Free	7	657	277	934
Mission	8	129	189	318
Military	5	363	77	440
Workhouse	26	3614	4892	8506
Gaol	1	112	52	164
Charitable Boarding	1	14	8	22
Total for the county	441	14,837	14,011	28,848

The county is divided into two ridings, north and south, each of which contains six baronies, the acreable contents and valuation of which are as follows :—

North Riding— Baronies.	Acres. No.	Valuation. L.
Eliogarty	90,254	61,973
Ikerrin	69,808	42,619
Kilnamanagh, Upper	59,990	23,418
Lower Ormond	135,723	72,851
Owney and Arra	89,672	36,123
Upper Ormond	79,472	39,004
Total	524,919	275,988

Tipperary.

South Riding— Baronies.	Acres. No.	Valuation. L.
Clanwilliam	115,960	98,374
Iffa and Offa, East	57,134	75,172
Iffa and Offa, West	117,176	63,007
Kilnamannagh, Lower	42,042	24,678
Middlethird	113,642	80,322
Slieveardagh	90,772	53,711
Total	536,726	395,264
Total for the county	1,061,645	671,252

These baronies are subdivided into 189 parishes, of which 96 were in the diocese of Cashel, 20 in that of Emly, 32 in Lismore, and 41 in Killaloe. The cathedrals of the dioceses of Cashel and Emly are both within the county, in places from which the sees have received their names. The former, which retains the rank of a city, is still a place of some note; the latter, though said to be the ancient Imlagh, noted by Ptolemy as one of the three principal cities in the island, is now an inconsiderable village. Tipperary returned eight members to the Irish parliament, two for the county, and two for each of the boroughs of Cashel, Clonmel, and Fethard. The number was reduced to four by the Act of Union, which disfranchised the last-named borough, and deprived each of the others of one of its members.

A considerable portion of the county is covered with a rich loamy soil. Arthur Young, who wrote about twenty years before the Union, when describing the Golden Vale, which extends from the town of Tipperary and to the foot of the Galtee Mountains, and spreads through the centre of the county of Limerick, says, "It is the richest soil I ever saw, and such as is applicable to every wish. It will fatten the largest bullock, and at the same time do equally well for sheep, for tillage, for turnips, for wheat, for beans, and, in a word, for every crop and circumstance of profitable husbandry."

Tillage prevails in the lowland districts, and is carried on in general according to the most modern systems. The size of the farms is generally small, averaging about 50 acres, and in many instances diminishing to 8 or 10, in consequence of the subdivision of land among the under-tenants. The rotation adopted on the rich lands in the Golden Vale, and in the almost equally fertile districts in the northern parts of the county, is potatoes, wheat, and oats; in the lighter soils, as on the Slieveardagh Hills, and the mountain sides, the crops are potatoes, barley or bere, and oats. In too many instances the repetition of the oat crop is continued until the land is completely exhausted, when it is allowed to rest until the renovating powers of nature clothe it with a new sward. Artificial grasses are much encouraged; clover of both kinds, rye and other grass-seeds, are sown, as are rape, vetches, and turnips. Flax is seldom to be seen but in detached patches, or along the head-lands of the corn-fields. The extent of land under each description of crop in 1856 and 1859 was:—

	1856.	1859.
Wheat	58,799	54,778
Oats	74,228	76,709
Barley, bere, rye, beans, and pease	7,532	4,013
Potatoes	60,709	66,042
Turnips	28,550	24,857
Other green crops	4,488	6,043
Flax	101	98
Meadow and clover	81,828	89,283
	316,235	321,823

Lime and limestone gravel, the latter taken from the escars in the eastern parts of the county, are the principal manures. The fences are stone walls, or mounds of earth 8 or 10 feet broad at the base, and tapering upwards to a considerable height, with a topping of furze or whitethorn. The latter plant is also employed as a ground fence in the best regulated estates. Owing to the undulating character of the surface, drainage is little required. Where it is adopted, and especially in the pasture lands, a covered drain is used, which is so narrow, and sunk so low, as not to be injured by the pressure of the feet of the cattle on the surface sod. Agricultural instruments of the most approved construction are coming into use. The rich low lands along the banks of the river are generally under meadow, and produce abundant crops of hay. The lands appropriated to pasture are used both as grazing and dairy farms. Butter, which is made to a great extent, finds a ready market at Clonmel, Waterford, and Limerick. The manufacture of cheese is almost unknown. The breed of Irish cows is still kept up, in consequence of the quantity of milk which they yield. They are sometimes reared without any mixture of other breeds, sometimes with a cross of the Holderness or Devon. The horses bred in the country are highly esteemed, and bring good prices. Swine are to be met with everywhere: they form an important part of the farming stock of the landholders, and are exported in great numbers to England. The quantity of live stock in the county, in 1850 and 1859, was—

	1850.	1859.
Horses	26,590	31,580
Cattle	182,249	200,553
Sheep	231,555	220,033
Pigs	85,421	90,658

Though a great deal has been latterly effected in the way of agricultural improvement in both its main branches of tillage and pasturage, much more is still required in order to draw forth all the capabilities with which the bountiful hand of nature has enriched this tract.

The manufacture of woollen cloth was formerly carried on to a great extent, particularly in the neighbourhood of Clonmel and Carrick, which were the two principal marts of the trade; but it is now nearly extinct; a small trade in blankets, flannels, and a mixed light cloth called ratteens, being the only vestige of its existence. Many efforts have been made to introduce the linen manufacture as a substitute. Grants of implements and premiums were offered by the Irish Linen Board, appointed to encourage and foster the manufacture. Much of the funds sent into the country from England during periods of famine were employed to turn the course of industry, particularly among the females, into this channel, but to no purpose. The culture of flax, as already stated, is but little attended to, the plant being raised in small quantities, and manufactured merely for domestic use, in which it is also more and more superseded every year by the increasing demand for cotton fabrics. The staple manufacture of the county is that of flour, for which there are numerous extensive mills. The abundant supply of the raw material from the rich valleys and champaign lands, and the numerous sites, with a great command of water-power, on the many branch-streams that feed the main rivers, afford facilities of which due advantage has been taken; and the export of flour is consequently a great source of internal wealth. Many plans have been devised to increase this wealth, by increasing the facilities for transmitting agricultural produce throughout the country, and to the great marts. The generally level yet undulating surface of the land affords adequate scope for carrying on lines of inland navigation, and extending railway communications. A canal was projected to form a continuation of that already existing from Dublin to Monastereven. It was to proceed by Roscrea and Cashel to Carrick, whence there is a river-navigation to Waterford. Others of minor extent were projected to pass through the northern and western parts of the Shannon, which is navigable all along the verge of the county; but the railroad system has now superseded the necessity for increasing inland navigation.

The remains of antiquity are numerous, and, in some

Tipperary. instances, of a very remarkable character. There are two round towers, one at Cashel, the other at Roscrea, both in good preservation. Among the remains of ancient monastic buildings, many of which are still in existence, the most worthy of notice are those on the Rock of Cashel, one of the most interesting assemblages of ruins in the kingdom, and, in the words of Sir Walter Scott, "such as Ireland may be proud of." They consist of the ancient cathedral, a fine Gothic structure, exhibiting a combination of the military with the ecclesiastical style of architecture; Cormac's Chapel, a venerable building, with a fine groined roof, and having in the interior some very ancient paintings in fresco, and a number of statues supposed to represent the apostles; there are also united with these the remains of the castle, and the before-mentioned round tower. Around the ruins about 3 acres of rich green sward have been enclosed; and from the summits of the ruins extensive views of the surrounding country are obtained. It is a singular fact, that the round tower which forms part of these ruins should be composed of freestone, whilst the material of all the other ruins is the limestone of the district. About 3 miles from Thurles are the fine ruins of the Abbey of Holy Cross, founded in the year 1182, by Donald O'Brien, King of Limerick. "They are very extensive, and, even to one not an antiquarian, highly interesting, from the general outline of the ruins, their towers, chapels, and arches, and from the beauty of some of the architectural remains within." In the abbey is the beautiful mausoleum of Lady Eleanor Butler, fourth Countess of Desmond. The remains of ancient castles are also numerous, as might be expected in a part of the country so often the seat of intestine wars. Several old fortresses are still kept in repair, and improved so as to form the residences of the proprietors of the surrounding lands. The dwellings of the peasantry differ little from those in other agricultural districts, nor are there any very marked variations observable in their manners, dress, or mode of living; but the inhabitants of the county have generally been supposed to embody all the strange anomalies characteristic of the rural population of Ireland. "You have here," says Mr Foster, "the richest land and the most extreme poverty. The people complain of high rents, and yet extract but half the profit out of the land which it will yield. They struggle desperately to possess a patch of land, because they have no employment by which to live, and yet the land is only half cultivated for want of the labour which might be profitably bestowed upon it. They shoot one another in the struggle to possess a patch of land, and leave neglected and waste thousands of acres which would amply repay their labour and capital. They complain of the want of tenure, and the moment they get a lease, they sublet and get rid of their tenure to another. They complain that landlords and agents in parts of the country will not reside, and they shoot them if they do." These inconsistencies are not exhibited by all, nor all at one time, but the extent to which they still come into play shows an entire ignorance of the rights, duties, and occupations of capital and labour, which is not altogether confined to any class of the population.

The county town of the south riding is Clonmel, on the Suir; a large and populous place, partly in this county and partly in Waterford, with a population, in 1851, of 12,518 souls. Since the division of the county into two ridings, Nenagh, where the assizes in the north riding are held, has received some improvement. The population of this town amounts to 7349. Cashel, a city with a population now reduced to 4798 souls, was anciently the royal residence of the kings of Munster. The other larger towns are Carrick-on-Suir, a place of some trade by means of its site on that navigable river—Pop. 6223; Thurles, the seat of the Roman Catholic see of Cashel, having in it the cathedral and the archiepiscopal residence, 5921; Tipperary, 7001; Roscrea, 3496; Cahir, 3719; Fethard, 2767; and Templemore, 4375.

Tipperary ‖ Tiree.

TIPPERARY, a market town of Ireland, formerly chief town of the county of the same name, stands on the Arra, an affluent of the Suir, and on the Limerick and Waterford Railway, 25 miles S.E. of Limerick. It is pleasantly situated in a plain near the foot of the Slievenamuck hills, and for an Irish town is pretty well built. It consists principally of one main street, which is well paved and clean; and has a handsome parish church with a tower and spire, a large Roman Catholic chapel, a Methodist meeting-house, several schools, a market-house, jail, &c. A considerable trade is carried on here in the agricultural produce of the surrounding country. Pop. (1851) 7001.

TIPTON, or TIBBINGTON, a village of England, in Staffordshire, 8 miles W.N.W. of Birmingham. It stands in the middle of a rich mining district, and has rapidly sprung up within a few years, owing to the many coal-pits and iron-mines in the neighbourhood. There are here, besides a parish and a district church, places of worship for Methodists, Independents, and Baptists; as well as several schools. The people are chiefly employed in the mines, iron-forges, mills, and factories for soap, red-lead, and machinery. Pop. (of the parish) 24,872.

TIRABOSCHI, GIROLAMO, a celebrated historian and writer on Italian literature, was born at Bergamo on the 27th December 1731. He studied at the Jesuit college of Monza, and afterwards joined that order. About 1766 he became professor of rhetoric in the university of Milan, and in 1770 was appointed by the Duke of Modena librarian of his rich library, where his predecessors had been Muratori, Zaccaria, and Granelli. In the interval, however, his first work had appeared, the history of a monastic order entitled *Vetera Humiliatorum Monumenta*, which was suppressed by a papal bull in 1771. This was followed by his *Storia della Letteratura Italiana*, which appeared between 1771 and 1782, in 13 vols. 4to, and which traces the history of Italian literature from the earliest recorded times of the Etruscans and the Greek colonies of Magna Græcia down to the end of the seventeenth century. No similar work had then appeared in that or any other country, and it is no mean praise to say, that it is probably as complete and accurate as could have been expected from one man. It was necessarily a work of immense labour, and most conscientiously has he executed it. It soon became highly esteemed, and passed through several editions. The second edition, in 16 vols. 4to in 1787–93, contains numerous additions and corrections by the author in the form of notes. In appreciation of his labours, the Duke of Modena made him a knight, and nominated him a member of his council. The chief of his other works are *Biblioteca Modenese*, 6 vols., 1781–86, and *Memorie Storiche Modenesi*, 3 vols., 1793. He died at Modena in June 1794.

TIRANAS and TONADILLAS (*Spanish*) are Spanish national melodies in ¾ time, and of a moderate movement, sung with an accompaniment for the guitar only. The Spanish dance-tunes, such as the *Fandangos*, the *Boleros*, and the *Seguidillas*, formerly much in vogue in Spain, were played on the guitar, often accompanied by the voice and by castanets. The *Bolero*, a modification of the *Seguidillas*, is said to have derived its name from a dancing-master of Murcia, named *Bolero*.

TIREE, one of the Inner Hebrides, Scotland, included in the county of Argyle, 15 miles W. of the island of Mull. Its length is about 12 miles, and its breadth varies from 3 to 6. Its form is very irregular, the coast-line being indented with many bays and creeks. The surface is low and flat, on an average not more than 20 feet above the sea-level. The island is not at all wooded, but contains several considerable lakes. The soil is in general light and

sandy, but in some places it consists of a rich deep loam. About the centre of the island is a plain, 1500 acres in extent, which affords excellent pasture. Agriculture is in a backward state; and barley, oats, and potatoes are the chief crops raised. The people are mainly employed in fishing and rearing cattle. Poultry and eggs are exported. Tiree forms a parish along with the adjacent island of Coll, and contains an Established church and a Free church. Pop. 3709.

TIRHOOT, a district of British India, in the presidency of Bengal, bounded on the N. by Nepaul, E. by the district of Bhaugulpore, S.E. by that of Monghyr, S. by that of Patna, and W. by that of Sarun. Length from E. to W. 140 miles, breadth 95; area, 7402 square miles. It is not a mountainous, but a gently undulating country, of a beautiful appearance, as it abounds with groves, orchards, and forests, and is watered by many fine lakes and rivers. The general slope of the country is from N.W. to S.E., and in that direction all the principal rivers flow. Besides the Ganges, which forms the southern boundary of the district, Tirhoot is watered by the Gunduck and the Bagmuttee, which flow into it. The climate is very warm and moist, but healthy for Europeans, though the natives often suffer from malaria. The soil is rich and industriously cultivated, though without much skill, by the natives; wheat, rice, barley, maize, millet, potatoes, &c., being raised in large quantities. Indigo is the staple commercial product of the district, but cotton, sugar, and tobacco are also raised. In the north there are extensive saul forests, and throughout the country many excellent fruits abound. Manufactures are few, being chiefly confined to coarse cloth, ropes, earthenware, the preparation of saltpetre and other salts. Tirhoot was granted to the East India Company by Shah Alum in 1765. Pop. 2,400,000.

TIRLEMONT, a town of Belgium, in the province of S. Brabant, on the Grande Geete, 25 miles E. of Brussels. The ancient walls, dismantled since 1804, are 4 miles in circuit, but include a good deal of vacant ground and extensive gardens. The town is entered by six ancient gates, and has regular streets and several handsome squares; among which are the market-place near the centre, containing the town-hall and the church of Notre Dame, rebuilt in the fifteenth century. There are here several schools and hospitals, and manufactures of woollen cloth, hosiery, oil, soap, and paper. Tirlemont was once a much larger and more flourishing town; but it has suffered much in war, and was taken by the French in 1635, 1792, and 1794. Pop. 8975.

TIRNOVA, or Ternova, a fortified town of European Turkey, Bulgaria, on the Jantra, an affluent of the Danube, 35 miles E. of Sistova. It stands on a basaltic hill about 1000 feet high, and is defended by walls and ditches. Tirnova is the seat of a Greek bishop, and contains many churches, synagogues, and mosques. Pop. 16,000.

TIROLESE (*Ital.*), a kind of waltz-tune mingled with triplet passages, in $\frac{3}{4}$ time, and of a moderate movement. The Tyrolese songs have a similar melody, and are generally performed in a singular *falsetto* voice.

TIRYNS, one of the most ancient cities of Greece, in Argolis, a little to the S.E. of Argos. Even in the time of Homer, it was celebrated for its strong and massive walls; and Pausanias describes them as in his day not less to be admired than the Egyptian pyramids. They consisted of huge masses of stone, the interstices between which were filled up with smaller stones. Almost the whole circuit is still remaining, and forms one of the most interesting relics of ancient Greece. It encloses a low flat hill, of an oblong shape, about 250 yards in length and from 40 to 80 in breadth, and consists of walls, towers, gates, and covered passages, leading from one part of the fortifications to another. The foundation of Tiryns is carried back to the most remote antiquity; and it is said to have been built by Prœtus, an ancient king of Argolis. At the time of the Dorian invasion of the Peloponnese, it seems to have been retained by the original Achæan inhabitants; and hence arose a hostility between it and Argos. Tiryns was destroyed by the Argives, probably about 468 B.C., and never again rose to any importance in history.

TISCHBEIN, John Henry, the *Elder*, a celebrated painter of the eighteenth century, was the son of a baker in Hayna, Hesse, and was born there in 1722. He was first apprenticed to a locksmith, but displaying some talent in drawing, he was taken away and placed with a paper-stainer in Cassel. A production of his attracted the notice of Count Stadion, through whose means he was enabled to visit France, where he studied for five years under Vanloo. He subsequently went to Venice and Rome, and in 1751 returned to Cassel, where he was soon after appointed cabinet painter to the landgrave. He was also director of the Academy of the Fine Arts in Cassel, and died there on the 22d August 1787. He was a very industrious painter, and excelled chiefly in historical and mythological subjects; but his works are little known out of Germany.

Tischbein, *John Henry William*, the *Younger*, nephew of the preceding, was born at Hayna in 1751. He first studied with his uncle, and afterwards spent some time in Hamburg, Holland, Hanover, and Berlin. In 1781 he went to Rome, and in 1787 to Naples. In the latter place he rapidly rose to distinction, and in 1790 was appointed director of the Academy of Painting, with a salary of 600 ducats per annum. On the breaking out of the revolution in 1799 he returned to Germany. The rest of his life was spent chiefly at Hamburg, and at Eutin near Oldenburg, at the latter of which he died in 1829. He painted many pictures of great beauty, and excelled in animal pieces. In 1796 he published at Naples a work, entitled *Têtes des différents Animaux dessinées d'après Nature*, with the view of showing the character of different animals from their physiognomies, to which he was probably led by his connection with Lavater. He also published, in 4 vols. folio, *A Collection of Engravings from Ancient Vases, mostly of pure Greek workmanship, discovered in Sepulchres in the Kingdom of the Two Sicilies, but chiefly in the neighbourhood of Naples, during the years* 1789 *and* 1790, *now in the possession of Sir W. Hamilton.* In 1801–4 appeared, in folio, his favourite work, *Illustrations of Homer from Antiques, with explanations by Heyne.*

TITANS (Τιτᾶνες), a race of deities placed beneath Tartarus by the might of Zeus, consisting, according to Hesiod, of six sons and six daughters of Uranos and Gaid, namely Oceanos, Coios, Creios, Hyperion, Japetos, Cronos, Theid, Rheid, Themis, Mnemosyne, Phoebe, and Tethys. Hesiod (*Th.* 207), gives the oldest derivation of the word, as *strivers* or *stretchers.* Passow conjectures, that it is the same with king (Βασιλεύς), but the most plausible derivation is from two Eastern words, *ti*=*bright*, and *tan*=*a country*, which would make the word originally indicate the *sun.*

The Titans were originally called Οὐρανίωνες, or dwellers in heaven, but after their struggle with Zeus, they were hurled down to nether darkness, and were known by their present denomination. This superhuman fight, or Titanomachia, as it was called, is reported to have lasted for ten years, during which time Zeus (who was a nephew of the Titans, being a son of the Titan Cronos, and who had been spared from destruction by the entreaties of Rhea, his mother), assisted by the hundred-handed Cottos, Briareus, and Gyes, ceased not to wage war, both by night and day, from the top of Mount Olympus, against their foes the Titans, who occupied Mount Othrys. At last Zeus gained the victory by a stratagem, when he flung down his rebellious uncles, aunts, and cousins, into a horrible cave beneath the lowest recesses of the Tartarean Gulf. This

Tithes ‖ Tithing.

legend must not be confounded with the like revolt of the Gigantes, or of the sons of Alöeus.

TITHES, in ecclesiastical law, are defined to be the tenth part of the increase yearly arising and renewing from the profits of lands, the stock upon lands, and the personal industry of the inhabitants; the first species being usually called *predial*, as of corn, grass, hops, and wood; the second *mixed*, as of wool, milk, pigs, &c., consisting of natural products, but nurtured and preserved in part by the care of man,—and of these the tenth must be paid in gross; the third *personal*, as of manual occupations, trades, fisheries, and the like,—and of these only the tenth part of the clear gains and profits is due. We cannot precisely ascertain the time when tithes were first introduced into this country. Possibly they were contemporary with the planting of Christianity among the Saxons by Augustin the monk, about the end of the sixth century. But the first mention of them which we have met with in any written English law is in a constitutional decree, made in a synod held A.D. 786, by which the payment of tithes in general is strongly enjoined. This canon or decree, which at first bound not the laity, was effectually confirmed by two kingdoms of the heptarchy, in their convention of estates, respectively consisting of the kings of Mercia and Northumberland, the bishops, dukes, senators, and people. This was a few years later than the time when Charlemagne established the payment of them in France, and made that famous division of them into four parts; one to maintain the edifice of the church, the second to support the poor, the third the bishop, and the fourth the parochial clergy. The next authentic mention of them is in the *Fœdus Edwardi et Guthruni*, or the laws agreed upon between King Guthrun the Dane, and Alfred and his son Edward the Elder, successive kings of England, about the year 900. This was a kind of treaty between those monarchs, which may be found at large among the Anglo-Saxon laws. As Guthrun was a pagan, it was necessary to provide for the subsistence of the Christian clergy under his dominion; and accordingly we find the payment of tithes not only enjoined, but a penalty added upon non-observance. This law was seconded by the laws of Athelstan, about the year 930. By the original law, all the land of the country was tithable, except such as belonged to the Crown and to the Church itself. From various causes, however, a large portion of England and Wales is now tithe-free. Much of the church lands, which, at the Reformation, were disposed of to laymen, and would thus have become tithable, were specially exempted; some have also been exempted by composition, and some by prescription. By the 13th Elizabeth, however, all subsequent compositions are limited to a period of three lives, or twenty-one years. No general attempt was made till very recently to remedy the inconvenient and vexatious mode of paying tithes in kind. By Act 6 and 7 Will. IV., cap. 71, a board of commissioners was appointed for the purpose of converting the tithes into a rent-charge payable in money, but varying in amount according to the average price of corn for the seven preceding years. The amount of the tithes was to be calculated on an average of the seven years preceding Christmas 1835; and the quantity of grain thus ascertained was to remain for ever as the annual charge upon the parish; and the annual money-value was ascertained from the returns of the comptroller of corn, who publishes annually in January the average price of an imperial bushel of wheat, barley, and oats, computed from the weekly averages of the corn returns during the seven preceding years. See ENGLAND.

TITHING (*Tithinga*, from the Saxon *Theothunge*, i.e. *Decuria*), a number or company of ten men, with their families, knit together in a kind of society, and all bound to the king for the peaceable behaviour of each other. Anciently, no man was suffered to abide in England above forty days, unless he were enrolled in some tithing. One of the principal inhabitants of the tithing was annually appointed to preside over the rest, being called the *tithingman*, the head-borough, and in some countries the borseholder, or borough's ealder, being supposed the discreetest man in the borough, town, or tithing. The distribution of England into tithings and hundreds is ascribed to King Alfred.

Titian.

TITIAN, properly called TIZIANO VECELLIO, one of the greatest painters that has ever lived. He was of the noble family of the Vecelli, and was born in 1477, at the small village of Cadore, on the Piave, near the foot of the Alps, in the Venetian territory. Before leaving his native village, he was probably instructed by an artist of that place, now but little known, called Antonio Rossi; but at the age of ten he was sent by his father to the house of an uncle in Venice, to be placed under some more competent master. Here he studied first under Sebastiano Zuccati, and then under Gentite Bellini; but at length attached himself to the school of Giovanni, the brother of the latter, and then the first painter in Venice. The prevailing style of art in Venice then was to neglect the masterpieces of antiquity for a laborious and minute imitation of nature; and in this manner are executed some of Titian's early works, wonderful productions even when compared with those of the best Venetian painters of the day. Among these are a picture of "Christ and the Tribute Money," now in Dresden, and many portraits, in which even the separate hairs on the heads, and stitches in the clothes of the figures are visible. An improvement on the common style was first introduced by a fellow-pupil of Titian, Giorgione di Castel Franco, who had adopted somewhat of the manner of Leonardo da Vinci; and the new style was followed by Titian, many of whose works about this time could hardly be distinguished from those of Giorgione. For a time the two painters were close friends, but at length an incident occurred that raised an ill feeling between them. Giorgione had been executing frescoes for the German warehouse, then newly erected at Venice, and a portion of this work had been intrusted to Titian; when some friends of Giorgione, not knowing this arrangement, remarked to him, that he had done the latter portion of his work better than the former, and thus roused his jealousy of his friend. On the death of his master in 1512, leaving unfinished a historical painting in the council-hall of the doge's palace, Titian was commissioned by the government to complete it; and having done so to their satisfaction, was appointed to the office of *Sensaria*, requiring him, for a salary of 300 crowns a year, to paint portraits of all the doges created in his time. In 1514, Titian was invited to Ferrara by Duke Alfonso I., to complete the decorations of a room in his palace, and here he painted several very fine works; among others, the "Bacchus and Ariadne," now in the National Gallery at London. On his return to Venice in 1516, he painted his masterpiece, the "Assumption of the Virgin," one of the finest pictures in the world; which, along with those he had done at Ferrara, spread his fame more widely, and procured him an invitation to Rome from Pope Leo X., warmly seconded by Raphael. But his proposed journey was delayed till 1520, and finally given up on the death of Raphael and the pope. About this time, Titian formed an acquaintance with the poet Ariosto, who, in his great work, mentions him along with Raphael, as one of the great painters of the day. The poet Aretino, who left Rome and settled in Venice about 1527, became intimate with Titian, and was the means of gaining for him the patronage of the Emperor Charles V.; for Titian, notwithstanding his great fame, had hitherto lived in a very humble style. In 1530 he was summoned to Bologna, to paint a portrait of the emperor; and here he also took those of Ippolito de Me-

Titian. dici and several other distinguished persons. From thence he went to Mantua, and executed for the Duke Gonzaga pictures of the twelve Cæsars. He painted Charles V. a second time at Bologna in 1532; and it was probably soon after this that he accompanied him into Spain, where he spent three years. In 1536, he met the emperor at Asti in Piedmont, returning from his African expedition, and he had now attained so great favour with Charles, that he would not allow any one else to take his portrait; and each time that Titian painted him he presented him with 1000 crowns (about L.500). It was probably in 1535 that he created him count palatine of the empire and knight of St Jago; and in 1541 and 1548 he granted him two pensions, amounting in all to 400 crowns a year. This, along with his salary from the Venetian government, and the income derived from his paintings, enabled Titian to live in great affluence, and his house at Venice became a favourite resort for the nobles of that city. In 1545, a false report of his death so much distressed the emperor, that Titian himself wrote a letter to him contradicting it; and the intimate terms on which he stood with Charles is further illustrated by the anecdote, that the latter once, looking on while Titian was painting, when he had let his brush fall, picked it up and gave it to him, with the words, "Titian is worthy to be served by Cæsar." In 1543 he was invited by Pope Paul III. to Bologna, where he painted his portrait; and a further request to accompany him to Rome was declined at that time, though two years later he visited that city, and again painted the pope, in a group along with Cardinal Farnese and Duke Octavio Farnese. While at Rome, Titian was visited, among other distinguished persons, by Michael Angelo, who, after seeing him at work on a picture of "Danae and the Golden Shower," is reported to have said, that it was a pity the Venetians did not study drawing more; for if Titian were aided by Art as much as by Nature, he would have produced inimitable works. Titian left Rome in May 1546, enriched with many presents, and returned by way of Florence to Venice. While at Florence, he offered to take the portrait of Duke Cosmo de Medici, but was not permitted. Soon after, the pope offered him the office of keeper of the seals, then vacant, but he declined it. In the beginning of 1548, Titian, on the invitation of the emperor, resorted to his court at Augsburg; and he again visited him at the same place in 1550. According to some accounts, his visit to Spain occurred after this; but this is not very probable, as the emperor was not in Spain at this time. Many of Titian's works are in that country, but these were not all painted there; as he sent many pictures from Italy both to Charles and to his successor, Philip II. Among these were one of the "Last Supper," and one of Titian's finest works, the "Martyrdom of St Lawrence," both for the Escurial. He also painted portraits of Philip, and of his wife, Queen Mary of England. His mode of painting in his later works was somewhat different from those he did in his youth, being much less minute and delicate, though he never executed any without much care and labour. He lived in his old age at Venice, and continued painting till the last; although the decay of his powers was manifest in the pictures he produced during the last ten years of his life. But he often showed the utmost irritation when any one ventured to hint that these works were unworthy of him. He lived in ease and affluence, esteemed and loved by all who knew him; and having enjoyed for more than seventy years a European fame, he died of the plague, at the age of ninety-nine, in 1576. By special permission of the senate, he was buried, but without pomp, in the church of Santa Maria Gloriosa dei Frari; where a costly mausoleum has recently been erected in his honour, by order of the Emperor Ferdinand I. The statue of the artist, in a sitting posture, with two allegorical figures, is surmounted by a handsome canopy, supported by four pillars. Of the private life and character of Titian but little is known. He appears to have been of an amiable and agreeable disposition; although he is believed to have been much influenced by a jealousy of his rivals. This is said to have extended even to his brother Francesco, and to have led to his dismissing the young Tintoretto from his school. His chief friends at Venice were Aretino the poet, and Sansovino the architect, from whom he was almost inseparable. An account of the style and principal works of Titian is given in the article PAINTING.

Titicaca, Lake || Titus.

TITICACA, LAKE. See BOLIVIA.

TITLE, an appellation of dignity or rank given to princes and persons of distinction. Titles were not so common among the ancient Greeks and Romans as they are in modern times. Till the reign of Constantine, the title of *Illustrious* was never given except to those who were distinguished in arms or letters; but at length it became hereditary in the families of princes, and every son of a prince was illustrious. The title of *Highness* was formerly given only to kings. The kings of England before the reign of Henry VIII. were addressed by the title of *your Grace*. That monarch first assumed the title of *Highness*, and afterwards that of *Majesty*. The title of majesty was first given him by Francis I., in their interview in 1520. Charles V. was the first king of Spain who assumed the same title. Princes, nobles, and clergy, generally have one title derived from their territories and estates, and another derived from their rank, or from some other remarkable circumstance. The pope has the title of *Holiness*. A cardinal is saluted by the name of *Eminent* or *most Eminent*. An archbishop, besides being named from his diocese, is called *his Grace* and *most Reverend*. A bishop is also distinguished by the name of his diocese, and has the title of *his Lordship* and *right Reverend*. Inferior clergymen are denominated *Reverend*.

TITUS, a Christian teacher, and companion and fellow-labourer of St Paul. He was of Greek origin, but was converted by the apostle, who therefore calls him his own son in the faith. He was one of the persons sent by the Church of Antioch to Jerusalem to consult the apostles, and it was not judged necessary that he should receive circumcision (Acts xv. 2; Gal. ii. 1). After a time we find him in company with Paul at Ephesus, whence he was sent to Corinth, where he was well received, discharged with discretion the task confided to him, and declined to suffer the Church to defray his expenses. He then proceeded to Macedonia, and at Philippi rejoined his master, who had vainly been expecting him at Troas. He was then employed by Paul in preparing the collection for the poor saints in Judæa, and, as an incident of this mission, became the bearer of the second epistle to the Corinthians. On a subsequent journey, Titus was left by the apostle in Crete, to establish and regulate the churches in that island, and he was still there when he received the epistle from St Paul which bears his name. He is therein desired to join the apostle at Nicopolis; and it is presumed that he did so, and afterwards accompanied him in his last journey to Rome, whence he was sent into Dalmatia. Tradition states that Titus eventually returned to Crete, and died there at an advanced age.

The genuineness of Paul's Epistle to Titus is attested by a large body of evidence; and seems never to have been questioned, except by the heretic Marcion, and that upon the most frivolous grounds, until, in recent times, it was attacked by Eichhorn and De Wette. The objections of the German critics are founded chiefly upon the difficulty of ascertaining the proper date of this epistle, and upon minute peculiarities in its style and sentiments; objections of so slight a nature, that it is unnecessary to enter upon any examination of them here.

Titus Vespasianus ‖ Tiverton.

The task which Paul had committed to Titus, when he left him in Crete, was one of no small difficulty. The character of the people was unsteady, insincere, and quarrelsome: they were given to greediness, licentiousness, falsehood, and drunkenness, in no ordinary degree; and the Jews who had settled among them appear to have even gone beyond the natives in immorality. Among such a people, it was no easy office which Titus had to sustain when commissioned to carry forward the work Paul had begun, and to set in order the affairs of the churches which had arisen there, especially as heretical teachers had already crept in among them. Hence Paul addressed to him this epistle, the main design of which is to direct him how to discharge with success the duties to which he had been appointed. For this purpose the apostle dilates upon the qualifications of elders, and points out the vices from which such should be free (ch. i.). He then describes the virtues most becoming in aged persons, in the female sex, in the young, in servants, and in Christians generally (ch. ii.). From this he proceeds to enjoin obedience to civil rulers, moderation, gentleness, and the avoidance of all idle and unprofitable speculations (ch. iii. 1–11). He then invites Titus to join him at Nicopolis, commends to him certain brethren who were about to visit Crete, and concludes with the apostolic benediction (ver. 12-15).

TITUS VESPASIANUS. See ROMAN HISTORY.

TIUMEN, a town of Asiatic Russia, Siberia, situated on the Tura, at its confluence with the Tiumenka, in the government and 100 miles S.W. of Tobolsk. Though built for the most part of wood, it is a handsome and flourishing town, containing 10 churches, 2 convents, a mosque, markets, bazaars, and several warehouses and counting-houses. It is the most important manufacturing town in Siberia, containing tanneries, especially celebrated for Russian leather, and manufactories of soap and coarse cloth. Gold is obtained in small quantities in the vicinity. Tiumen carries on an active transit trade, especially in soap, tallow, and other goods imported from the Kirghiz territory into Russia, and of timber and other Russian produce exported. It is also an emporium of the trade with China. Pop. 11,215.

TIVERTON, a market town, municipal, and parliamentary borough of England, Devonshire, on the slope of a hill at the confluence of the Exe and Loman, 13 miles S. by E. of Exeter, and 165 W.S.W. of London. It has a handsome appearance, as many of the old houses were destroyed by a fire in 1731, and have since been replaced with more substantial buildings. There are several broad and well paved streets, crossing Fore Street, the main thoroughfare, at right angles. Both the rivers are crossed by good stone bridges. On an eminence N. of the town, stand the remains of an old castle, consisting of the chief gateway, and some walls and towers. The castle was built in 1106; it was long the residence of the earls of Devon; and was stormed by Fairfax in 1645, and afterwards dismantled. The Church of St Peter, in the Gothic style, is considered, next to Exeter Cathedral, the finest ecclesiastical edifice in Devonshire. It is partly of the eleventh, and partly of the fifteenth century; and has a tower 116 feet high. St George's chapel of ease is in the Doric style; and Tiverton also contains places of worship for Independents, Baptists, and Wesleyans. Education is supplied by a grammar school, National and British schools, an endowed school, and two blue-coat schools. There are also several almshouses. Tiverton has a large market-place, guild-hall, theatre, assembly rooms, and jail. The woollen trade of the town was at one time important; but it fell into decay, and the cotton trade which succeeded it has also declined. The principal employment of the people now is lace-making, which was introduced in 1816; and there is also an iron-foundry in the town. A considerable trade is carried on. The borough is governed by 6 aldermen and 12 councillors, one of whom is mayor, and represented in Parliament by two members. Pop. 11,144.

Tivoli ‖ Tlemecen.

TIVOLI (anc. *Tibur*), a celebrated town of the Papal States, in the Comarca, and 18 miles N. by E. of Rome. It stands on the slope of Monte Ripoli, on the left bank of the Teverone (anc. *Anio*), just at the point where it descends by a series of rapids to the plain of Rome. It is now a dirty, disagreeable place, with wretched houses, and narrow, steep, unpaved streets. It has a cathedral and several other churches, some of them very old; but its chief interest is derived from the beautiful scenery, the falls of the Teverone, and the remains of ancient buildings in the town. The appearance of the falls has been much altered by an inundation, which, in 1826, swept away a number of buildings, and rendered it necessary to alter the channel of the river. It now falls in one mass to a depth of 80 feet; and there are also several smaller cascades. The antiquities of Tivoli are numerous; but the names and even the character of most of them are very differently described by different antiquaries. What is commonly called the Temple of Vesta, an elegant circular building overhanging the river, is identified by some with that of the Sibyl, and by others with that of Drusilla; and the extensive ruins generally known as the villa of Mæcenas are said by some to be a temple of Hercules, and are now occupied by an iron-work established by Lucien Bonaparte. Tibur was a very ancient town, and is said to have been founded, long before Rome itself, by three brothers, named Tiburtus, Coras, and Catillus, grandsons of Amphiaraus, who flourished in Greece long before the Trojan war. No important events are recorded in its ancient history, which is chiefly occupied with the various feuds and wars carried on with Rome, under the power of which it eventually fell. In the time of Augustus it was a favourite summer retreat of the Romans, and even of that emperor himself. Many of the principal men of the day are known to have had villas here; and the poets Horace, Catullus, and Propertius, have celebrated the beauty and pleasantness of the place. Catullus had an estate in the vicinity; but it is doubtful whether Horace had a villa here or not, although he lived much at Tibur. In later times it was the residence of Zenobia, the captive queen of Palmyra, in the last years of her life. In the middle ages, Tivoli was an imperial city, independent of Rome, and was the occasion of many contentions between the emperors and the popes; in the course of which it was frequently taken and retaken as either party gained the ascendant. Pop. 6200.

TLEMECEN, or TLEMSEN, a town of Africa, Algeria, in the province and 50 miles S.W. of Oran. It is an ancient place, with narrow streets, containing numerous fountains, and houses generally one story high, built in some cases of brick or stone, and in others only of clay. It is enclosed by walls, and has a citadel and several mosques. In the vicinity there are extensive orchards, and some interesting remains of antiquity. Manufactures of iron, morocco-leather, woollen, cotton, and linen cloth, are carried on here, and there is a considerable trade with the interior. Tlemecen was captured by the French in 1836; but given up the next year, and again occupied by them in 1842. Pop. (1851) 14,165; of whom 11,273 were natives.

Tobacco. TOBACCO, the dried leaves of various species of plants of the genus *Nicotiana*, so named from Nicot, a French ambassador, who introduced tobacco into France about the year 1560. The tobacco with which we are best acquainted is obtained from *Nicotiana tabacum*, a species which furnishes all the American tobacco, of which there are varieties, slightly differing from each other through differences of soil and culture. The Persian tobacco is obtained from a distinct species, *N. persica*; and the Syrian from another, *N. rustica*. The whole genus possesses stimulating and narcotic qualities, and belongs to the extensive order *Solanaceæ*, or *Nightshades*; which, although it contains among its genera the wholesome potato and tomato, must yet rank as a suspicious and dangerous assemblage of plants. The deadly nightshade, the henbane, and the thorn-apple, belong to this order, and are powerful narcotic poisons. Others of equal virulence exist in less known species, especially in *Acocanthera venenata*, a native of the Cape of Good Hope, which is used to envenom weapons and to destroy wild beasts. Even the potato (*Solanum tuberosum*) is possessed of narcotic properties, which are only rendered harmless by cooking. *Nicotine*, the active principle of tobacco, is poisonous in an isolated form; hence it has been argued that the use of tobacco must be generally injurious. This has not been confirmed, however, by the usage of mankind, among whom the practice of smoking tobacco is widely and increasingly prevalent; and it appears that the excess only of its use is dangerous to health, causing a tendency to paralysis.

The word *tobacco* has been the subject of much inquiry, and is not very satisfactorily accounted for. Some derive it from Tabago or Tabacco, one of the lesser Antilles; others from Tabasco, an island in the bay of Campeachy; others, again, from the circumstance that the herb is wrapped up for use in a dry leaf, which forms a sheath or envelope, and that this kind of sheath is always called *tabacos* by the Caribbeans. Whatever may be the derivation of the name, there can be no doubt about the origin of the plant itself. When Columbus, in 1492, discovered the New World, he found in the island now known as Cuba many persons of both sexes who had in their mouths a roll of leaves, of which they were inhaling the smoke. These were the leaves of tobacco, a plant growing wild on the heights of that island, and which at that time does not appear to have been the object of care or cultivation. A century later we find its culture attended to. In 1586 it was cultivated in Virginia, and soon afterwards in the West India Islands and in India, as well as in Europe, where it had been previously known by report or by the specimens brought by travellers.

A large proportion of the European consumption of tobacco is supplied by Virginia and other parts of the United States of America; and the importance of the plant in a commercial sense will appear from the fact, that only one article of foreign production, namely, sugar, yields a greater sum to our revenue than tobacco. A general description of the plant and of its culture will sufficiently apply to various parts of the earth, the cultivation varying but little with the locality.

Common tobacco is a handsome annual plant, having much the appearance of the sun-flower during its early growth. A strong erect stem rises to the height of 6 or 7 feet, sending out from its sides large light-green leaves, the lower ones perhaps 20 inches long and broad in proportion, gradually decreasing as they ascend. The flowers grow in clusters at the top, and are handsome, of a yellowish-white outside, and a delicate red within. They are monopetalous, and somewhat resemble our garden *petunias*, which belong to the same order. They are succeeded by kidney-shaped brown capsules, containing each about a thousand seeds. These seeds are sown in March or April in prepared nursery beds or *patches*, where the soil is rich and dry, and conveniently situated for watering. The least frost kills the young plants, therefore it is usual to protect the seed-beds with straw, fern, or matting over hoops. A border of white mustard-seed is often sown round the beds to attract the fly, which prefers mustard to tobacco. In about a month the young plants are 4 or 5 inches high, and ready for removal. The ground to which they are transplanted has been previously laid out in a succession of long narrow mounds like asparagus-beds, with intervals between them, which serve for drainage, and also for the cultivator to walk on between the rows. Moist weather is chosen, and the transplantation, if carefully done and to a richly-manured ground, scarcely causes any check in the growth of the tobacco plants. They are taken up carefully with a small spade or trowel, and placed in a slanting position in a basket (the earth being left about their roots), and thus carried from the seed-bed to the planting-ground. There they are inserted without injury to the fibres of their roots; one or two of their lower leaves are pinched off, and the rich new mould is brought well up about their stems. If great heat should follow the season of their removal, a few will wither and die: these must be replaced by other plants, left in the seed-bed for that purpose. The plants are set at about 16 inches apart, and the rows are at the same distance from each other, two rows being as much as one of these long narrow beds will accommodate. The plants are carefully weeded and attended to, and the soil is frequently stirred with narrow hoes until the period when they show symptoms of flowering. This may be when they are only 3 feet high, or not until they have reached their proper height of 6 or 8 feet; but the flowers must not be allowed to form, except in the case of a few plants left purposely for seed. To obtain fine and strong leaves on the plant is the great object of the cultivator, and a fine tobacco plant ought to have from eight to twelve large succulent leaves. Some cultivators diminish the number of leaves, under the idea that the remaining ones will afford the strongest tobacco. Suckers or shoots near the root are carefully removed, and everything is done to concentrate the strength of the plant in the leaves. Every leaf injured by insects is removed, and the crop is watched until the leaves have a yellowish tint and begin to droop, when they are fit to be gathered. This is usually in September, so that the plants, from the time of their insertion on the mounds, have occupied the ground four months, during which time they have been subject to many vicissitudes, from the attacks of insects, and from a disease called *firing*, caused by the long continuance of very wet or very dry weather, when the leaves perish in spots. Also in climates not intertropical, they have been in imminent danger from frosts, one white frost being sufficient to spoil a whole crop, and cause it to rot. Tobacco is one of the most exhausting crops that can be grown upon any soil, on account of the very large proportion of mineral constituents which it carries off, the proportion of ash amounting to as much as 21 per cent. of the dry leaf. Nitric acid is among the mineral constituents, often exceeding 2 per cent. of the dry leaf; while the salts of potash amount to more than one-third of the saline residue.

The gathering of the crop consists of cutting down the stems close to the surface of the soil, or even a little underneath it, leaving them to dry during the heat of the day, with frequent turnings, and then housing them before night, that the dew may not injure them. If the stalks are very thick, they are split down the middle to facilitate the drying. If the plants are very full of juice, they are sometimes taken out again the next day for further drying; but in most cases they are left, covered with matting, for two or three days in the shed to *sweat*, after which they are removed to *curing-houses*, or buildings erected for the pur-

Tobacco.

pose, with arrangements for admitting a thorough draught of air and keeping out the rain. Here the plants are dried in the way which the planter finds most convenient. In some cases the leaves are stripped off, and strung up in rows from the roof downwards; in others the whole plant is hung on pegs placed in rows at regular distances. The temperature of the curing-house must be kept tolerably equable, and for this purpose, if there is too much moisture, artificial heat is applied. In about a month the tobacco is sufficiently dried, and said to be *in case*. Moist or foggy weather is then chosen for its removal, otherwise the leaves might crumble in the handling. They are now usually *sorted* (though in some cases this is done later), that is, the lower or ground leaves, which are usually soiled and torn, are placed in one heap; the small upper leaves are placed in another heap; and the middle large leaves, which form the really valuable portion of the crop, are placed in a third. This done, the leaves are made up in small bundles called *hands*, and placed on hurdles or wooden platforms and covered up, to undergo a second sweating or fermentation. This lasts from a week to a fortnight, and requires great care that it be not allowed to go too far, and on the other hand, that it be not checked too soon, for in either case the quality of the tobacco would be impaired. In some cases the making of the leaves into bundles follows the fermentation; decayed stalks are stripped off, and the bundles being again dried, are packed in casks for exportation, being compressed several times during the packing by inserting a round board, and applying by lever or screw a pressure equal to several tons weight. Several casks are in the course of packing at the same time, so that some are under compression while others are being filled. The hogsheads used in Virginia are 48 inches long, and from 30 to 32 inches diameter at the ends. Each contains from 950 to 1000 or even 1200 lb. of tobacco.

The cultivation of tobacco may be carried on in most of the warm and temperate climates of the earth; but in no place is the quality and flavour of the product superior to that of Cuba, the island in which it was originally discovered. The best Havana tobacco-farms are comprised within a district 27 leagues long and only 7 broad, on the south-west of that island. This district is sheltered on the north by mountains, and is bounded on the south and west by the ocean. The specimens of cigars manufactured by a Spanish firm from the finest tobacco of that district, were pronounced by the jury at our Great Exhibition to be "the best it is possible to produce;" and they were said to fetch L.30 per 1000 even in the Havana. Variations in size, form, and colour, and sometimes in the flavour, may all exist in the product of the same crop of tobacco; for, as we have already noticed, the leaves vary in quality and strength according to their age and position on the stem.

The American varieties of tobacco are numerous, though all of one species. There is the *strong Virginian leaf*, of which ships' tobacco is manufactured. There is also the *fine Virginia leaf*, prepared for chewing; the delicately-flavoured *Ohio leaf*; the *Mason county leaf*, which to some extent furnishes *shag* tobacco; and the *Cavendish tobaccos*, so largely manufactured in the United States from the finest qualities of leaf, and formed into cakes, sometimes with the addition of molasses, for chewing. This is the purpose for which these kinds of tobacco are principally used in America; but in England, where the custom of chewing tobacco is happily less prevalent, they are valued for their fine flavour in smoking. Canada produces very fair leaf-tobacco for cigars, about equal to second-class Virginia leaf. The best *C'naster*[1] or *kanaster* of England is made from *Varinas*, a South American tobacco. Maryland leaf is used for the common c'naster of the north of Europe.

Tobacco is largely cultivated throughout the northern and western provinces of India, in fact, no plant of European introduction seems to be in such general request; its consumption is almost universal in the islands of India, where a sufficient crop is raised to supply the wants of the inhabitants, and to leave a surplus for exportation. The tobacco imported from British India into this country is, however, of the rankest and commonest kind. Fine tobacco is grown in Java, but the seed has first to be raised in the cooler mountain districts, and the seedlings afterwards conveyed to the lowlands, to perfect the plants. If the seeds were sown in the hotter districts, the plants would speedily degenerate. The flavour of the Indian leaf is weaker than that of the American; but this is attributed not so much to difference of climate and cultivation as to want of skill in the curing.

A fine quality of tobacco is grown in Manilla, one of the Philippine Islands. The three principal districts of the island which have become celebrated for tobacco are Visagas, Ygarotes, and Cagyan. Spain supplied to the Great Exhibition some beautiful specimens of Manilla leaf from these districts, and Manilla cheroots.

The tobacco of Persia has long been held in renown, but, like other eastern tobacco, it is too mild to be generally pleasing to English taste. One of the most celebrated sorts is a mild perfumed tobacco called "Aburika, or Father of Perfumes." Shiraz tobacco is esteemed in the East for its delicate flavour and aromatic quality. Damascus tobacco is also of fine quality, and is strong. Turkey produces some fine tobaccos; that of Latakia is the most celebrated, but we have very little information respecting the growth of these or other kinds of Asiatic tobacco.

The African continent is represented by Algiers and the Cape of Good Hope. The former of these is becoming the great tobacco mart of France. The Havana, the Syrian, and the Manilla varieties are there cultivated both by Arabs and colonists, and the crops are fine and well-grown. The curing is well accomplished, and the making-up of the cigars is often excellent; yet they are deficient in flavour and strength as compared with the tobaccos of the western world. The cigars of the Cape of Good Hope are, for the most part, clumsily made, and without proper selection of the leaf; yet the flavour is tolerably good, and it is probable that the manufacture will improve and flourish.

Among the tobacco manufacturers of Europe, the Spanish and Portuguese stand high. The superiority of the Spanish department, in this respect, was conspicuous at the time of the Great Exhibition, as already alluded to in our notice of the products of Havana and Manilla. The tobacco and snuffs of Portugal were also deservedly admired. There are extensive tobacco-fields on the banks of the Rhine, cultivated by small proprietors, and employing upwards of 20,000 hands. The agricultural society of Baden has greatly encouraged the cultivation of tobacco, and for some years both culture and curing have been so successful that a large demand for German tobacco has sprung up, and it is exported in vast quantities, in the leaf, to England, Belgium, Spain, and, in bad seasons, even to the Havana itself. Tobacco is grown in Russia, and the cigars and cigarillas are of good quality and very mild. Hungary yields fine and delicately flavoured tobacco. The climate of England is too variable for the successful cultivation of tobacco. A specimen of English-grown tobacco, raised on a light soil in Cambridgeshire, was shown as a curiosity at the Great Exhibition; but it was deficient in flavour. As manufacturers of tobacco and cigars, however, the British nation holds an important place. Owing to the high duty on tobacco, the British importer examines his tobacco in the bonding warehouses of the London Docks, and removes

[1] From *Canastra*, a Spanish word signifying a basket, in which it was imported.

Tobacco. any portions which have become damaged during the voyage, or were originally defective. These are burned in a furnace, familiarly known as the Queen's tobacco-pipe, and the sound portion is that on which alone duty is paid.

The chief supplies, in Great Britain, of unmanufactured or leaf-tobacco are from the United States of America, and they are known by the names of the states where they are grown; such as *Virginia*, *Maryland*, *Kentucky*, *Missouri*, and *Ohio*. Tobacco was formerly imported from America in the form of *carrots*, made by depriving the leaves of their mid-ribs, placing them together in large handfuls, and binding them tightly round with woody fibre or strong grass; but of late years this method has been abandoned. A certain quantity of *Havana* and *Cuba* tobacco is received from the island of Cuba; *St Domingo* tobacco from the island of that name; while Columbia furnishes the varieties known as *Columbian*, *Cumana*, and *Varinas*. There is also *Brazilian* tobacco, and small importations from *Porto Rico*, *Turkey*, the *East Indies*, &c. *Amersfoort*, or *Dutch* tobacco, is imported from Holland. The leaf-tobacco of the United States is chiefly used for *cut* or *roll* tobacco, and also for snuff. The other growths are occasionally used for these purposes; but they are chiefly in demand for the manufacture of cigars and cheroots. Manufactured tobacco is also imported into this country in the form of cigars from Havana, cheroots from Manilla of the East Indies, negro-head and Cavendish from the United States. In the manufacture of tobacco and snuff in the United Kingdom, the raw or leaf-tobacco is converted into various forms, such as *tobacco-stalks*, consisting of the stalk or mid-rib separated from the leaf; *tobacco-stalk flour*, consisting of the stalk ground to a fine dry powder; *returns* of tobacco, consisting of small portions of broken leaf, and of the dust and siftings produced in the various processes. The stalks, the flour, and the returns are converted into snuff. The terms *cut* and *shag* refer to all those kinds of tobacco which are produced by cutting the leaf into small pieces or shreds, varying from 16 to 100 cuts in the inch, and distinguished as *thumb-cut*, *broad-cut*, &c.; but the popular term *shag* refers to the shaggy appearance of the product. The manufactured varieties known as *roll*, *twist*, *pigtail*, *negrohead*, and *cavendish*, are formed by twisting or spinning the leaf, and afterwards pressing it into *rolls*, *lumps*, or *sticks*. The terms *carrott*, *blackleaf*, and *lug*, refer to forms of the compressed leaf, not much in use in this country. Cigars and cheroots are also manufactured in Great Britain. *Rappee* snuffs are all those varieties of snuff which are prepared by grinding the tobacco to powder in a moist state. In *Scotch*, *Irish*, and *Welsh* snuffs the tobacco is dried by heat preparatory to grinding. *Brown* Scotch snuff, is Scotch snuff moistened after having been ground.

The first operation in the manufacture of tobacco, after the hogsheads or bales have been unpacked, is to separate the tobacco leaves by shaking, rubbing, and pulling them apart. If the mid-rib had not been removed before the tobacco was packed, that operation is now performed. The leaves are sorted into different baskets or boxes according to their quality, for, although apparently identical when packed, the leaves undergo different changes during the voyage, or by remaining in a state of compression for a considerable time. The largest and strongest leaves are set aside as *robes* or covers for pigtail, and the rest are spread out on a floor, and sprinkled with water in order to make them supple and cut easily into shreds. And here we may remark, that the English manufacturer is allowed the use of water only for moistening the tobacco; but, on the continent of Europe, solutions of salt, &c., known as *sauce*, are employed. The chief ingredient is common salt, or rather sea-salt, which is more deliquescent than common salt; but sal-ammoniac, sugar, and other ingredients, are used in the preparation of fancy tobaccos. Common salt is sometimes dissolved in liquorice-juice in which some figs have been boiled; bruised aniseed is added, and then the solution is saturated with salt; a little spirits of wine completes the sauce. We do not pretend to explain the action of these preparations, in which a great deal of mystery and very little chemistry seems to be involved. The English manufacturer is allowed the use of certain salts in the preparation of snuff, and the fame of his house often depends on their judicious application. There is, of course, much temptation to mix cheaper materials with an article so heavily taxed as tobacco, and some idea may be formed of the ingredients which at some time or other have been used as adulterants by the following quotation from one of the clauses of the Act 5 and 6 Vict., which prohibits manufacturers, under a penalty of L.200, from having in their possession "any sugar, treacle, molasses, or honey, or any commings or roots of malt, or any ground or unground roasted grain, ground or unground chicory, lime, sand (not being tobacco sand), umber, ochre, or other earth, sea-weed, ground or powdered wood, moss, or weeds, or any leaves, or any herbs or plants (not being tobacco leaves or plants), respectively, nor any substance, or material, syrup, liquid, or preparation, matter or thing, to be used, or capable of being used as a substitute for, or to increase the weight of tobacco or snuff." That the fear of this large penalty does not deter some manufacturers from using illegal materials is evident from the various publications on the subject, among which we may mention *Tobacco and its Adulterations*, by Henry P. Prescott, of the Inland Revenue Department, London, 1858; written "for the purpose of assisting officers of the government, and others interested in the subject, in acquiring a knowledge of the characters of unmanufactured and manufactured tobacco, and of enabling them to detect its impurities." Among the substances used for adulteration, he enumerates the following:—Leaves of *rhubarb*, *dock*, *burdock*, *coltsfoot*, *beech*, *plantain*, *oak*, and *elm*; *peat-earth*, *bran*, *saw-dust*, *malt-rootlets*, *barley-meal*, *oat-meal*, *bean-meal*, *pea-meal*, *potato-starch*, and *chicory* leaves steeped in tar-oil. We need scarcely say, that the microscope is the chief means for detecting these sources of adulteration.

Tobacco.

For the manufacture of cut tobacco, the damped leaves are laid straight, pressed into cakes by means of a screw, or hydraulic press, and are then placed in a cutting machine in which a knife is arranged as in a chaff-cutting machine, only, working by steam power: it has a rapid chopping motion, and after each ascent of the knife the cake of tobacco is pushed forward through a small space, and the descending knife cuts off the portion thus protruded. The cut tobacco is combed out by hand, shaken, and rolled so as to make the fibres curl, and at the same time is exposed to the action of steam. It is next spread out to cool, after which it is fit for use. What is called *bird's eye* tobacco is formed by retaining in the leaf a portion of the mid-rib, transverse sections of which give an "eyed" appearance to the tobacco.

The tobacco of the United States is in general too strong for the manufacture of cigars, that of the West Indies, Havana, and Europe being employed. The mid-rib is removed, the perfect are separated from the imperfect leaves, the former being cut to shape for making wrappers, while the latter are rolled up for the insides, covered spirally first with a rude wrapper and then with the perfect one. One end is cut square and the other is brought to a point where the leaf is secured by a little paste instead of the curl or twist formerly in use. The workman is expected to make cigars of the same quality, of the same weight and dimensions. Cheroots are portions of elongated cones, and are preferred by some smokers on account of the freer dissipation of the oil, and consequently less heat in the mouth than in the case of cigars, where the oil is apt to accumu-

Tobacco. late near the contracted part. The cigars are laid out on canvas trays to dry, either with or without artificial heat, according to circumstances.

In the manufacture of pig-tail, Virginian tobacco is usually employed. The leaves being sorted, a man, assisted by two boys, works at a bench, at one end of which is a wheel, turned by one of the boys, for the purpose of keeping in the twist given to the leaf by the workman. The man begins by rolling up the leaves by means of a flat board which he wears on his hand, and attaching the end of the cord thus formed to a hook on the wheel, the boy turns the wheel, while the man continues making fresh cord, the other boy supplying him with tobacco leaves, which he pitches one within the other on the table, so that he has in a very few minutes a cord of tobacco extending the whole length of the table, or about 20 feet. When this 20 feet is finished, the man rolls it on the cylindrical wheel, but brings the end forward again over the hook, so as to continue the cord by the addition of another 20 feet. This process is repeated until the wheel is full. The "ball of work," as the wheel-full is called, weighs about 40 lbs. This is then made up into smaller balls, called, according to the shape given to them, *casks*, *cakes*, *negro-heads* or *hanks*, and *rolls*, the various coils being kept in shape by bands of bast or by wooden pegs, and a little oil being used to prevent the coils from sticking together. The bundles thus formed are put into a press and kept there from two to six weeks, when a slow fermentation takes place, which modifies the character of the tobacco. This kind of tobacco is used for chewing, and sometimes for cutting up for smoking.

In the manufacture of snuff, tobacco of all kinds may be used, and a second fermentation is induced in it by the addition of moisture or some kind of sauce, as already noticed; the time during which the fermentation is carried on may be several weeks, but this depends on the kind of snuff required. For moist snuffs, which are represented by *rappee*, the tobacco is ground by edge runners or stones mounted on a horizontal axis, and moving by their edges, like a wheel, in their beds. After the snuff has been sifted, it is stored for from three to six months, and for the choicer kinds for some years, when it is fit for use. The dry snuffs are prepared by fermenting the material, drying it by the aid of artificial heat, and grinding it in an iron mortar, by means of a weighted pestle. A large number of these mortars and pestles are arranged side by side and are worked by power. There are many snuff-mills on the river Wandle in Surrey, employed in grinding up the material sent by different tobacconists. The large number of different kinds of snuff are prepared by grinding together tobaccos of different growths, and by varying the nature of the sauce. The following recipe is from Joubert's *Nouveau Manuel du Fabricant de Tabac*, Paris, 1844. For the preparation of the fancy snuff known as *Maroco*,—take 40 parts of genuine St Omer (South American) tobacco, 40 parts of St Omer (European), 20 parts of fermented Virginian stalks in powder; the whole to be ground and sifted. Then take 2½ lbs. of rose-leaves, to be cut and mixed with powdered Virginian stalks, add 2½ lbs. of rose-wood in fine powder; moisten with salt water, and incorporate the whole well together. Then work it up with 1 lb. of cream of tartar, 2 lbs. of salt of tartar, and 4 lbs. of table salt. This snuff is highly scented, and must be preserved in lead.

We do not attach much importance to these recipes, since the great change wrought in the tobacco is induced by fermentation. When snuff is manufactured on a large scale, as at the imperial tobacco works in Paris, we see how important this process really becomes. According to Pelouze and Fremy (*Traité de Chimie*, tome iv.), the tobacco leaves are moistened with about one-fifth of their weight of salt and water (sp. gr. 1·089), made up into blocks, and piled, in large rectangular heaps, in quantities of 40 or 50 tons. The temperature gradually rises to 140°, and sometimes reaches 170°; but the heat must be regulated, or parts of the mass would become black as if charred. The heaps are made up in spring and autumn, and the fermentation is continued for five or six months, when the temperature remains stationary or begins to decline. The heap is then opened, and the tobacco is ground, by which means a pale brown dryish powder is obtained. This is mixed with about $\frac{4}{10}$ths of its weight of a solution of common salt, and is passed through a sieve, that the powder may be uniformly moistened. It is then packed in large open chests in quantities of from 25 to 50 tons, where it remains for nine or ten months, and undergoes another fermentation, the temperature rising in the centre of the mass to 120° or 130°. During this process the snuff acquires its dark colour, and developes its aroma. But it is not uniform in quality throughout, and is removed to a second chest, in such a way as thoroughly to mix all the different parts together, and, after the lapse of two months, it is again turned over, and the process is sometimes repeated a third time. When the snuff is ripe, the contents of the various chests are mixed together in a large room capable of holding 350 tons of snuff, where it is left for about six weeks, and the whole mass being uniform in quality is sifted into barrels for the market. The whole process of manufacture occupies from eighteen to twenty months. During these repeated fermentations about two-thirds of the nicotine is destroyed. This is a volatile base, the active principle of the tobacco plant in which it occurs in combination with malic and citric acids. It is also contained in the smoke of the burning leaves. It is a limpid, colourless, oily liquid, with an irritating and powerful odour of tobacco: it is very inflammable, burning with a smoky flame: it is very soluble in water, alcohol, and ether, and also in the fixed oils: it is extremely poisonous, a single drop being sufficient to kill a large dog. The proportion of nicotine varies greatly in different varieties of tobacco; French tobacco contains 7 or 8 per cent., Virginia 6 or 7 per cent., and Maryland and Havana not more than 2 per cent., which is the proportion in ordinary snuff. The change that takes place during the fermentation of snuff is thus described by Professor Miller (*Elements of Chemistry*, Part iii., 1857):—"A small portion of this base appears to exist in snuff, in the uncombined form; but the greater part of the portion still remaining is left in the form of acetate; a certain amount of acetic acid having become developed during the fermentation. A portion of the decomposed nicotia becomes converted into carbonate of ammonia, which is partially retained by the snuff: and the gradual volatilization of this salt appears to favour the conversion of nicotia into vapour, and thus to occasion the pungent odour for which snuff is valued. The proportion of citric and malic acids becomes diminished during the fermentation, so that ordinary snuff has an alkaline reaction. A certain quantity of a peculiar essential oil appears also to be developed during the operation; and to the variable proportion of this oil much of the difference in the flavour of the different varieties of snuff is owing. The quantity of nitrate of potash which fresh tobacco contains passes over unaltered into the snuff."

Tobacco, in its various forms, is subject to very heavy excise duties, and is a considerable source of revenue. In the year ending 31st December 1857, and the two following years, the quantities of *stemmed* tobacco imported into the United Kingdom amounted to 14,258,767 lb., 14,760,874 lb., and 16,236,871 lb. Of *unstemmed* tobacco, 18,339,721 lb., 19,090,037 lb., and 18,256,203 lb.; while of manufactured tobacco and snuff there were only 252,877 lb., 259,940 lb., and 298,187 lb. respectively. The customs duty on all raw tobacco is 3s. and an extra 5 per cent., or 3s. 1½d. per lb. Snuff pays a duty of 6s. 3½d. per lb.:

Tobago.

cigars and manufactured tobacco, 9s. 4½d. per lb. In the three years above named, the total receipts of customs duties on tobacco amounted to L.5,253,431, L.5,454,214, L.5,573,463, respectively. The value of raw tobacco varies from 4d. to 12d. per lb.; choice cigar tobacco will fetch a much higher price. The great demand, however, in this country is for shag tobacco; and some idea may be formed of the demand for tobacco and cigars from the fact, that one of the leading London houses, from which much of the information contained in this article is derived, manufactures 2000 lb. of cut tobacco per day, and only 60 lb. of cigars. In fact, it is stated that as much as three-fourths of the consumption of tobacco in this country is for shag, or common roll, and the common kinds of snuff. There has of late years been a falling-off in the demand for snuff—at least the snuff-millers complain of a falling-off in their business, and an increase in the consumption of cigars. But the consumption of tobacco in Great Britain, however large it may appear from the above figures, is small compared with that of Germany and the north of Europe, where the duty is low, and smaller still compared with the consumption of the United States of America. The manufactories of snuff are principally in London, Liverpool, Bristol, and Leeds, also in Glasgow and Edinburgh; but it must be remarked, that what is called *Scotch* snuff is largely consumed chiefly by women of the lower classes; and that there is no demand for it in Scotland, where *rappee* is the favourite snuff. The manufactories of Dublin and Cork produce large quantities of high-dried snuff, which is much esteemed in Ireland.

A great deal has been written as to the effect of tobacco on the human frame, and although medical opinion has frequently been expressed against its use, and we have seen that nicotine is a powerful poison; yet there is the strong fact, that wherever tobacco has been introduced it has been consumed with avidity, and its use among whole nations has amounted to a passion. Nor do we find that advancing civilisation checks the use of this poisonous weed; but, on the contrary, the demand for it seems to increase as society advances, as is indeed proved by the returns already given. Doubtless, there are persons of weak digestion to whom tobacco in any form must be injurious; but there are others to whom its moderate use may be as agreeable and refreshing as tea and coffee are to most persons. In cases of this kind one's own experience is better than dogmatic rules, especially when we find so many contradictory opinions on the subject among medical men. One thing, however, is certain, that moderation must be useful, and total abstinence can do no harm. (C. T.)

TOBAGO, one of the West Indian Islands, belonging to Great Britain, in the Windward Group, N. Lat. 11. 25., W. Long. 60. 32., 24 miles N.E. of Trinidad. It is 32 miles long by 12 broad, and has an area of 97 square miles. It has been called the "Melancholy Isle," because when viewed from the N. it presents a gloomy and wild aspect, with steep cliffs rising from the sea, and densely wooded mountains rising behind them. On a nearer approach the appearance is more attractive, and the hills lower, but almost the whole of the island is covered with conical hills and ridges, diverging on both sides from a chain about 1800 feet high, which traverses the centre of the island. Between these ridges, and along the shore, there lies a succession of broken plains and valleys, running up into deep and narrow ravines among the hills. Eight rivers, with numerous tributaries and smaller streams, flow down from the hills and water the island; and the coast is indented with many bays, some of which form safe and excellent harbours. The prevalent geological formation here is limestone, but basaltic columns occur in some places, as at the N.E. extremity, and in the vicinity of Scarborough, where schistose rock also exists. The soil in the lower ground consists of a rich mould, favourable to the growth of the sugar-cane; there are swamps and marshes of considerable extent, but the land has been much improved by drainage, which has been carried on for some time by means of bamboos. The climate is warm, especially in the less open parts, where it is not tempered by the sea breezes, which render the regions along the shore mild and healthy. On the whole, the island is not salubrious, and the rate of mortality is higher than in the other West Indian islands; but the clearage and drainage of the country is doing much to improve it. The productions are similar to those of the other islands of the group, including sugar, cotton, coffee, maize, and various fruits, such as cocoa-nuts, figs, pine-apples, pomegranates, oranges, lemons, &c. Only the low ground, and some tracts on the slopes of the hills, have as yet been cultivated. Horses, asses, oxen, and sheep are reared in large numbers; and wild hogs abound in the island. Sugar, rum, and molasses, with small quantities of cotton and arrowroot, are the chief articles exported; while cotton, linen, and woollen cloth, hardware, pottery, soap, candles, timber, &c., are imported. In 1852, the total value of the imports into Tobago was L.53,519; and that of the exports, L.56,831. The tonnage of the vessels that entered the various ports was 8172; of those that cleared, 9296. The island is included in the jurisdiction of the governor of the Windward Islands; and has a lieutenant-governor, a legislative council of nine, and a house of assembly of sixteen members. The public revenue in 1852 amounted to L.7476. The Church of England has here five churches and chapels; the Methodists five; and the Moravians two. These denominations also support various schools, in all sixteen. Tobago was discovered by Columbus in 1496, and named by him from the pipes used by the natives in smoking tobacco. It was first colonized in 1632 by the Dutch, who were expelled by the Spaniards, but afterwards returned. It subsequently passed into the hands of the French; but was ceded to the English in 1763. In 1781 the French again captured it; but it was retaken in 1793, and has since remained a British colony. The capital is Scarborough, on the S.E. coast. Pop. 15,679.

Tobarra ‖ Tobolsk.

TOBARRA, a town of Spain, in the province and 33 miles S.S.E. of Albacete. It has some remains of ancient fortifications, a town-hall, two churches, several schools, and an hospital. In the vicinity are a hermitage and a mineral spring with good baths. The town has manufactories of linen cloth, flour, oil, and fulling mills, and carries on some trade in fruit. Pop. 8818.

TOBERMORY, a seaport of Scotland, the largest town in the Island of Mull, Argyllshire, stands on the shore of a beautiful bay, protected by a small island, near the N.E. extremity of Mull. It is for the most part well built, along the shore and on the slope of a hill; and contains Established and Free churches, a government school, school of industry, and a distillery and boat-building yards. There are two quays and a good harbour. Some coasting trade is carried on, and many steamers touch at Tobermory. There is also some fishing here. Pop. 1547.

TOBOLSK, a government of Asiatic Russia, comprising the extreme west of Siberia, between N. Lat. 54. and 73., E. Long. 55. and 80.; bounded on the N. by the Arctic Ocean, E. by the governments of Tomsk and Yeniseisk, S. by the Kirghiz territory, and W. by the governments of Perm and Orenburg. Length from N. to S. 1400 miles; greatest breadth 900; area estimated at 500,000 square miles. The surface is mountainous towards the west, where the Ural chain forms its boundary; and also on the south, where the Altai mountains border on the government. The rest of the surface is level, or occupied by a slightly undulating plain. The principal river is the Obi, which enters the country from the east, and then turns northwards and falls into the Gulf of Obi. It receives,

Tobolsk.

along with a number of smaller affluents, the Tobol, Irtish, and Ishim, from the south, which all unite before entering the main river; the Ishim and the Irtish some distance above Tobolsk; and these with the Tobol at that town.

The character of the soil and productions in different parts of the government varies considerably. In the southern part there are many rich agricultural tracts along the banks of the rivers; and among the hills there is much good natural pasture-land. The centre of the government is occupied with vast forests of fir and birch; while north of them there stretch low level plains, called *tundras*, of the most desolate character, consisting of moors and morasses, dotted here and there with low stunted trees and shrubs. The climate is on the whole cold, even in the southern part of the government; for, while the summers are frequently very hot, they are of short duration, and the winters are long and severe. The principal crops raised in Tobolsk are rye, barley, oats and buckwheat; which are conveyed from the more fertile regions in the south, down the Obi, to the villages in the north, in exchange for furs and skins. Many important minerals, such as gold, silver, platinum, iron, and copper, are obtained in the Ural and Altai mountains. There are large forges for these metals in various places, and the manufacture of leather, soap, woollen cloth, and tallow, is carried on. But the trade is of more importance than the manufactures of the government; and most of the inhabitants, except the clergy and government officials, are engaged in it to a greater or a less extent. Fish, fur, and hides from the north are sent through Tobolsk, Tiumen, and other towns, either to the fairs at Nijnii-Novgorod, or to the Kirghiz territory, to be bartered for horses, cattle, &c.; or to Kiachta, in exchange for tea, silk, and other Chinese productions. The inhabitants of Tobolsk are partly Russians, partly Ostiaks, Samoyedes, Tunguzes, and other tribes. The government is divided into nine circles as follows:—

	Pop. 1851.
Tobolsk	88,712
Tiumen	83,708
Turinsk	49,129
Beresov	21,558
Tara	69,992
Yalutorovsk	136,003
Kurgan	147,960
Ishim	150,282
Omsk	86,937
Total	872,268

But the total population in 1856 amounted to 1,011,413.

Tobolsk, the capital of the above government, stands at the junction of the Irtish and Tobol rivers. The city proper stands on a flat-topped hill, but there is a lower town at its foot, stretching along the Irtish, and liable to inundations from it. The upper town is defended by a brick wall with towers and bastions, and the streets in both parts are broad, regularly laid out, and paved with wood. Most of the houses are well built, though, with the exception of the public edifices, only of wood. The cathedral is a large and conspicuous building with five circular cupolas. There are twenty-two other Greek churches, mostly in the Byzantine style, a Lutheran church, two convents, two mosques, a theological seminary, and various other schools, a theatre, public offices, &c. Leather, soap, tallow, tiles, firearms, surgical instruments, and boats for river navigation, are made here. A considerable trade is carried on with European Russia and China. Tobolsk was founded by the Russians in 1587, and was for some time the capital of the whole of Siberia. In 1837 it was visited by the present Emperor of Russia, then the heir-apparent, when for the first time Siberia was honoured with the presence of a member of the imperial family. Pop. 16,120, mostly consisting of Russians, Tartars, and Germans.

Tocqueville.

TOCQUEVILLE, Charles Alexis Maurice Clerel de, a member of the French Academy; a member of the Chamber of Deputies from 1839 until December 1851; and one of the ministers of Louis Napoleon Bonaparte, as president of the French Republic, was born at Verneuil, in the department of the Seine and Oise, on the 29th July 1805. Descended from an ancient family of Normandy, he was the third son of the Count of Tocqueville, by his marriage with Mdle. de Rosambo, one of the granddaughters of the illustrious Malesherbes. This marriage had been contracted in 1793, and was quickly followed by that imprisonment during the Terror, which so many of that eminent family quitted only for the guillotine; a fate from which the parents of M. de Tocqueville narrowly escaped by the event of the 9th Thermidor.

Alexis de Tocqueville was educated at the college of Metz, at first with a view to the military profession, which had already been adopted by his two elder brothers. But, before his studies were concluded, this intention was changed. He prepared himself for the bar, to which he was called in 1825, and then travelled through Italy, before entering into practice. In 1827 he was appointed judge-auditor at the tribunal of Versailles. The revolution of 1830 matured in his mind liberal sympathies and aspirations which had not been concealed in gloomier days; but the only favour which he sought at the hands of the new government was a commission to examine, jointly with his friend Gustave de Beaumont, and at their personal expense, the penitentiary system of the United States of America. This task they undertook early in 1831, and performed it, exhaustively, during a long tour throughout the States, which occupied the remainder of that year and much of 1832. They were cordially received, and made many friendships.

Inquiry into the penitentiary system.

In 1833, the results of the inquiry were published in a work entitled, *Du Système Pénitentiare aux Etats-Unis, et de son Application en France; suivi d'un Appendice sur les Colonies Pénales*, &c. This report traces the history of the American system, and describes the remarkable measure of success which had attended it. It shows that this success was principally due to the local administration which had both originated and worked out the system. It recommends, therefore, that in France power should be given to the departments, severally, to erect and govern cellular prisons; insists on the prime necessity of isolation, —labour,—religious instruction,—fit and responsible warders,—in the management of such prisons; condemns the system of "surveillance" exercised by the French police over released prisoners; and condemns still more emphatically the punishment of transportation under all its forms. This last feature in the report is noticeable for its date. In 1832, little attention had yet been aroused to the mischievous consequences of transportation as practised in our own country—consequences now so generally admitted. Our example, indeed, had just then been urged for French imitation by an author, M. de Blosse, whose work was laureated by the French Academy. The creation of special reformatory prisons for juvenile delinquents is also one of the recommendations of this pregnant report. Its authors, as is usual in such cases, found it uphill work to carry into operation the reforms they recommended; but both of them had opportunity to urge their views on the attention of the Chamber of Deputies, and important improvements were gradually effected in the French prisons.

Results of the mission to America.

The immediate results, however, pale their fires before the grand result which came but incidentally from the mission of 1831; for to it we owe a masterpiece in political literature. Here, also, the date is an important element towards due appreciation. There had already been plenty of travellers in the United States, with much curiosity and ample note-books. But the great majority of them had been engrossed by the pettiest objects. Not a few had

Tocqueville.

profited by an openhanded hospitality to turn into ridicule the manners, and to caricature the failings of their hosts. Others had carried into America the most vulgar prejudices of the political coteries of Europe, and from New York to Louisiana were solely intent on picking up stones to cast at republicanism. Very different was the ambition of M. de Tocqueville. He was not a republican either by conviction or by self-seeking. Himself an accomplished member of the polished aristocracy of France, he was little likely to overlook the absence in America of many courtesies and ornaments, materially conducive to the charms of social life. But he carried with him the memory of revolutions which had terribly disturbed the elegant repose of people who persist in mistaking shadows for substances. In his childhood he had heard of the prisons of the Terror from the lips of those whose lives they had blighted,—had witnessed the plaudits which welcomed the veterans who had traversed Europe in triumph,—and had twice seen foreign armies overrunning his native land. At his own outset in public life, he beheld a king driven swiftly into exile, and a luxurious capital laid at the mercy of insurgents, many of whom were in want of bread. In America, he found stability, instead of incessant revolution; peaceful enjoyment of the fruits of industry, instead of habitual panic; an almost universal possession of many of the comforts as well as of the mere necessaries of life, instead of the frequent contrast between lavish splendour and utter penury; and he thought the causes of such disparities must be worth investigating. He certainly had not travelled over the length and breadth of the United States, in such years as 1831 and 1832, without seeing the social landscape in all its aspects, and under all its phases of atmospheric change. He had witnessed things which induced a friend to ask him how it was possible that he could write of them with such good humour and kindly forbearance. "Ah!" he replied, "had you, like me, been bred up amidst all the miseries of insecurity, political and personal, you would have learned to view the worst that happens in America with calmness."

The first portion of the treatise *De la Démocratie en Amérique* was published in Paris in 1835. It reached its fifth edition in 1838, and its thirteenth edition in 1850; was quickly translated into English by Mr Henry Reeve, into Spanish by Sanchez de Bustamante, and into German by F. A. Aüder. In 1836, the French Academy awarded to it the Monthyon prize. In 1839, the second part appeared in two volumes, like the former part. As usual, the continuation was not received with quite so much favour as its predecessor. In this instance there is cause, we think, for the opinion, that its distinctive merits themselves somewhat lessened its popularity.

The seminal idea of this famous book is, that the irresistible tendency of American institutions, and of American thought, towards the utmost possible equalization of human conditions, is the counterpart of a substantially similar tendency in Europe, but is, in America, so developing itself, as to exhibit at once the ultimate benefits and the contingent perils which that equalization enfolds. In De Tocqueville's opinion, therefore, to portray America is, in a certain sense, to prefigure Europe; in substance, that is—by no means necessarily in form; and with the important qualification, that American experience may possibly so influence European opinion, as to make attainable the benefits, and avoidable the perils, of a solution of the great social problem, which, in the main, he believes to be inevitable. Equality of condition—speaking broadly—must, he thinks, be realized in Europe as well as in America. Wise advances on the part of those who wield government or sway opinion, will help to realize it safely. Unwise resistances may retard its coming, but must at last embitter its unavoidable rule.

Tocqueville.

In Part I., after describing the external configuration of North America, and the starting-point of its colonists, he shows what they brought with them. He singles out that old principle of local self-government, from whence all the existing institutions of the country have grown, and traces its progress and its ramifications. He examines the several institutions of the States, marks the growth of their jurisprudence, and the formation of political opinion. He shows how it has come to pass that, in the most rigorous sense of the words, "the people governs;" that not only are the institutions democratic, but all their developments and modes of working are also democratic; that in America the people virtually elect both the law-maker and the administrator of law, whilst itself is the jury which punishes those who break the law. He dissects the federal constitution, and reconstructs it from its elements, bringing saliently out these three main facts:—(1.) That the majority is everywhere and in everything omnipotent; (2.) that the peace, prosperity, and even the very existence of *the Union*, lie immediately in the hands of the Supreme Federal Court, "the true moderator," as he terms it, "of the democracy;" (3.) that the higher and ultimate security of political freedom, and all that it involves, lies, on the one hand, in the absence of administrative centralisation; on the other, in the universal diffusion of education, property, and the sense of inherent and inalienable rights throughout the entire community. There is no winking either at the vices or at the perils of democracy. In speaking of the absolute subjection even of the press to the will of the majority, there is such plain-speaking as this:—"No writer, whatever his renown, can escape from the obligation to burn incense before his countrymen. The majority lives in perpetual self-worship. Disagreeable truths reach the ears of Americans only from the voice of a foreigner, or from the lessons of experience."[1] Elsewhere he says,—"I know no country in which there is, usually, less independence of mind, less real freedom of discussion, than in America."[2] But in marking defects, there is no clamour, no invective, no disdain; uniformly, the anxiety is to indicate a remedy.

Thus far the author had a solid framework of facts, of institutions, of measurable and computable results. His book is a masterpiece of systematic construction. All its parts unite and converge towards weighty and definite conclusions. In advancing to the second part, the demarcations of the subject become necessarily less distinct. There he has to treat of the influence of democracy on (1) intellectual progress; on (2) public feeling (*sentiments*); on (3) manners; on (4) political society. It is much easier to criticise this arrangement than to suggest a better one; to say, for instance (as is obvious), that "public feeling" is very closely allied both with intellectual progress and with manners. A more serious objection may perhaps lie to the universality of the influences ascribed to the one passion for political and social equality. But an excessive estimation of a great subject is probably the unavoidable condition on which we receive great works. At all events, it is certain that the modifications and minor adjustments of any such subject may easily come afterwards, and that minds of smaller calibre will suffice for the task. To the discoverer of an untrodden region in the world of thought, we can forgive some exaggeration of its treasures.

The wide survey here taken of American society in all its phases, results, on the whole, in a genial estimate of the present, and in hopeful auguries of the future. But in describing the intellectual and social results of democracy as they unfold themselves in America, there is as little sup-

[1] *De la Démocratie*, &c., treizième édition, i. 309.

[2] Id. i. 307.

Tocqueville.

pression of the unfavourable features as there was in the analysis of its political results. Thus, for example, in a chapter of the second part, which treats of the special importance to democratic communities of the remoter aims of human action, there occurs this passage:—"As soon as men cease to place their grand aims at a great distance, they are naturally impelled to seek the immediate realization of their pettiest desires; as if, despairing to live eternally, they must needs act as though they had but a single day to live." This is a warning, for proof of the pertinency of which we need not look so far as to America. Much of the book has a like home applicability. There are keen censures in it, which consist simply in putting facts under the light, but the facts so lighted up are by no means exclusively of American growth. This, we think, is one of the causes why the second part was not, like the first, highly lauded in articles, the entire drift and spirit of which was in antagonism with the book reviewed. Instead of this, we may perhaps find in one number of a literary journal loud praise, and in another number of the same journal an assertion that "those who follow De Tocqueville are pantheists in politics, and will soon come to pantheism in religion,"[1]—a hit, assuredly, very wide of the mark. To us it seems that the deficiencies in the book really most obnoxious to criticism are (1), the absence of any adequate estimate of the political effects of the wide extent of sparsely-peopled territory in America;[2] and (2), the utterly insufficient view which is given of the influences of Protestantism on the American people; both of them, it may be noted, points which are likely to be very differently regarded in France and in Britain. That *Democracy in America* is the work of a mind saturated with the past glories of France, alarmed at the perils that visibly obstructed her onward path, and intent, above all things else, on her deliverance, is not its least merit. To make American experience subserve French progress was the author's constant aim.

Labours in the Chamber of Deputies.

De Tocqueville's political career was in thorough harmony with the pervading patriotism and the lofty qualities of the book, the fame of which was already world-wide before that career began. He was elected to the Chamber of Deputies by the department of La Manche in 1839, and in the course of the same year made a valuable report on slavery in the French colonies, proposing its abolition (which was not effected, however, until after the fall of Louis Philippe), with an indemnity to the colonists, as a matter of public utility, "not as a compensation for the loss of that which no man ever had or could have any right to possess,"[3] a proposition which excited great turmoil amongst the colonists. In February 1840, and again in April (after the formation of the Thiers ministry,) he strenuously supported motions for limiting the number of public functionaries in the Chamber of Deputies. Repeatedly during that and subsequent years he laboured in the promotion of improvements in the criminal law, and especially in prison discipline. In 1847, as chairman of the committee on Algiers, he made elaborate reports recommending administrative reform in that colony, and the extension of local powers in secondary matters; and strongly condemning (1) the prevalent system of attempting to do everything for the colonists, instead of training them to do most things for themselves; and (2), a particular pet project of the government for military agricultural settlements at the public cost,[4] which was, however, carried out, but with results strongly confirmatory of the opposer's views. His most memorable speech was that made on the 27th January 1848, in which, in the simplest words, but with the utmost possible incisiveness, he urged every member of the Chamber to put to himself the question, "What must be the end of that electoral corruption and that public scandal which I, individually, know to exist?" and then implored the ministers to change a policy which, said he, "makes the ground tremble beneath our feet;" concluding with these prophetic words—"Is it possible you can be undisturbed by that sough of revolution which is in the wind (*vent de révolution qui est dans l'air*), which blows we know not whence or whither, and know as little, be assured of that, whom it will whirl away? Is it at such a moment that you can calmly witness the degradation of public morality?"[5] These words were timely. They were uttered exactly four weeks before the revolution of February; but many ears are deaf to the wisest charmer.

Tocqueville.

Political career under the Republic and the Empire of Louis Napoleon.

After that revolution, the department of La Manche returned M. de Tocqueville to the National Assembly by a majority of 110,711 votes over his next competitor. He was third on a list of fifteen names. He voted for the banishment of the House of Orleans; became vice-president of the Committee of Public Instruction, and a member of the Committee on the Constitution, and took a very noticeable part in the discussions on the "rights of labour." In one of his speeches on this topic, the socialistic theories were, for the first time in the National Assembly, fairly grappled with. He branded "socialism" as an energetic and pertinacious appeal to the lower passions of mankind; as a system of which the basis was a thorough mistrust of liberty, a hearty contempt for man individually; as, in a word, a lust for the old servitude in a new livery. In 1849, after representing France at the Brussels Congress, he became Minister of Foreign Affairs, and in that capacity he strenuously vindicated the policy of the memorable expedition to Rome, to which, in its origin, he had not been a party, and the ultimate direction of which was to fall into quite other hands. The defence, assuredly conscientious, seems to us just as certainly fallacious. Here, however, it can neither be described nor appreciated. But it must be mentioned that one of the chief grounds of that defence in his mouth was, that the expedition tended "to prevent a return of the old abuses. . . . You must never," he told the Assembly, "lose sight of that which now becomes the main point,—that we desire to secure to the States of the Church really liberal institutions."[6]

M. de Tocqueville's ministry of foreign affairs lasted only five months. When (31st Oct. 1849) the president sent his significant message, declaring that the old parties must no longer be permitted to "renew their factious struggle," and that the suffrage of the people had "adopted, not a man, but an entire system of policy," the ministry in a body resigned. The brief remainder of M. de Tocqueville's political life was passed in firm opposition to that "entire system." Very happily, four years of vigour were left him for the production of a noble book—*L'Ancien Régime et la Révolution*—of which all that can here be said is, that it is more than worthy of the author of *Democracy in America*. This work was published in 1856. M. de Tocqueville died at Cannes on the 16th April 1859.

---

[1] *Quarterly Review*, lxvi. 493.

[2] Yet this point was strongly urged upon the attention of the fellow-travellers (in relation to the specific object of their mission), by a letter from the Attorney-General of Maryland, written in January 1832.

[3] *Rapport au nom d'une Commission . . . . relative aux Esclaves des Colonies* (*Procès Verbaux des Séances de la Chambre des Deputés, Session de* 1839). Séance du 23e Juillet.

[4] *Rapport au nom de la Commission chargée d'examiner le projet de loi relatif aux credits extraordinaires demandés pour l'Algérie* (*Procès verbaux*, &c., *Session de* 1847, vi. 305–410).

[5] *Discours de M. de Tocqueville, dans la discussion du projet d'adresse*, Séance du 27 Janv. 1848 (*Moniteur*, 28th Jan. 1848).

[6] *Discours de M. de Tocqueville*, &c., 6 Août 1849 (*Moniteur*, 7th Aug. 1849).

Todd ‖ Toga.

The political horizon was then very dark. The institutions he loved, and to which he had been an honour, were suppressed. The servility he hated was rampant. But he knew that liberty has sometimes been more wisely used, and more highly valued, for its temporary loss, and that no prescription can bar the rights of a people. He had, too, a title to console himself with the thought that in his last book he had left to his countrymen an excellent manual of political study and aspiration. It is a legacy which the most gifted in the long and glorious line of French publicists might have been proud to bequeath. (E. E.)

TODD, HENRY JOHN, was born in 1763. Passing from Hertford College, Oxford, where he graduated in 1786, he became a minor canon of Canterbury Cathedral. He was presented successively to the vicarage of Milton in 1792; to the rectory of Allhallows, London; to the keepership of the manuscripts at Lambeth in 1803; to the rectory of Settrington, in Yorkshire, in 1820; prebend of Husthwaite, in the cathedral church of York, in 1830; and in 1832 he was made Archdeacon of Cleveland. Todd died chaplain-in-ordinary to her Majesty on the 24th December 1845.

The chief works of Archdeacon Todd were the following:—*The Poetical Works of John Milton, with Notes and a Life*, 6 vols. 8vo, 1801; *The Works of Edmund Spenser, with Notes and a Life*, 8 vols. 8vo, 1805; *Illustrations of the Lives and Writings of John Gower and Geoffrey Chaucer*, 8vo, 1810; *Johnson's Dictionary of the English Language, with Corrections and Additions*, 4 vols. 4to, 1814; *Memoirs of the Life and Writings of the Right Rev. Brian Walton, Bishop of Chester*, 2 vols. 8vo, 1821; *A Letter to the Archbishop of Canterbury concerning the Authorship of Icôn Basilikè* (in which the work is assigned to Bishop Gauden), 8vo, 1825 (followed up by various answers and replies); *Life of Archbishop Cranmer*, 2 vols. 8vo, 1831.

Todd wrote, besides, catalogues and various theological pieces. His gift lay rather in the field of bibliography than in that of criticism. His notes were, for the most part, rather dry and uninteresting.

TODMORDEN, a market-town of England, Lancashire, on the left bank of the Calder, 53 miles S.E. of Lancaster, and 202 N.W. by N. of London. It consists of two principal streets, and is, on the whole, neat and well built. The old church is now in ruins, and is only used for burial services; but there is a handsome modern church, with a square embattled tower; and also places of worship for Independents, Baptists, various sects of Methodists, Quakers, and Unitarians; a grammar-school, national school, court-house, and public hall. Todmorden is an important manufacturing town, containing several large cotton factories, silk, woollen, and worsted works, iron and brass foundries, and manufactories of steam-engines and machinery. Markets are held twice a week, and fairs twice annually. Pop. 4532.

TOGA (from *tĕgĕre*, to cover, according to Varro), was the principal outer garment worn by the Romans, who regarded this style of dress as their peculiar distinction; and hence the name which their nation received of *togati*, and sometimes *gens togata*. It is supposed to have been of Etruscan origin, as the *toga prætexta* certainly was. The toga was a loose, woollen, semicircular kind of garment without sleeves, which was worn either with or without the *tunica*. It differed in richness and in size, according to the rank of the wearer; and the usual colour of those worn by men was the natural hue of white wool. Black togas were worn by mourners. The *toga prætexta*, which was the dress of children of both sexes, of magistrates, of priests, and of persons engaged in sacred rites, was ornamented with a broad purple border. When lads attained to man's years, they doffed the *toga prætexta*, and took the *toga virilis*. Girls, again, wore the *prætexta* till their marriage, when they assumed the matronly *stola*. The *toga picta*, again, which was worn by generals in triumphs, by consuls under the empire, and by prætors when they celebrated games, was embellished with Phrygian embroidery. In war, the *toga* was laid aside for the *sagum* or *paludamentum*, or some less cumbrous style of attire; and hence *togatus* is opposed to *miles;* and as the toga was the distinguishing peculiarity of Roman citizens, *togatus* is opposed to *rusticus*.

Tokat ‖ Toland.

TOKAT, a town of Asiatic Turkey, in the pashalic and 55 miles N.W. of Sivas, near the Jezil Irmak, the ancient Iris. It is enclosed on three sides by lofty hills of limestone, which in some places form almost perpendicular cliffs, and is open only towards the N.E. The whole appearance of the town is wretched in the extreme; the streets are dirty, narrow, and unpaved; none of the houses are of better materials than sunburnt bricks, and many of them are mere wooden sheds covered with tiles. The town is frequently injured by fires; and the dirt and luxuriant vegetation, along with the quantities of fruit, produce in the summer and autumn malignant fevers, which are very destructive. The only important buildings are the mosques, fifteen in number, the Armenian churches, some of which are very handsome; a good stone bazaar, with others of an inferior kind, and some old khans. Some manufactures are carried on to a considerable extent here; there are dyeing and cotton printing works, woollen, linen, silk, and cotton factories, copper foundries, &c. The trade of the place was formerly extensive, but has fallen off very much, and is now confined to the supply of the neighbouring villages; the khans and bazaars are almost empty, and the streets show few signs of bustle or animation. It was at Tokat that the missionary Henry Martyn died, on his return from India in 1812. Pop. 60,000.

TOKAY, a town of Hungary, in the county and 27 miles S.W. of Zemplin, on a lofty spur of the Hegyalla hills, near the right bank of the Bodrog, at its confluence with the Theiss, here crossed by a wooden bridge. It is generally ill built, and has no important edifices except a ruined castle, and several places of worship belonging to different sects; but the place is famous for its wines. The whole of the Hegyalla hills, for a length of 30 miles, are covered with vineyards, in which the most of the inhabitants of Tokay are employed. The wines are of several varieties, but are all known by the name of Tokay, and the annual produce is estimated at three or four millions of gallons. There is also some trade in salt. Pop. 5712.

TOLAND, JOHN, a well-known writer, was born at Miseogan, near Londonderry, in Ireland, in 1669 or 1670, and educated in the Popish religion, but at sixteen years of age he embraced the Protestant faith. He studied three years in the University of Glasgow; took the degree of A.M. in that of Edinburgh; and afterwards completed his studies at Leyden, where he resided two years. He then went to Oxford, where, having the advantage of the public library, he collected materials upon various subjects, and composed some pieces—among which was a dissertation to prove the received history of the tragical death of Atilius Regulus, the Roman consul, to be a fable. He began likewise a work of greater consequence, in which he undertook to show that there are no mysteries in the Christian religion. He published it in 1696, at London, under the title of *Christianity not Mysterious*. This book gave great offence, and was attacked by several writers. One of the most ingenious books which it called forth was a treatise on *Reason and Faith*, by the Rev. John Norris of Sarum, 1697. Toland afterwards wrote in favour of the Hanoverian succession, and many other pieces. In 1707 he went to Germany, where he visited several courts; and in 1710 he was introduced to Prince Eugene, who bestowed upon him several marks of his generosity. Upon his return to England, he was for some time supported by the liberality of the Earl of Oxford, lord-treasurer, and kept a country-

Toledo.

house at Epsom; but soon losing his lordship's favour, he published several pamphlets against that minister's measures. During the last four years of his life he lived at Putney, but used to spend most part of the winter in the metropolis. He died at London in 1722. He was a man of uncommon abilities, published a number of curious tracts, and was perhaps the most learned of all the infidel writers; but his private character was far from being an amiable one, for he was extremely vain, and wanted those social virtues which are the chief ornaments as well as duties of life. Four years after his death appeared, *A Collection of several Pieces of Mr John Toland, now first published from his Original Manuscripts; with some Memoirs of his Life and Writings*, Lond. 1726, 2 vols. 8vo. The memoirs were written by Des Maizeaux, and the contents comprised a great deal of curious and interesting matter.

TOLEDO, a province of Spain, in New Castile, bounded on the N. by those of Avila and Madrid, E. by that of Cuença, S. by that of Ciudad-Real, and W. by that of Caceres. Area 5620 square miles. The surface is throughout lofty, and in a great part of its extent mountainous. Towards the centre, indeed, there are extensive plains or tablelands, but the whole of the south and east is occupied by the mountains of Toledo, which separate the waters of the Tagus on the north from those of the Guadiana on the south. These hills are of no great height; and they were once densely covered with forests, which have now been partly cut down, although there are still woods and groves of considerable extent on their lower slopes. Branches of this chain enclose the province on the east and west; and part of the range that stretches north of the Tagus approaches its north-western frontier. Among these hills there are many deep and narrow glens, secluded from one another, and from the level country. The province is watered by the Tagus, and many of its affluents, such as the Tajuna, Jarama, Guadarama, Alberche, and Tietar, from the north; and the Algodor, Torcon, Pusa, Sangrera, and Cedron from the south. The Guadiana forms for some distance the south-west frontier; and its tributary, the Guiguela, waters the eastern part of the province. The country is very rich in minerals, containing veins of gold, silver, lead, iron, quicksilver, copper, and tin; and coal, alum, cinnabar, &c., are also found. The soil produces corn, pulse, potatoes, oil, wine, flax, oranges, lemons, melons, chestnuts, &c. The number of sheep and goats is few, of horses and mules still less; and the only oxen in the province are those used in agriculture. Bees and silkworms are kept in considerable numbers. The produce of the country is sufficient, but very little more than sufficient, for the home consumption. Manufactures once flourished here, but are now in a very low state; silk and woollen cloth, earthenware, soap, and swords, being almost the only articles made. The little trade of Toledo consists in the exportation of the manufactured articles. Pop. (1857) 328,755.

TOLEDO, the capital of the above province, and once of the whole of Spain, stands on a rocky eminence washed on three sides by the Tagus, 37 miles W.S.W. of Madrid. The Tagus is spanned by two fine stone bridges, the Alcantara, a Moorish one of a single arch, giving entrance to the town from the east; the other, that of San Martin, from the west; while between them the river makes a bend to the southward. The town is enclosed by two walls, the inner built by King Wamba in the seventh century, and the outer by Alfonso VI. in 1109. Both are pierced by numerous gates, some of which are very handsome. The appearance of Toledo from a distance is splendid and imposing; but a nearer approach shows it to be a dull, decaying place, having palaces without nobles, churches without worshippers, and streets without passengers or traffic. The houses are large and massive, generally in the Moorish style, and three or four stories high; and the streets are narrow, steep, and crooked. The principal public square in Toledo is called the *Zocadover*, or square market; it is planted with trees, and forms a favourite promenade. From it to the cathedral stretches a long and tolerably broad street, the best in the town. The cathedral was built on the site of a former mosque, and completed in 1492. Its exterior is neither beautiful nor regular; it has two towers, only one of which is finished, rising to the height of 325 feet. The interior is fine, though somewhat low, and stripped of many of its former rich decorations. It is 404 feet long, by 204 broad, and divided by 84 pillars into five lateral naves; the central one, which is the loftiest, containing the choir, richly adorned with sculpture, on the one side by Vigarny, and on the other by Berrugnete. Near the cathedral is the palace of the archbishop, which contains a large and valuable library. Among the archbishops of this see have been many celebrated men, such as Fonseca, Mendoza, and Ximenes; and the chapter at one time included nearly 100 dignitaries. Besides the cathedral, Toledo once contained 20 parish churches, 6 other churches, 9 chapels, 14 convents, 23 nunneries, and 10 hospitals. Many of these have been destroyed; but some still remain, affording beautiful specimens both of the Gothic and of the Saracenic architecture. Of the former, one of the finest is that of *San Juan de los Reyes*; and of the latter, *La Iglesia del Transito*, which was formerly a Jewish synagogue. The *alcazar*, or palace, is one of the most conspicuous features of Toledo. It stands in a commanding position on a rock, and was originally built by King Wamba, but altered and rebuilt many times, until the time of the Emperor Charles V., who built it almost entirely anew. It is now in a very dilapidated condition, but still preserves traces of its former magnificence, and commands a fine view from the top. The ancient university of Toledo has been reduced to a secondary school; and the celebrated manufactory of sword-blades, though still existing in its old building outside the town, and producing blades as perfect as ever, has dwindled greatly, and now employs only 70 or 80 hands. The town has numerous elementary schools, a public library, museum, theatre, town-hall, hospitals, &c. Besides swords, coarse cloth, paper, leather, and guitar-strings are made here. Toledo existed in the time of the Romans, who conquered it in 193 B.C., and found it a small town but strongly situated. They strengthened the fortifications, and built an aqueduct to supply the place with water. By the Goths, who captured Toledo in 467 A.D., these works were kept up and improved; and under the Moors, who possessed it from 714 to 1085, it was an important city, second only to their capital, Cordova. Alfonso VI. of Castile and Leon recovered it from the Moors; and under him and his successors it continued to be a flourishing town, till the permanent establishment of the court at Madrid gave a final blow to its prosperity. The population, which once amounted to 200,000, was in 1857 no more than 15,797.

TOLEDO, a town of the United States of N. America, Ohio, on the Maumee, 4 miles from its mouth in Lake Erie, and 134 N.N.W. of Columbus. It extends about a mile along the river, and consists of an upper and a lower portion, the former commanding a wide and beautiful prospect. Toledo is one of the most important commercial places in the lake country, and enjoys many and great facilities for trade. The river forms a capacious and safe harbour, frequented by most of the steamers plying on the lake; the Wabash and Erie Canal, the longest in the States, terminates here; and many railways diverge to the other centres of trade in different directions. Among the objects of trade, a prominent place is occupied by articles of food. Toledo received in 1859, 688,103 barrels of flour, 2,312,583 bushels of wheat, 714,291 of maize, 492,000 of other grains; 43,417 barrels of pork, 22,831 of beef,

Toledo.

Tollens ‖ Tomsk.

45,840 live hogs, and 4,728,175 lb. of dressed hogs, besides a large amount of cattle. From Toledo, among other articles, there were sent 48,286 head of cattle, 173,438 hogs, and a very large number of horses. In the trade in wool, cotton, and other articles, Toledo surpasses St Louis, one of the most flourishing marts in the west, and eight times its size, although in some other articles its trade is inferior. Large quantities of timber are also sent eastwards from Toledo, and this branch of commerce is rapidly increasing. The town contains eight churches, three banks, and several newspaper offices. Pop. (1850), 3829; (1853), 6412.

TOLLENS. See HOLLAND, § *Literature.*

TOLOSA, a town of Spain, Biscay, capital of the province of Guipuzcoa, on the Oria, here crossed by two splendid bridges, 35 miles S.W. of Bayonne. It is surrounded by walls, flanked with towers and entered by several gates. The houses are regularly and well built of stone, and have in general iron balconies; and the streets are straight and well paved. There is a fine parish church with three naves, several other places of worship, a nunnery, a suppressed convent, now occupied by barracks, a college, academy of design, and several schools; two town-halls, a custom-house, hospitals, &c. Tolosa has many manufactories, including iron-works, machine-shops, paper-mills, flour-mills, tanneries, potteries, &c. The inhabitants of the suburbs are largely employed in agriculture. The town was occupied by the French from 1808 till 1813. Pop. 7000.

TOMASZOW, a town of European Russia, Poland, on the Pilica, in the government and 62 miles S.W. of Warsaw. It has Protestant and Roman Catholic churches, a synagogue, manufactories of woollen and cotton cloth, dye-works, worsted-mills, and iron-works. An active trade is here carried on, and there are in the neighbourhood valuable iron-mines. Pop. 5000.

TOMB. See BURIAL-PLACE.

TOMLINE or PRETYMAN. See PITT, WILLIAM.

TOMSK, a government of Asiatic Russia, Siberia, lying between N. Lat. 49. and 61., E. Long. 75. and 90.; bounded on the E. by that of Yeniseisk, S. by Chinese Turkestan and the territory of Semipalatinsk, W. and N.W. by the government of Tobolsk. Length from N. to S. about 750 miles, greatest breadth about 600; area 333,922 square miles. The Altai range forms its southern boundary; and along its eastern frontier stretches a branch of these mountains, forming the watershed between the Obi and the Yenisei. The former of these rivers rises in the Altai mountains in this government, and flows north-west through a country gradually sloping downwards to the ocean. It receives from both sides numerous affluents, such as the Tom, Tchulima, Ket, Tchumish, and Bia, in Tomsk. There are several large lakes in the government, especially towards the west, where there is a chain of them, including the Tchany, Soumy, and others. The north part of the country is cold, wild, and desert, and is occupied only by wandering tribes. Towards the south the climate is milder, and the soil more productive. There are extensive pastures, on which are fed the cattle that constitute the chief wealth of the country. Some valuable minerals are worked to a considerable extent among the mountains; gold, silver, lead, copper, and iron being the chief. Some manufactures are carried on, especially those of tallow, leather, brandy, and pottery; and there is a considerable trade. The government is divided into six districts as follows:—

	Pop. (1851).		Pop. (1851).
Tomsk	85,772	Bijsk	104,702
Kainsk	56,098	Barnaul	77,721
Kusnezk	72,221	Kolyvan	72,964

Total.....(1851), 476,355; (1856), 687,677.

TOMSK, the capital of the above government, on the Tom, not far from its confluence with the Obi; N. Lat. 26. 29., E. Long. 84. 58. It stands in a fertile region, occupied with corn-fields and pastures. It consists of an upper town, inhabited chiefly by Russians, and a lower town or suburb, occupied by Tartars or Bukharians. The latter is regularly built, and consists chiefly of low wooden houses, from among which the minarets of several mosques rise. The upper town has larger and more handsome buildings, churches, monasteries, mosques, a bazaar, a college, schools, hospitals, &c. Coarse cloth, leather, and soap are made here; and a considerable trade is carried on in corn, leather, fur, and fish. Pop. 20,202.

Tonality ‖ Tonnage.

TONALITY (Ital. *tonalità*, Fr. *tonalité*), a modern term, introduced to designate the existence of differences among various musical modes, ancient and modern, and among the elements of melodies and harmonies founded upon these modes. (See MUSIC.)

TONGA ISLANDS. See POLYNESIA.

TONGRES, a town of Belgium, in the province of Limburg, on the Geer, 12 miles S.W. of Maestricht. It is of great antiquity, and was once a large town. The principal church, built in 1240, is said to have been the first north of the Alps dedicated to the Virgin. There are five chapels, a town-hall, court-house, hospital, several schools and convents. Brewing, distilling, tanning, bleaching, and dyeing, the manufacture of hats, chicory, candles, bricks and tiles, are carried on here. In the neighbourhood is a mineral spring, with medicinal properties, which was known as early as the time of Pliny. Pop. 6180.

TONNAGE. The term *tonnage*, as applied to shipping, was originally intended to express the actual burthen that any ship could carry, in order that the various dues and customs which are, and always have been, levied upon ships might be proportioned to their carrying powers. To avoid cavilling and uncertainty as to the real tonnage of a vessel (which, it is evident, depends upon the draught of water at which she can safely swim), it must have been soon found necessary to establish one universal mode of calculating the tonnage of merchant-shipping, depending on certain fixed and definite measurements of the hull. A fixed rule, strictly enforced by law, has consequently been adopted by all maritime nations for this purpose. Upon the principles recognised in framing these rules depends, in a great measure, the preponderance of good or bad qualities in the ships themselves, the body of shipowners in general being found unequal to the temptation of sacrificing the prospective safety, and the weatherly qualities, of their ships to the present sure gain arising from a low rate of register tonnage, when this can be compassed by any peculiarity of build, however extravagant. Legislation on this subject requires, therefore, to be conducted with the utmost caution and circumspection, an irreparable injury having been already done to the merchant-shipping of this country from the erroneous principles on which the measurement for tonnage used to be made.

Significa-tion of the term.

Importance of good rules for tonnage.

Not only are all dues and customs levied according to tonnage, but ships are also built, bought, and sold for a certain price per ton of their admeasurement; and by the conditions of Lloyd's classification-list of shipping, they must be timbered and fastened, and must have their anchors, cables, and boats, all in proportion to the same datum. The *tonnage* of a ship, therefore, in so far as these considerations are involved, is virtually assumed to be a correct representation of her *size.*

Tonnage used for fiscal and commercial purposes.

The true principles upon which the register tonnage of shipping should be computed appear to be the following:— 1st, It should afford a practically correct measurement of all space eligible for stowage or passenger accommodation; 2d, The measurements and dimensions involved should be such, both as regards their number and position, as to effectually prevent even our most ingenious builders from escaping the due influence of the rules, whatever form or

The true principles on which tonnage should be computed.

Tonnage.

dimensions of vessel may be resorted to; and 3d, It should be such as to ensure the dues levied being justly proportional for all classes of vessels. The question has been raised whether the legal tonnage of a ship should not represent numerically the commercial tons actually carried, either of measurement or dead-weight cargoes, or both of them, rather than merely express, as at present, the relative capacity of ships. On this subject it was remarked by Mr G. Moorsom, surveyor-general for tonnage to the Board of Trade, at a meeting of the Institution of Naval Architects (as reported in the *Mechanic's Magazine* of 6th April 1860), "that the preservation of the expression of the present aggregate tonnage of the kingdom has been the *sine quâ non* with all the public commissions on the question, and is upheld also by the shipping community, as constituting a fairer standard of capacity, under general circumstances, than the estimated cargoes carried, either of measurement or weight, which must necessarily vary with the ever-varying circumstances of longer or shorter voyages—to say nothing of the acknowledged almost impossibility of satisfactorily arriving, by any general rule, at the proper positions of the load and light draughts of water, on which the calculation of the weights carried solely depends." In regard to the question of weight-cargoes, Mr Moorsom observed that "parties were agitating as to the desirableness of placing a scale of tonnage (or displacement) on a ship's certificate of registry, to show the weight of cargo carried at different lines of flotation, for the convenience of ship owners, brokers, and masters. He questioned, however, if the utility of that object was at all commensurate with the labour and difficulty of its production, and he had yet to learn that the parties themselves, for whose interest it was proposed, desired such a document. But, if needed, it could be furnished to the ship owner or broker by any respectable builder or surveyor of shipping, and ought not to be prepared at the public expense. It would require ten or twelve practised draughtsmen for a period of nine or ten years to prepare such scales for the existing commercial navy, and two or three others in addition for the ships annually building. Tables had been prepared at the Board of Trade by which it appeared that the weights due to one inch of immersion at the two different draughts of the load and the light lines varied, on an average, to the extent of about 10 per cent. only, so that, for all commercial purposes, it would be sufficient to know what weight of cargo corresponded to an inch of depression."

Mr Moorsom, surveyor-general for tonnage.

On scales of displacement.

Old rule for tonnage, called "Builders' Old Measurement."

Until January 1836, the rule for computing the tonnage of ships was as follows:—The length was taken on a straight line along the rabbet of the keel of the ship, from the back of the main stern-post to a perpendicular line from the fore part of the main stem under the bowsprit. The breadth was taken from the outside of the outside plank in the broadest part of the ship, either above or below the main wales, exclusively of all manner of doubling planks that might be wrought upon the sides of the ship. If the ship to be measured was afloat, a plumb-line was dropped over the stern, and the distance between such line and the after part of the stern-post, at the load water-mark, was measured; then was taken the length from the top of this plumb-line, in a direction parallel with the water, to a perpendicular immediately over the load water-mark, at the fore part of the main stem. Subtracting from this length the before-mentioned distance between the plumb-line and the after part of the stern-post, the remainder was reckoned to be the ship's extreme length, from which three inches were deducted for every foot of the load draught of water. With the dimensions thus obtained, the rule then was:—"From the length taken in either of the ways above mentioned, subtract three-fifths of the breadth taken as above; the remainder is esteemed the just length of the keel to find the tonnage; then multiply this length by the breadth, and that product by half the breadth, and dividing by 94, the quotient is deemed the true contents of the tonnage."

Tonnage.

This rule (called "builders' old measurement," or when contracted, B.O.M.) is still much in vogue as a guide for the purchase and sale of ships. It is evident that the tonnage as determined by it was intended to express the size or bulk of the ship, the half-breadth being an assumed equivalent for a mean depth. The evils which arose out of this assumption were very great. As the depth was not at all involved, it might be increased to any extent without increasing the tonnage; while, on the contrary, as the square of the breadth was involved, an undue preponderance was given to this dimension, and it became necessary, on the part of shipowners, to restrict it within the least possible limits. The effect of such a law was obvious. The British merchant-ships, in order to profit by its inconsistencies, were built exceedingly narrow and deep in proportion to the length, so that, according to parliamentary returns, we find, on an average, the mercantile navy would carry a third more weight than its legally registered tonnage. In fact, the ships became little more than oblong boxes, most dangerous as sea-boats, and, from their want of stability, not capable of carrying sufficient sail to insure their safety on lee shores. Hence, after every gale of wind, the leeward coasts were covered with their wrecks; and hence Lloyd's books registered annually the average loss of six ships in four days. This tonnage law, as we have said, was happily altered in January 1836, when the following rule for calculating the tonnage of vessels was substituted for it.

Tonnage law of 1836.

The tonnage of every ship or vessel required by law to be registered shall, previously to her being registered, be measured and ascertained while her hold is clear, and according to the following rule: (that is to say), divide the length of the upper deck between the after part of the stem and the fore part of the stern-post into six equal parts. Depths—at the foremost, the middle, and the aftermost of those points of division, measure in feet and decimal parts of a foot the depths from the under side of the upper deck to the ceiling at the limber-strake. In the case of a break in the upper deck, the depths are to be measured from a line stretched in a continuation of the deck. Breadths—divide each of those three depths into five equal parts, and measure the inside breadths at the following points: *videlicet*, at one fifth and four-fifths from the upper deck to the foremost and aftermost depths, and at two-fifths and four-fifths from the upper deck of the midship depth. Length—at half the midship depth measure the length of the vessel from the after part of the stem to the fore part of the stern-post; then to twice the midship depth add the foremost and the aftermost depths for the sum of the depths; add together the upper and lower breadths at the foremost division, three times the upper breadth, and the lower breadth at the midship division, and the upper and twice the lower breadth at the after division, for the sum of the breadths; then multiply the sum of the depths by the sum of the breadths, and this product by the length, and divide the final product by 3500, which will give the number of tons for register. If the vessel have a poop or half-deck, or a break in the upper deck, measure the inside mean length, breadth, and height, of such part thereof as may be included within the bulkhead; multiply these three measurements together, and dividing the product by 92·4, the quotient will be the number of tons to be added to the result as above found. In order to ascertain the tonnage of open vessels, the depths are to be measured from the upper edge of the upper strake.

Mode of ascertaining the Tonnage of Steam-Vessels.

In each of the several rules herein before prescribed,

Tonnage.

when applied for the purpose of ascertaining the tonnage of any ship or vessel propelled by steam, the tonnage due to the cubical contents of the engine-room shall be deducted from the total tonnage of the vessel, as determined by either of the rules aforesaid, and the remainder shall be deemed the true register tonnage of the said ship or vessel. The tonnage due to the cubical contents of the engine-room shall be determined in the following manner: that is to say, measure the inside length of the engine-room in feet and decimal parts of a foot, from the foremost to the aftermost bulkhead; then multiply the said length by the depth of ship or vessel at the midship division, as aforesaid, and the product by the inside breadth at the same division, at two fifths of the depth from the deck, taken as aforesaid, and divide the last product by 92·4, and the quotient shall be deemed the tonnage due to the cubical contents of the engine-room.

For ascertaining the Tonnage of Vessels when laden.

And be it further enacted, that for the purpose of ascertaining the tonnage of all such ships, whether belonging to the United Kingdom or otherwise, as there shall be occasion to measure while their cargoes are on board, the following rule shall be observed and is hereby established: that is to say, measure, first, the length on the upper deck, between the after part of the stem and the fore part of the stern-post; secondly, the inside breadth on the under side of the upper deck, at the middle point of the length; and, thirdly, the depth from the under side of the upper deck, down the pump-well, to the skin; multiply these three dimensions together, and divide the product by 130, and the quotient will be the amount of register tonnage of those ships.

Objections to it.

It was soon found that this rule was somewhat partial in its operation in different classes of vessels, and that it could be, within certain limits, evaded by an ingenious builder; but still the evasions were not so destructive to the good qualities of ships as those which were commonly practised during the continuance of the old law.

Difficulty of framing a perfect tonnage law.

It is exceedingly difficult, probably even impossible, to frame a rule for computing the tonnage which shall be at once of practical application, and yet not have in some degree the effect of restricting improvement in the qualities of merchant-ships. It is difficult to induce a man to forego a constant and positive gain for one that is only prospective and uncertain. We have seen that the obstacles which oppose themselves to correctly and satisfactorily determining either the light or the load draughts of water, are sufficient to prevent the difference between the light and load displacements from being taken to represent the tonnage. This is, however, the only correct measure of a ship's power to carry cargo; the difference being, of course, exactly equal in weight to the cargo which either has caused or may cause it. All other quantities which can be taken as measures of that power are little more than assumptions, and whether they represent the external dimensions of a ship, or her internal capacity, they scarcely give an approximation even to the power which she may possess of carrying burthen; while, in either of the above cases, the fact that these quantities must be determined by measurements at fixed measuring places, affords opportunity for evasion, and indeed invites it. For if, by any arrangement of the dimensions, or by any peculiarity of the shape, a ship can be enabled to carry a greater burthen than her registered tonnage, the freight of that greater burthen is a premium which is offered to that one proportion between her dimensions, or that one peculiar form for her body, and a restriction is, to a certain extent, placed upon improvement; because the shipowner will content himself with the best ships that he can obtain possessing the advantages of those dimensions or of that form.

The rule last quoted for computing the tonnage assumes it to be the space for stowage, and the internal capacity of the vessel is calculated in order to determine it. As there are necessarily fixed measuring places, the rule may, as we have said, be evaded by a certain build. Its phraseology might also be easily evaded by building accommodations on deck, which would not come within the meaning of the terms that are used in it—"poop," "half-deck," or "break in the deck." Under its operation, vessels might also be advantageously built of very small register tonnage to carry cargoes of heavy goods; for which purpose they should be of the lightest materials, but with very large scantlings, that the internal capacity may bear but a small proportion to the load displacement of the vessel. This rule, however, was far less injurious to the mercantile navy of Great Britain than that which had preceded it.

Tonnage.

New tonnage law of 1854; its advantages.

The present rule for tonnage was introduced in the year 1854, constituting one of the most important sections of the Merchant Shipping Act of that year. It is universally admitted to be a vast improvement upon all that had gone before, and indeed to be one of the greatest benefits ever conferred by the Legislature upon naval architecture, tending, as it does, to advance the character of the merchant marine of this country. The builder is at length free to construct his ship in the way he thinks best for the requirements of her particular trade; the very impossibility of evading the law by any alterations in the dimensions or form making shipowners content to have good trustworthy ships, in place of the dangerous abortions of twenty years since. It is found that the vessels built since the new law came into operation have an average length of 5 times their breadth, in place of 3½ times as formerly, and that their average depth has decreased from above ⅘ths of the breadth to ⅔ds ditto, their speed and weatherly qualities being improved in like proportion.

The following is the present law for measurement of tonnage (introduced 1854):—

Tonnage deck.

Throughout the following rules, the tonnage-deck shall be taken to be the upper-deck in ships which have less than three decks, and to be the second deck from below in all other ships; and, in carrying such rules into effect, all measurements shall be taken in feet, and fractions of feet, and all fractions of feet shall be expressed in decimals.

Rule I., for ships where the hold is clear.

The tonnage of every ship to be registered, with the exceptions mentioned in the next section, shall, previously to her being registered, be ascertained by the following rule, hereinafter called Rule I.; and the tonnage of every ship to which such rule can be applied, whether she is about to be registered or not, shall be ascertained by the same rule.

(1.) Measure the LENGTH of the ship in a straight line above the upper side of the tonnage-deck from the inside of the inner plank (average thickness) at the side of the stern, to the inside of the midship stern-timber or plank there, as the case may be (average thickness), deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern-timber in the thickness of the deck, and also what is due to the rake of the stern-timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the ship belongs.

Table of classes.

TABLE.—Class 1. Ships of which the tonnage-deck is (according to the above measurement) 50 feet long or under, into 4 equal parts. 2. Ships of which the tonnage-deck is (according to the above measurement) above 50 feet long, and not exceeding 120, into 6 equal parts. 3. Ships of which the tonnage-deck is (according to the above measurement) above 120 feet long, and not exceeding 180, into 8 equal parts. 4. Ships of which the tonnage-deck is (according to the above measurement) above 180 feet long, and not exceeding 225, into 10 equal parts. 5. Ships of

Tonnage.

which the tonnage-deck is (according to the above measurement) above 225 feet, into 12 equal parts.

Transverse areas.

(2.) Then, the hold being first sufficiently cleared to admit of the required depths and breadths being properly taken, find the TRANSVERSE AREA of such ship, at each point of division of the length, as follows:—Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor-timber at the inside of the limber-strake, after deducting the average thickness of the ceiling which is between the bilge-planks and limber-strake; then, if the depth at the midship division of the length do not exceed 16 feet, divide each depth into four equal parts; then measure the inside horizontal breadths at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above (*i.e.*, number the upper breadth *one*, and so on down to the lowest breadth); multiply the second and fourth by 4, and the third by 2; add these products together, and to the sum add the first breadth and the fifth; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet, divide each depth into 6 equal parts instead of 4, and measure, as before directed, the horizontal breadths at the five points of division, and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together, and to the sum add the first breadth and the seventh; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Computation from areas.

(3.) Having thus ascertained the transverse area at each point of division of the length of the ship, as required by the above table, proceed to ascertain the REGISTER TONNAGE of the ship in the following manner:—Number the areas successively 1, 2, 3, &c., No. 1 being at the extreme limit of the length at the bow, and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into 4 or 12 parts, as in classes 1 and 5, or any intermediate number, as in classes 2, 3, and 4, multiply the second and every even-numbered area by 4, and the third and every odd-numbered area (except the first and last) by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the quantity thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage-deck; divide this product by 100, and the quotient being the tonnage under the tonnage-deck shall be deemed to be the REGISTER TONNAGE of the ship, subject to the additions and deductions hereinafter mentioned.

Poop and any other closed-in space.

(4.) If there be a break, a poop, or any other permanent closed-in space on the upper-deck, available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of such space shall be ascertained as follows:—Measure the internal mean length of such space in feet, and divide it into two equal parts; measure at the middle of its height three inside breadths—namely, one at each end, and the other at the middle of the length; then to the sum of the end-breadths add four times the middle breadth, and multiply the whole sum by one-third of the common interval between the breadths, the product will give the mean horizontal area of such space; then measure the mean height, and multiply by it the mean horizontal area; divide the product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage-deck, ascertained as aforesaid, subject to the following provisoes:—*First*, that nothing shall be added for a closed-in space, solely appropriated to the berthing of the crew, unless such space exceeds one-twentieth of the remaining tonnage of the ship,—and in case of such excess, the excess only shall be added; and, *secondly*, that nothing shall be added in respect of any building erected for the shelter of deck-passengers and approved by the Board of Trade.

Tonnage.

In case of two or more decks.

(5.) If the ship has a third deck, commonly called a spar-deck, the tonnage of the space between it and the tonnage-deck shall be ascertained as follows:—Measure in feet the inside length of the space at the middle of its height from the plank at the side of the stem to the lining on the timbers at the stern, and divide the length into the same number of equal parts, into which the length of the tonnage-deck is divided as above directed; measure (also at the middle of its height) the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively, 1, 2, 3, &c., commencing at the stem; multiply the second, and all the other even-numbered breadths by four, and the third and all the other odd-numbered breadths (except the first and last) by two; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height of such space, and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the ship, ascertained as aforesaid; and if the ship has more than three decks, the tonnage of each space between decks above the tonnage-deck shall be severally ascertained in manner above described, and shall be added to the tonnage of the ship ascertained as aforesaid.

Allowance for engine-room in steamers.

In every ship propelled by steam, or other power requiring engine-room, an allowance shall be made for the space occupied by the propelling power, and the amount so allowed shall be deducted from the gross tonnage of the ship, ascertained as aforesaid, and the remainder shall be deemed to be the register tonnage of such ship; and such deduction shall be estimated as follows (that is to say):

To be rateable in ordinary steamers.

(*a*) As regards ships propelled by paddle-wheels, in which the tonnage of the space solely occupied by and necessary for the proper working of the boilers and machinery is above 20 per cent. of the gross tonnage of the ship, such deduction shall be 37 hundredths of such gross tonnage; and in ships propelled by screws, in which the tonnage of such space is above 13 per cent. and under 20 per cent. of such gross tonnage, such deduction shall be 32 hundredths of such gross tonnage.

May be measured where the space is unusually large or small.

(*b*) As regards all other ships, the deduction shall, if the commissioners of customs and the owner both agree thereto, be estimated in the same manner, but either they or he may, in their or his discretion, require the space to be measured, and the deduction estimated accordingly; and whenever such measurement is so required, the deduction shall consist of the tonnage of the space actually occupied by, or required to be inclosed for the proper working of the boilers and machinery, with the addition in the case of ships propelled by paddle-wheels of one-half, and in the case of ships propelled by screws of three-fourths, of the tonnage of such space. In the case of screw-steamers, the contents of the shaft-trunk shall be added to and deemed to form part of such space.

In every registered British ship the number denoting the register tonnage, ascertained as hereinbefore directed, and the number of her certificate of registry, shall be

Tonnage and Poundage.

deeply carved, or otherwise permanently marked on her main beam, and shall be so continued; and if it at any time cease to be so continued, such ship shall no longer be recognised as a British ship.

Tonnage, &c., to be carved on main beam.

Practical working of the rules.

These rules have now been in operation for a period of five years, during which about 16,000 British, and a much greater number of foreign ships, have been measured by them. The experience of their operation thus afforded has proved highly satisfactory, with the single exception of the method of estimating the allowance made to steamers for their propelling power, by the plan of percentages on their gross tonnage. After explaining certain abuses under the old law, which led to the adoption of this mode of allowance, Mr Moorsom, in the paper before alluded to, stated, that "it had been found practically to admit of the intended allowance being anomalously increased by other means, and had given dissatisfaction even to the owners themselves, by its unjust action between steamer and steamer." In illustration of this, Mr Moorsom gave a paper of examples, by which it was seen that, in two paddle-ships of about the same gross tonnage and power, there could be, and frequently was, a difference in their allowances to the extent of 20 per cent.; and that in a similar case of screw-vessels, the difference was to the still greater extent of about 40 per cent. He likewise found that "the system of percentages frequently gave to large-powered coasting steamers undue allowances, to extreme-power tugs to within 1 per cent. of a negative tonnage, and to long-voyage auxiliary-power vessels, on the contrary, a less allowance than the old system." Steam-vessels seem to have gained by the new law, as regards their register tonnage, an average advantage over sailing vessels of a decrease of about 6½ per cent., which is very unequally and unjustly distributed between steamer and steamer. To give an example, the steam-tug United States, of Cardiff, 60 horse-power, is but 4 tons register. This anomaly will probably be soon remedied, such an alteration in the law being already provided for, without further legislative interference, under the provisions of the 29th section of the Merchant Shipping Act of 1854. (R. M—Y.)

Allowance to steamers not satisfactory.

TONNAGE and POUNDAGE, an ancient duty on wine and other goods, the origin of which seems to have been this: About the 21st of Edward III. complaint was made that merchants were robbed and murdered on the seas. The king thereupon, with the consent of the peers, levied a duty of 2s. on every ton of wine, and 12d. in the pound on all goods imported; which was treated as illegal by the commons. About twenty-five years after, the king, when the knights of shires were returned home, obtained a like grant from the citizens and burgesses, and the year after it was regularly granted in parliament. These duties were sometimes diminished and sometimes increased; at length they seem to have been fixed at 3s. tonnage and 1s. poundage. They were at first usually granted only for a stated term of years, as, for two years in 5 Ric. II.; but in Henry VI.'s time they were granted him for life by a statute in the 31st year of his reign; and again to Edward IV. for the term of his life also: since which time they were regularly granted to all his successors for life, sometimes at the first, sometimes at other subsequent parliaments, till the reign of Charles I., when, as Clarendon expresses it, his ministers were not sufficiently solicitous for a renewal of the legal grant. And yet these imposts were imprudently and unconstitutionally levied and taken, without consent of parliament, for fifteen years together; which was one of the causes of those unhappy discontents. The king found it expedient to pass an act, whereby he renounced all power in the crown of levying the duty of tonnage and poundage without the express consent of parliament; and also all power of imposition upon any merchandises whatever. Upon the Restoration, this duty was granted to King Charles II. for life, and so it was to his two immediate successors; but by three several statutes, 9 Anne, c. 6, 1 Geo. I. c. 12, and 3 Geo. I. c. 7, it is made perpetual, and mortgaged for the debt of the public.

Tonneins ‖ Tooke.

TONNEINS, a town of France, in the department of Lot-et-Garonne, on the right bank of the Garonne, which is crossed by a suspension bridge, 10 miles S.E. of Marmand. It is a neat, cheerful place, consisting of well built though irregularly placed houses. The most conspicuous building is a government tobacco factory; but there are also a town-hall, theatre, public baths, &c. Cordage and leather are manufactured here, and there is an active trade in corn, brandy, prunes, hemp, &c. Pop. 7549.

TONNERRE, a town of France, in the department of Yonne, on the Armançon, 19 miles E.N.E. of Auxerre. It is well built and regularly laid out, and has a Gothic church with a tower, a splendid hospital, a college, and manufactories of earthenware, nails, leather, agricultural implements, and machinery. Some trade is carried on in these articles. Pop. 4672.

TONQUIN. See COCHIN-CHINA.

TONTINE, a loan given for life annuities with benefit of survivorship; so called from the projector, Lorenzo Tonti, a Neapolitan. He proposed his scheme in 1653, to reconcile the people to Cardinal Mazarin's government, by amusing them with the hope of becoming suddenly rich. He obtained the consent of the court, but the parliament would not register the edict. He made attempts afterwards, but without success. It was not till Louis XIV. was distressed by the league of Augsburg, and by his own immense expenses, that he had recourse to the plans of Tonti. A second tontine was opened in France in 1689. The last survivor was a widow of ninety-six years of age, who, for an original subscription of 300 livres, enjoyed an income of 73,500 livres at her death. The last French tontine was opened in 1789.

The nature of the plan is this: An annuity, after a certain rate of interest, is granted to a number of people, divided into classes, according to their respective ages; so that the whole annual fund of each class is regularly divided among the survivors of that class, till at last it falls to one, and, upon the extinction of that life, reverts to the power by which the tontine was erected.

TOOKE, JOHN HORNE, an ingenious grammarian, and an active politician, born in Westminster, June 1736, was the son of Mr John Horne, a poulterer living in Newport Market. He was the third of seven children; but his father, having acquired considerable affluence, first sent him for a short time to Westminster school, and then to Eton, where he remained five or six years without particularly distinguishing himself, and was removed sooner than had been intended, on account of the accidental loss of an eye. He went to St John's College, Cambridge, where he took the degree of A.B. in 1755. He then became an usher in a school at Blackheath, kept by Mr Jennings; but he was soon after induced by his father to take deacon's orders, and obtained a curacy in Kent. His own preference, however, was so much in favour of the law, that in 1756 he entered as a student of the Middle Temple; but in 1760 he was persuaded to return to the church, and to receive ordination as a priest; and he officiated for three years in the chapelry of New Brentford, which his father had purchased for him; performing his duties with decency, and taking some pains to study the elements of medicine, for the sake of the poorer members of his congregation. He then went as tutor to France with the son of Mr Elwes, a gentleman of Berkshire, well known for his riches and his economy.

In 1765 he commenced his political career by writing an anonymous pamphlet in defence of Wilkes and his party. He returned to the Continent, and made the tour of Italy in company with a Mr Taylor; and at Paris he formed

Tooke. an intimacy with Wilkes himself, who then found it convenient to reside there. He had altogether laid aside his clerical character in these excursions, but he resumed it for a short time after his return. Soon, however, he relapsed into his political amusements; exerting himself, with some success, in various elections, as a partisan of his friend Wilkes, and taking up the cause of a Mrs Bigby, in the pursuit of an appeal of blood against the murderers of her husband, who were supposed to have obtained a pardon through corrupt interest with the court; though the widow at last disappointed him by accepting a pecuniary compensation for her right of appeal. He was, however, successful, on his own behalf, in repelling a prosecution for a libel on Mr Onslow; and he gained some credit with a party in the city by suggesting to Beckford, then lord mayor of London, the reply which he made to the king's answer to their remonstrance, and which may still be seen engraved on the pedestal of Beckford's statue in Guildhall. He was soon after very active in establishing the Society for Supporting the Bill of Rights, and in obtaining the liberation of Bingley, the printer, who had been somewhat hastily committed to prison by Lord Mansfield.

In the year 1770, he had reason to be dissatisfied with the conduct of Wilkes, in some pecuniary transactions relating to the Society for the Bill of Rights. Both parties appeared to the public in a light somewhat ridiculous on the occasion, and neither of them gained in respectability, though the society did not appear to value Wilkes the less for the exposures that took place. It was, however, shortly after dissolved, and most of its members, except the particular friends of Wilkes, were incorporated into the Constitutional Society. The next year Mr Horne completed his academical course at Cambridge, by taking the degree of A.M., though not without some opposition. About this time he exerted himself greatly in procuring the publication of the debates of the House of Commons in the daily papers, notwithstanding the well-known standing orders of the house; and so far as he was instrumental in carrying this point, he appears to have rendered at least one very essential service to his country; but Wilkes, and especially Almon the bookseller, are said to have a still stronger claim to the merit of this transaction, whatever may have been its character. He had also a sharp contest with the anonymous Junius, against whose hasty attack he defended himself with great spirit and energy, and with unexampled success. In 1773 he made a formal resignation of his living, and meant at the same time completely to lay aside his clerical character, though no person seems to have felt himself authorised to accept this part of his resignation; and he began to study the law very diligently, intending to make it the occupation of his life. He adopted soon after a singular method of forcing himself upon the notice of the public, and of the House of Commons in particular. An enclosure bill being about to be hurried, as was reported, a little too rapidly through the house, he wrote some paragraphs in a newspaper, which reflected very severely on the conduct of the Speaker, on purpose that he might be summoned to appear before the house; and being placed at the bar, he gave such reasons for his conduct as produced some animated discussions, and in the end was supposed, though probably without foundation, to have caused the bill to be modified in some oppressive clauses. By these means he obtained the favour of Mr Tooke of Purley, who thought himself aggrieved by the bill in its original state, and received from him such assurances of testamentary favours as induced his nephew, Colonel Harwood, to agree upon a partition of their joint interest in the reversion of his estate; though Mr Horne never received, first and last, more than L.8000 from the property, notwithstanding the subsequent change of his name [from John Horne to John Horne Tooke] about the year 1782 in acknowledgment of his patron's kindness, and his long-continued intimacy and frequent residence at Purley; the principal legatee, after all, being a Mr Beaseley. Tooke.

Horne Tooke was, of course, a strenuous opposer of the American war; and in 1777 he published a very offensive advertisement, in which the sufferers in the battle of Lexington were described as having been murdered by the king's troops. For this attack on the government he was tried at Guildhall in July 1777. He conducted his own defence, but was found guilty of the libel, and sentenced to one year's imprisonment in the King's Bench, and a fine of L.200. It was on this occasion that he first appeared before the public as a grammarian, in the criticisms which constitute his celebrated *Letter to Mr Dunning*. The next year he suffered a still severer punishment, in the refusal of the Society of the Inner Temple to admit him to the bar, on account of his having taken orders; so that his prospects of professional advancement were utterly annihilated. This occurrence made him still more bitter against the existing government, and in 1780 he printed some severe remarks upon the measures of Lord North. He attempted to establish himself as a practical farmer in Huntingdonshire; but he caught an ague, and, soon becoming disgusted with an agricultural life, he returned to London, and occupied for some years a house near Soho Square. His ideas of parliamentary reform, contained in a second letter addressed to Mr Dunning, were by no means extravagant, and he continued to adhere, in this respect, rather to the party of Mr Pitt than to that of Mr Fox.

The publication of his grammatical dissertations, under the title of the *Diversions of Purley*, afforded but a slight and imperfect intermission of his political pursuits, for his etymological works are as replete with the politics of the day as his speeches and his pamphlets. Another of his pamphlets appeared in 1788, under the title of *Two Pair of Portraits*, being intended to serve the cause of Pitt's party in their elections. But in 1790 he himself became a candidate for the representation of Westminster, in opposition to Mr Fox and to Lord Hood; and he distinguished himself sufficiently as a public orator, though he was not successful in the contest.

In 1794 he was tried for high treason, together with several other members of the corresponding societies, who had been active in attempting to introduce some imitations of the French Revolution in the plans of reform which they brought forward. He exhibited on the trial somewhat more of firmness than of good taste. One of his associates had before been acquitted, and the jury speedily returned a similar verdict with respect to himself. He afterwards dedicated the second volume of his *Diversions of Purley* to his counsel, Gibbs and Erskine, and to the jury who tried him.

In 1796 he again became a candidate for the representation of Westminster, but again without success; and, notwithstanding his strong opinions respecting a reform in parliament, he afterwards condescended to accept from Lord Camelford, in 1801, a seat for the nominal borough of Old Sarum. It was then to be determined if a clergyman could sit in the House of Commons; but the ministry, instead of contesting the point with respect to his particular case, brought in a bill to decide the question in the negative for the future, and he remained in the house till the dissolution of the parliament in the next year, but without particularly distinguishing himself in its proceedings. His last public effort as a party man was made in espousing for a short time the cause of Mr Paull, as candidate for Westminster; but he abandoned this gentleman in a subsequent contest. The later years of his life were chiefly passed in the society of a select circle of friends, who frequently partook of his hospitality at Wimbledon.

Tooke, Horne.

He died in March 1812, leaving his property to some natural daughters; for he had never been married. He was buried in Ealing church, and not in his garden, as he had directed; his executors thinking themselves the less bound by these instructions, as a literal compliance with them might have been unfavourable to the sale of the property.

His earliest publication was a pamphlet entitled *The Petition of an Englishman*, 1765. It consisted principally of apologies for the private conduct and immoral writings of Wilkes. He also published a *Sermon* while he continued in the church, that is before the year 1773; but it attracted little notice. *A Letter to Mr Dunning*, 1778. The rudiments of his grammatical system, arising out of remarks on the particles employed by the attorney-general in his indictment, and by the judges in his sentence. It was afterwards incorporated into the *Diversions of Purley*. *Facts*, 1780; consisting of remarks on the adminstration of Lord North; with some additions relating to finance by Dr Price. *A Letter on Parliamentary Reform*, 1782; addressed to Mr Dunning, afterwards Lord Ashburton. Επεα Πτεροεντα, or *Diversions of Purley*, 1786, 8vo Ed. 2, 4to. Part i. 1798. Part ii. 1802. This is his great and celebrated work; rich indeed in etymology and in wit, but meagre in definition and in metaphysics. *A Letter to the Prince of Wales*, 1787; relating to his supposed marriage with a Catholic. *Two Pair of Portraits*, 1788, 8vo. The two Pitts contrasted, in opposite columns, with the two Foxes, in colours by no means favourable to the latter. Many of his Letters have been printed in Stephen's *Life of Tooke*.

It now becomes necessary to add some remarks on his literary and moral qualifications; and in both these points of view the subject has been treated in so masterly a manner by the author of an article in the *Quarterly Review*, who is supposed to be a near relation of Tooke's most intimate friend, the late Colonel Bosville, that it would be presumption in any man to go over the same ground, without adopting very nearly the eloquent and energetic expressions which that noble and learned person has employed.

"Mr Tooke," says the accomplished reviewer of the Memoirs of his Life (*Quarterly Review*, vol. vii. p. 325), "was possessed of considerable learning, as indeed his writings sufficiently show. To other more casual acquirements, he united a very extensive acquaintance with the Gothic dialects, of which he has so copiously and so judiciously availed himself in his etymological researches." But it must be remarked, that a person more intimately acquainted with the "Gothic dialects" as living languages, will easily discover that his knowledge of them was in truth but superficial, or that he was indebted for it more to grammars and dictionaries, than to any extensive study of the authors who had written in those languages, or to any habit of speaking them; and such a person will easily find a variety of instances, in which a very different etymon to that which he has assigned, will naturally suggest itself as the true origin of the work in question.

"Though Mr Tooke's philosophical works are the results of no common talent and industry, yet they are neither written in a truly philosophical spirit, nor do they display traces of a mind which, even if it had been wholly dedicated to the study of metaphysics, would have much enlarged the bounds of our knowledge in that nice and intricate branch of science. His object seems to have been rather to retard than to advance the progress of philosophy, by recalling us from those sound conclusions as to the nature and operations of the human mind, which are built upon observation and experience, to vague speculations drawn from the imperfect analogy existing between the moral and the physical world. There can be no doubt that the proposition which he has succeeded in establishing is highly interesting and important; and that in the illustration of it he has shown great learning, ingenuity, and research. But then, on the other hand, he has so monstrously exaggerated its importance, and so widely mistaken its tendency, and has attempted to raise so vast a superstructure upon such a narrow, slippery, and inadequate foundation, that we are quite lost in amazement when we recollect how completely the sagacity which guided him so well in the investigation of his principal fact, appears to desert him when he comes to apply that fact to the purposes of a theory. The distance between what he has proved, and what he wishes us to believe that he has proved, is enormous. What he has proved is, that all words, even those that are expressive of the nicest operations of our minds, were originally borrowed from the objects of external perception; a circumstance highly curious in the history of language, consequently in the history of the human mind itself; and the complete demonstration of which, of course, reflects great credit upon its author. What he thinks he has proved is, that this etymological history of words is our true guide, both as to the *present* import of the words themselves, and as to the nature of those things which they are intended to signify; a proposition so monstrous that he has nowhere ventured to enunciate it in its general form, but has rather left it to be collected from the tenor of his remarks upon particular instances. In truth, the inferences at which Mr Tooke arrived, far from being warranted by his facts, are directly the contrary of those to which he ought naturally to have been led by the result of his own studies, when they were most successful. In tracing upwards, through all the mazes of etymology, the origin of words, he ought to have seen more clearly, if possible, than anybody else, that their *real present* sense is not to be sought for in their primitive signification, or in the elements of which they were originally composed, but that, on the contrary, their *actual import*, with which alone in reasoning we have to do, hardly ever corresponds with their etymological meaning, although the one always bears to the other a certain resemblance, more or less accurate, according to the greater or less effect of time and accident. One could without difficulty understand how a person, unaccustomed to such considerations, and misled by a few instances partially chosen, should adopt a theory like that which Mr Tooke was desirous to establish; but how a philosopher, minutely acquainted with the whole subject, and proceeding upon a most copious induction of particulars, should not have perceived that, in ninety-nine instances out of a hundred, such a doctrine would lead to absolute absurdity, is, to us at least, inconceivable."

Tooke, Horne.

The reviewer then follows Mr Dugald Stewart in some very just criticisms which this distinguished philosopher had already made on several of Mr Tooke's examples, fully proving the complete fallacy of the system which so completely confounds the definition of a term with its etymology. Mr Tooke has indeed the merit of having demonstrated pretty clearly that all the parts of speech, including those which grammarians had often considered as expletives and unmeaning particles, may be resolved more or less completely into nouns and verbs; but, on the one hand, it has been observed, that the very same doctrine may be clearly traced back to the works of Aristotle; and, on the other, it may be asserted with equal truth, if we wish to carry the theory to its utmost extent, that language consists only of nouns and *one verb*; since all verbs may in fact be resolved into participles or adjectives, compounded with auxiliary verbs, as well as those which exhibit this complication in their exterior form.

"In the ordinary intercourse of life, Mr Tooke was kind, friendly, and hospitable." We doubt whether his temper was naturally good; but if it was not, he had a merit the more; for he had so completely subdued it by care and self-control, as never to betray, under any provocation, the slightest mark of that irritability which often accompanies talent, and which gains so rapidly upon those who know not how to guard against its approaches. Indeed, the aspect under which he appeared in private was by no means such as the stern cynicism and ferocious turbulence of his public conduct would have led one to expect; and those whose opinion of him has been formed exclusively upon his political character and his writings, will have some difficulty in believing that the curate of Brentford was one of the best-bred gentlemen of that age. In this respect he was a sort of phenomenon. He was born in a low station; at no period did he appear to have possessed any remarkable advantages for the study of good breeding; on the contrary, the greater part of his life was spent in constant intercourse with coarse, vulgar, and uneducated men; yet his natural taste was so good, and he had profited so judiciously by whatever opportunities he enjoyed, that courts and high stations have seldom produced a better example of polite and elegant behaviour, than was exhibited by the associate of Messrs Hardy and Thelwall. Indeed his manner had almost every excellence that manner can display; grace, vivacity, frankness, dignity. Perhaps, indeed, in its outward forms, and in that which is purely conventional, his courtesy wore the air of the *vieille cour*, and was rather more elaborate than is consistent with the practice of this lounging unceremonious age; but it was never forced or constrained, and it sat not ungracefully upon an old man. It may, however, deserve to be remarked, in contemplating this paradox, though rather as a collateral coincidence than as a satisfactory explanation, that even from his infancy Tooke had actually seen something of the very highest society, having been admitted once or twice a week at Leicester House as a playfellow to George the Third; and though he may have learned but little from imitation of the manners of the young prince, yet the early habit of self-restraint imposed by such a presence, may easily have imprinted some courtly traces on his character, which were not easily effaced, and which an association with the heirs of the first families of the kingdom, throughout his boyhood, at Westminster and at Eton, must naturally have made still more distinct and permanent.

"He never appeared to greater advantage than in conversation. He possessed an inexhaustible fund of anecdotes, which he introduced with great skill, and related with neatness, grace, rapidity, and pleasantry: he had a quick sense of the ridiculous, and was a great master of the whole art of raillery, a dangerous talent, though

Tooke, Thomas ‖ Topiary Work.

the exercise of it in his hands was always tempered by politeness and good humour."

"In spite of labour and dissipation, his life was protracted to a period which indicated an originally sound and vigorous frame. For the last twenty years, however, he was subject to several severe, distressing, and incurable infirmities. These he bore with a patience and firmness which it was impossible not to admire: to the very last he never suffered himself to be beaten down by them, nor ever for one moment indulged in complaint, or gave way to despondency. In the intervals of pain, nay, even when actually suffering under it, he preserved a self-command, which enabled him to converse, not only with spirit and vigour, but with all his accustomed cheerfulness and pleasantry; never making any demand upon the sympathy of his friends, or mentioning his own situation at all, except when occasionally, and by a very pardonable exercise of his sophistry, he amused himself in exalting its comforts, and explaining away its disadvantages; displaying, in this respect, a manly spirit and a practical philosophy, which, if they had been brought to bear upon his moral as well as upon his physical condition, if they had been employed with as much effect in reconciling him to his political exclusion as to his bodily sufferings, might have produced, not the very imperfect character we have been attempting to delineate, in which the unfavourable traits bear so large a proportion to those of a nobler and more benign cast, but the venerable portrait of a truly wise and virtuous man."—Stephens's *Memoirs of John Horne Tooke*, Lond. 1813, 2 vols. 8vo. *Quarterly Review*, vol. vii. pp. 320. *British Critic*, N. S., vol. i. pp. 79, 193. Aikin's *General Biography*, vol. ix. pp. 449. Chalmers's *Biographical Dictionary*, vol. xxix. p. 449. (T. Y.)

TOOKE, *Thomas*, a political economist, was the son of the Rev. William Tooke, preacher at the English chapel in Cronstadt, and author of a *History of Russia*, a *Life of Catherine II.*, and other works; and brother to William Tooke, the editor of Churchill, was born at St Petersburg in 1774. Having early embarked in business as a merchant engaged in the Russian trade, he became acquainted almost from his youth with those details of ordinary business which in his maturer years he was to grasp with so firm a hand, and strain out of them the profound economic secrets which were to guide future thinkers and legislators. He published in 1823 his *Thoughts and Details on High and Low Prices*, which was followed up by his great work, the *History of Prices*, in 6 vols., 1838–1857. In the last two volumes of this work, Tooke had the assistance of his friend and pupil Mr Newmarch. Tooke is known to have written in 1820 the famous Merchants' Petition, and to have brought it before the Legislature solely by his own exertions. In 1831 he founded the Political Economy Club, which is now vigorous and flourishing. He died on the borders of his eighty-fifth year, on the 26th of February 1858.

Tooke had an eminently solid head—patient, observant, and sagacious; and he worked his way with slow and sure steps to the generalisation of those economic laws, the details of which had always been common property, but the eye to see which had only been given to this patient inquirer.

TOPIARY WORK was the name formerly given to trees and shrubs which had been trained or cut so as to resemble some object of nature or art. The Romans applied the word *topia* to such figures, and the term *topiarius* to the artist. The origin of these words may perhaps be found in the Greek word τοπια, a rope, for it was by means of ropes and strings that the branches were twisted and trained into the desired shape. It is said that one Matius, a friend of Augustus, was the person who brought into fashion the custom of clipping and trimming plants into imitations of other objects. However that may be, there are numerous passages in ancient authors which show how much attached the Romans became to this mode of ornamenting their gardens. Cicero, writing to his brother on the subject of a villa belonging to him, says, "I have praised your gardener, for he has clothed everything with ivy, both the base of the villa and the pillars of the walk, so that the statues themselves seem to be constructing topiary work, and to be offering ivy for sale." From the minute account of Pliny's Tusculan villa given us by the owner, we learn that his lawn was decorated with numerous figures of animals cut in box, and was surrounded by a walk inclosed by evergreens shorn into a great variety of forms. Beyond this was a place for taking exercise, the middle ornamented with box-trees cropped into a great diversity of figures. The whole garden was fenced in by a wall covered with box rising in several stages to the top. In another part of the estate were many branching paths divided from each other by box-hedges cut into letters, some of which expressed the name of the owner, others that of the artificer. In another place he mentions that the cypress was trained into representations of various objects (N. H. l. 6, c. 33). Vitruvius (l. 7, c. 5) tells us of some work of this kind which represented images of the gods, the Trojan war, and the wanderings of Ulysses. This style of ornament was not, it seems, to the taste of Martial, who praised a Baian villa because it partook of a certain degree of wildness, and was destitute of "idle myrtle groves and cut box." The practice, however, descended to the Italians, and to this day many specimens of topiary art may be seen in the gardens of the Roman nobility. It was also adopted by the French and Dutch, and from them came into England, where many gardens were laid out in this style two hundred years ago. Travellers tell us that the Chinese delight in torturing shrubs into the forms of pagodas, junks, and animals; amongst which they speak of imitations of deer, the antlers and every part so neatly grown that they excited involuntary admiration.

Topiary Work.

The labour once bestowed upon designing and executing topiary works will hardly now be credited, nor can the effect of a large garden so adorned be easily conceived. Casaubon remembered seeing in his youth, somewhere in the neighbourhood of Paris, a piece of work of this kind which was so extensive that the siege of Troy was represented, with the contending armies and their generals. Laurembergius, a German writer on horticulture (1631), says very gravely, that since the human head becomes like a wild wood unless it be kept trimmed, so do plants require to be treated by gardeners for the removal of their rude ungainly luxuriance. He mentions a garden near Chartres where the seven wise men of Greece, the three Graces, the labours of Hercules, and the heathen gods at a banquet, were excellently represented, with appropriate inscriptions framed out of living box. "When I beheld these things," he exclaims, "I was astonished at the industry of man, which is able to conquer all difficulties!" The same writer speaks of Hampton Court (Hampten Kurtus) with approbation; for there existed then in the gardens the figures of animals, the insignia of the English kings, and many other things, cut in privet. Laurembergius has given students of the art some topiary figures for their consideration, such as a crane, and a man attacking a bear followed by a dog.

Old Leland refers to a garden near Towton, where lived a prebendary of York, "possessed of a goodly orchard with walks *opere topiario*." He also mentions "the exceedingly fair gardens within and orchards without the mote" of Wresehill Castle, an ancient seat of the Percys, where were "mounts *opere topiario* writhen about with degrees like turning of cokill shells to cum to the top without pain." In René Rapin's essay on gardening (1672), we are told that the forms into which box could be shaped were past counting, for the topiary art had then arrived at perfection, the gardeners of his time being far superior therein to their predecessors. In a poem by the same writer, entitled *Horti*, he sings of a chess-board with its pieces represented in box. In Dr Plot's *Natural History of Staffordshire* (1686) will be found some account of "the pleasant walks and topiary works" then extant in that county. "In the garden at Brerewood," said he, "is a yew-tree that, from divers branches issuing out of it about a yard from the

Topiary Work.

ground, forms a fair, spacious arbour of a square figure, each side, without measuring, about five yards, but within not exceeding above ten feet, cut on the top with loop and crest, like the battlements of a tower adorned at each corner with a pinnacle, over which is wrought a canopy out of the middle branches about two yards in diameter, which is carried up again to a lesser gradation, and then terminates at the top in a smaller pinnacle. There is also near the pale inclosing the hort-yard a fine yew-tree cut up gradually from greater to lesser rounds to the number of twenty, in which sort of ornament the people of this country seem to take great delight, there being others of twenty-one, twenty-two, and twenty-three stories high." A yew-tree is also described which was trimmed into the shape of a wren's nest, capacious enough to receive a man to sit on a seat made within it. Something of this sort it was, probably, in which Maria, "the youngest wren of nine," hatched her plot against the solemn, overweening Malvolio. "Get ye all three into the box-tree," said she to her confederates, "close, in the name of jesting."

Besides the construction of shapes which have been spoken of, "l'adroit ciseau"[1] was called into play for the purpose of forming those tall evergreen hedges which divided alley from alley in the "curious knotted gardens" of our ancestors.

"They rose by measure, and by rule they grew."[2]

Of "stately arched hedges" Bacon approved, and an old garden was not complete unless it contained a long arcade of foliage to screen from sun or shower the dames and cavaliers of the time. At Sayes Court there was a splendid hedge, the destruction of which Evelyn mourned over when the place was in the possession of Peter the Russian Czar. Butler, in describing "the fringe and tassel" adorning the chin of Sir Hudibras, which he belathered with so much wit, declared that—

"No topiary hedge of quick-set
Was e'er more neatly cut or thick set,
That made beholders more admire
Than china plate that's made of wire."

In process of time, however, topiary work fell out of estimation, and a more natural style of gardening came into fashion. Lord Bacon passed sentence upon tree-sculpture with judicial solemnity in this concise emphatic language:—"I, for my part, do not like images cut out in juniper or other garden stuff; they be for children." At a later period, Addison thus delivered his opinion, "Our British gardeners, instead of humouring nature, love to deviate from it as much as possible. Our trees rise in cones, globes, and pyramids. We see the marks of scissors upon every plant and bush. For my own part, I would rather look upon a tree with all its luxuriancy and diffusion of boughs and branches than when it is thus cut and trimmed into a mathematical figure, and cannot but fancy that an orchard in flower looks infinitely more delightful than all the little labyrinths of the most finished parterre." Pope wrote an essay in the *Guardian* in which he assailed with keen satire the prevailing affectation: "I know an eminent cook who beautified his country seat with a coronation-dinner in greens, where you see the champion flourishing on horseback at one end of the table, and the queen in perpetual youth at the other." Some of the handiwork of a virtuoso gardener was then described—for instance, St George in box, his arm scarce long enough, but will be in a condition to strike the dragon by next April. A green dragon of the same, with a tail of ground ivy for the present. A pair of giants stunted, to be sold cheap. A quickset hog shot up into a porcupine by being forgot a week in rainy weather.

Few examples of these old-fashioned gardens now remain in the land. There is an arcade of beech at Hampton Court which excites the attention of visitors; but the numerous figures in foliage which the gardens once contained have vanished. Indeed, when we have mentioned the grounds of Haddon Hall in Derbyshire, Stonyhurst in Lancashire, and Levens Hall in Westmoreland, we have almost exhausted the list of places where those of the present generation can see instances on a considerable scale of the quaint gardening of a bygone age—a style which agreed so well with the gable-ends and curious irregularities of antique mansions.

Töplitz ‖ Torbay.

"The sidelong walls
Of shaven yew; the holly's prickly arms
Trimm'd into high arcades; the tonsile box,
Wove in mosaic mode of many a curl
Around the figured carpet of the lawn." (J. Y. J.)

TÖPLITZ, or TEPLITZ, a town of the Austrian empire, Bohemia, on the frontiers of Saxony, in a valley of the Erzgebirge, 16 miles N.W. of Leitmeritz. It is celebrated for its hot sulphureous springs; and the name, which is of Slavonian origin, is one applied to baths in general. The town forms an irregular square, more than a mile each way; it contains a large number of inns and lodging-houses, but has nothing very remarkable about it. The principal building is the palace of Prince Clary, the extensive and beautiful grounds of which form a favourite place of resort, and contain a theatre, and a hall used variously as a dining, reading, and ball room. There are also in the town two churches and a town-hall. The baths are numerous, and are of three classes, some open to the public free, others private baths for the higher classes, and some devoted to the use of noble or royal personages. In the neighbouring suburb of Schönau there are some bathing establishments not inferior in size or elegance to those of the town itself. The water varies from 113° to 119° Fahr., and is considered good for gout, rheumatism, and various other complaints. Töplitz is a very fashionable watering-place; and is frequented not only by the nobility but by the crowned heads of Germany. The visitors frequently amount to 10,000; but the permanent population of the town is only 4000.

TOPSHAM, a market-town and seaport of England, Devonshire, on the right bank of the Exe, at the head of its estuary, 4 miles S.E. of Exeter. It extends about a mile along the river, partly on a level with it, and partly on higher ground. About the middle of the town stands the parish church, containing monuments by Chantrey to Admiral Sir J. T. Duckworth, and his son Colonel George Duckworth, who fell at Albuera. Topsham has also Methodist, Independent, and Unitarian places of worship, national and other schools. Ropes, anchors, and chain-cables are made here; paper-making and ship-building are also carried on. The commerce of the town was formerly extensive, but is now confined chiefly to the coasting trade. Pop. 3377.

TORBAY, a commodious bay on the S.E. of Devonshire, at once the most perfect in form, and the most beautifully picturesque in Britain; of great importance to the naval power of the empire, as it is capable of affording shelter and anchorage to any number of even the largest vessels. The bay is formed by the projection of two rocky promontories, that on the north being named Hope's Nose, and that on the south Berry Head. The distance between these two points is about 4 miles; the depth of the bay from east to west is about 3½ miles; and the extent of the semilunar coast from Hope's Nose to Berry Head is about 12 miles. Near to the northern extremity is a sheltered recess in which is situated the singularly beautiful town of Torquay (which see): at about the middle of the bay is Paignton, a cheerful town, having the advantage of exten-

[1] Delille, *Les Jardins.*

[2] Dryden, *The Flower and the Leaf.*

Tordenskiold ‖ Torgau.

sive hard sands favourable for sea-bathing; and near to the southern point is Brixham, the chief seat of the Torbay fisheries, the greater part of the population being in one way or other dependent upon the fishing trade. Brixham is likewise distinguished as the spot at which William, Prince of Orange, and his followers, disembarked on the memorable November 5, 1688. At the entrance of the bay on the northern side there are four insulated rocks, called Orestone, Loadstone, Thatcher, and Shagrock. These form no hindrance to navigation, as close around them is a depth of water of from 6 to 10 fathoms. The bay in every part is sheltered, and the anchorage being strong clay, any number of vessels may be secured. Not a single river falls into the bay, which is situated about midway between the mouths of the Teign and of the Dart.

TORDENSKIOLD, Peter Wessel, a distinguished vice-admiral of the Danish navy, was the son of obscure parents, and was born at Drontheim in Norway, on the 28th of October 1691. He was originally apprenticed to a barber, but disliking this trade he ran away to sea. He engaged as a common sailor in the service of the East India Company, and at the end of three years he received the appointment of midshipman in the royal navy. From 1709 to 1711, he commanded a small privateer, with which he made many prizes. In 1712, he was advanced to the rank of lieutenant, and ere the middle of summer he and his small frigate met with a Swedish ship, of double the size of his own, which he almost annihilated. In 1715, he was despatched to reconnoitre the Swedish fleet, when, by his extraordinary skill and boldness, he destroyed four ships of the enemy's line and three frigates, besides capturing another frigate, and carrying her in triumph to head-quarters. For this exploit he was raised to the rank of commodore. Again, on the 7th of August 1716, he encountered the Swedish fleet, commanded by Admiral Wachtmeister, when the enemy, who possessed double the number of ships of the Danish commander, experienced a total defeat. It is said that this terrible engagement was watched steadily by Charles XII., from an eminence in the Island of Rügen. This victory was commemorated by a gold medal, which the king permitted him to wear suspended by the blue ribbon of the Order of the Elephant. In 1717, Commodore Wessel was raised to the rank of a nobleman, by the title of Tordenskiold (*shield against thunder*). During the same year he took Marstrand, one of the most important Swedish fortifications in the Cattegat. When peace came in 1720, Tordenskiold set out to travel. At Hanover, whither he had gone to visit George II., he met a gambling count, who ran him through the body in a duel, and he expired in a few moments. Foul play was suspected to have been instigated from a higher quarter. Tordenskiold died in 1720.

TORDESILLAS, a town of Spain, in the province and 24 miles S.W. of Valladolid, on the right bank of the Douro. It has a town-hall, several churches, convents, hospitals, and schools. Many of the people are employed in farming; but there are also in the town fulling-mills, tanneries, and manufactories of coarse cloth. Pop. 4000.

TORGAU, a fortified town of the Prussian monarchy, in the province of Saxony and government of Merseburg, on the Elbe, 70 miles S.S.W. of Berlin. It is a place of considerable strength, being defended by walls and bastions, as well as by an ancient castle, now occupied by a magazine and barracks. Besides public offices and courts of law, there are here four churches, a gymnasium, and other schools, poor-house, orphan hospital, &c. Woollen and linen cloth are made; and there is some fishing and navigation in the Elbe, which is here crossed by a long wooden bridge. The chief articles of trade are corn, yarn, and wool. Here, in 1760, Frederick the Great defeated the Austrians. Pop. 9327.

TORIES. See England, *History of*.

Tories ‖ Toronto.

TORNEA, a town of European Russia, Finland, in the government and 64 miles N.W. of Uleaborg, at the mouth of the Tornea, in the Gulf of Bothnia. It is regularly and neatly built, almost entirely of wood; and has an active trade in iron, timber, tar, fish, reindeer skins, fur, quills, butter, hemp, &c. Pop. 641

TORO Arbucali, a town of Spain, Leon, in the province and 21 miles E. of Zamora, on the Douro, which is crossed by a fine bridge. It is an ancient, decaying town, surrounded with earthen walls, and entered by several gates. The streets are dirty and in bad repair. The chief buildings are an old palace, a handsome but unfinished town-hall, a theatre, and numerous churches. Toro has also schools and hospitals, flour-mills, distilleries, brick and tile works, tanneries, and some trade in almonds, grain, and millstones. Pop. 6897.

TORONTO, lately the temporary political capital of Canada, formerly the political, and still the commercial capital of Canada West, is built on the edge of Lake Ontario, about 30 miles from its western end. A peninsula, stretching for some miles in a long flat arc, almost parallel with the land, at a distance of somewhat more than a mile, forms a broad and beautiful harbour, which first decided the site of the present city. From the water little is seen of the town, on account of the flatness of the ground near the lake, but a gentle slope upwards to the north, of about 1 foot in 50, relieves the view at some distance back, till, at a mile and a half or two miles, an irregular ridge of sand, rising to the height of low hills, once the beach of the lake, but now covered with verdure and dotted here and there with houses, serves as a border to the picture.

The first houses in Toronto were built in 1794, the site having been chosen the year before by Governor Simcoe, the first governor of Upper Canada. The advantages of the bay, and of the fact that, by opening a road to the north, the waters of the Georgian Bay, a part of Lake Huron, would be reached, and an avenue thus secured for trade with the whole western parts of the continent, were held by that clear-headed and far-sighted man more than a counterbalance to the natural defects of the locality. One of the first settlers describes it as "fitter for a frog-pond or beaver-meadow than a habitation of human beings." A broad marsh at the eastern end of the bay was fruitful of ague, and everywhere there was too much swamp for comfort or health. Two families of Indians were the only population at that early day; but the bay was alive with wild-fowl, while a dense and beautiful forest clothed the soil to the water's edge. The long wars of the end of last century, and the first fifteen years of this, were fatal to the rapid growth of colonies, by destroying the men who would have been emigrants, and hence the growth of Toronto, or York, as it was then called, was at first very slow. Nearly thirty years after its foundation, there were only 1336 inhabitants; and even so late as at the time of the rebellion in 1837 it was still very insignificant. From that time, for a number of years, it grew rapidly, until, in 1856, the population was over 40,000. The universal commercial crisis of 1857, however, and the removal of the seat of government to Quebec in 1859, have for a time not only checked its advancement, but reduced its population to not more, at the most, than 35,000.

Like all new cities, Toronto straggles greatly at its edges, and is closely and continuously built for any great distance on only a few streets. It is well laid out in rectangular blocks, the two main thoroughfares being King Street, which runs east and west at a short distance from the lake, and Yonge Street, which strikes down on it from the north, about the middle of the city. In both these are excellent shops, King Street boasting the more fashionable. All the principal streets, and many of the less important, are lighted

Toronto. by gas, which the citizens enjoy in their shops and dwellings at 13s. 4d. per 1000 feet. Water is also provided for the principal streets, steam-engines driving it up by force-pumps, unfiltered from the bay, which, while it yields the water of the city, receives its sewerage. Only from 900 to 1000 buildings take the water thus provided, the rest of the 8000 houses, of which the city consists, depending on numerous private wells, which, at no great depth, afford an abundant supply. For soft water, very many depend on the rains. The principal streets are macadamized, and have pavements of thick plank, except where, here and there, a short stretch of paving-stone, brought from Kingston or Ohio, has been laid down. The houses are generally of red brick, many of them, of late years, flat roofed. A large number of the better class have latterly been built of white brick, made from clay found in the neighbourhood, and a few of the more ambitious warehouses and shops, and some of the public buildings are faced with stone brought from a distance. The drainage of the city has been greatly improved within a few years back, and this, with an opening made by the lake in the east end of the peninsula, which has dissipated the stagnant waters of the marsh formerly existing there, has wholly removed any charge of unhealthiness once made against it. The population is about one-third Episcopalian, a fourth Roman Catholic, a seventh Presbyterian, and an eighth Methodist, the fraction which remains distributing itself into the various other bodies. In 1856 there were 57 clergymen of all denominations, and twice as many lawyers. Toronto is governed by a council of 14 aldermen and 14 councillors, with a mayor chosen by the direct vote of the people. The municipal franchise is L.6, but, from the high rates obtained by landlords, this is nearly equivalent to universal suffrage, and the results are little in favour of the system. Many of the municipal authorities are chosen from the dregs of the people, the mob electing them as like themselves. The value of property assessed in the city was, in 1857, L.359,909 of real property, and L.64,030 personal property; in 1858, L.357,064 of real property, and L.56,719 of personal; in 1859, L.331,427 of real property, and L.45,236 of personal. From the fall of rents, and general commercial depression, the accounts for 1860, which are not yet published, will be very considerably less in both real and personal property. 1860 has, so far, been the worst year Toronto has seen, perhaps, in its whole history. The city possesses property to the value of L.6800 a year. The city debt, contracted nearly altogether within the last few years, has reached the enormous amount of L.458,888. The city taxes for 1857 were 2s. 6d. on the pound; for 1858, 2s. 11d; for 1859, 2s.; and for 1860 they will not be less than 3s. 6d. on the pound. But this is less than in almost any other Canadian town at this time. Unlimited liberty of borrowing has tempted nearly every municipality far beyond its depth. In 1858 there were upwards of 500 licensed and unlicensed houses for the sale of intoxicating drinks; but this great number has since decreased, the public outcry having forced the authorities to limit the evil. They are now only about half that number. By the police returns, it appears that 4593 cases were brought before the magistrates last year. One half of these were for drunkenness. Sixty-four per cent. of all arraigned were Irish, and 117 were coloured people. Hitherto the city prisoners have been confined in the county jail, which is in Toronto, but a new jail for the city alone is being built, which, with the land attached, will cost L.40,000. The land, 119 acres of sand, two miles from the city, cost, by a job, L.8000.

Education is liberally provided for in Toronto. The Roman Catholics have separate schools, to which a provincial and municipal grant is made in proportion to the attendance. For the rest of the population, eight schoolhouses have been built—six of brick, the others of wood; the average cost of each of the brick houses, with its site and furniture, has been about L.2500. These are the "common schools" for "primary" education. They are entirely free, the expense of maintaining them being met by local taxation aided by a government grant. They are under the direct control of a board of trustees, 14 in number, half of whom are chosen each year by household suffrage for two years' service. The average daily attendance in 1859 was 2150. The cost of each child was L.2, 8s. a year. The total expense of the schools for 1859 was L.5188. The system is not very efficient as a means of universal education. Neither the middle class nor the very poor use its advantages, the one wishing more select schools, the others none. The richer classes have to pay for the children of mechanics and others who could quite well pay for their own families, and private schools are wellnigh extirpated. A monopoly of "free schools" might do for a republic, but for a British people they are largely unpopular, and deservedly so. There are no fewer than three high schools in Toronto; the Upper Canada College, with twelve masters, largely attended and liberally endowed; the Toronto Grammar School, with one master and three assistants, ably taught but scantily aided; and the Model Grammar-School, with a number of masters, richly endowed from provincial taxes though just established. It owes its existence to the political influence of the chief superintendent of education, whose theories would suffer by the humbler but better plan of improving already existing institutions. Toronto.

The university of Toronto is a very fine building in the Norman style. It has cost about L.100,000, derived from the sales of part of its very rich endowment of university lands over the province. University College enjoys the use of this fine structure, and is worthy of the building. It has a staff of ten professors, all from Europe, and a Hebrew and a classical tutor. It offers great inducements to students, by large bursaries freely given, liberal and numerous prizes, and fees only nominal where they are taken at all. The number of matriculated students is not large, but many more attend particular courses as occasional students. Trinity College, an institution established in connection with the Church of England on the secularization of University College, is also in Toronto. It is an elegant building, has six professors and a provost, and is modelled after Oxford. The Free Church likewise has its college in Toronto, but it confines itself chiefly to theological studies, its students attending University College for general branches, excepting logic and philosophy, which are ably taught by Professor Young. The United Presbyterians and the Congregationalists have each a theological seminary in the city. In medicine, Toronto has two rival schools—that of the Hon. Dr Rolph with most students, and the "Toronto School" with most professors. As the head-quarters of the educational system of Canada West, Toronto is ornamented by the large and handsome buildings devoted to the different offices of the educational scheme. The main structure is occupied in different parts by a collection of paintings and plaster busts and casts bought by the superintendent in Europe, and as much criticised as praised; by the "depository," in which he keeps an immense stock of books, maps, apparatus, &c., to sell to libraries, teachers, and scholars, to the great injury of business, and in violation of all sound policy; and by the special offices of the superintendent and his subordinates.

There are three daily papers published in Toronto, at three halfpence currency each (a little over a penny); five weekly, and seven monthly, including two denominational magazines. The daily papers are very different from their prototypes in Britain, politics in a small province too often degenerating into personalities, and the circulation and price

Toronto.

not warranting the same expenditure on literary excellence as in a denser population.

Toronto has many charitable institutions. The General Hospital, supported by a revenue from its lands and an annual grant of the legislature, is a fine building, and could accommodate many more sufferers than it does, but for the inadequacy of its means. The Provincial Lunatic Asylum, also a very fine building, erected by the province, and supported by an annual provincial grant, and by a municipal tax of one penny on the pound, is a credit to Canada. Over 400 lunatics are frequently gathered together in it and in a branch asylum, which it has been found necessary to open in addition. Various other charitable institutions, supported in most cases more or less by government grants, attest the prevalence of right feeling in the community at large. Juvenal speaks of the number of fires in Rome; had he lived in Toronto the complaint would have been equally just. The outhouses being very generally of wood, and many roofs being covered with shingles (split pine wood), lead to many. Incendiarism takes advantage of the fact, and in dull times, like the present, is very often at work. The fire department, however, though very inferior in organization, discipline, and subordination to British fire companies, is active. Its expenses are borne by the city, which pays a captain L.160 a year, other officers in proportion, and the men L.8 each. There are 240 men enlisted in the force. Toronto is the chief seat of law in Canada West. The Court-house is a plain but massive building, and Osborne-hall, where Chancery and the Courts of Common Pleas and Queen's Bench sits, and where the library and offices of the Law Society are established, is still finer in its appearance. The Law Library numbers about 3000 volumes. Toronto has a Mechanics' Institute with a library of 4000 volumes, and the "Canadian Institute," which is the equivalent to British "Royal Societies," and the like. The Board of Agriculture has its offices in Toronto, and in many ways, labours to advance the interests of the province. Under its care a permanent "Crystal Palace" was built in 1858, 256 feet in length, and 96 in width. The railroads starting from Toronto, or passing through it, furnish every facility for travel. The Northern Railroad runs back to Lake Huron; the Great Western to Hamilton, to the Suspension-bridge at Niagara Falls, and to London and Windsor; and the Grand Trunk runs to Port Saruea to the west, and to Montreal, Quebec, and Portland to the east. The effect of this rapid travelling has been disastrous to the shipping of the port. Formerly the bay was filled with steamers and sailing vessels, but now it is hardly used more than it was forty years ago. There is at present only one steamer running from Toronto; it sails to Niagara. The railways all run along a level tract reclaimed from the lake, and called the "Esplanade," to make which has cost the city not less than L.140,000. The railroads, of course, ought to have made their own way, but jobbery carried the day. That so much of the freight formerly brought to Toronto is carried by the Grand Trunk straight through to Portland or Montreal, hurts Toronto greatly. Wholesale business is likewise drawn by the easy communication from it to the latter places. The amount of imports entered at the Toronto customs was for 1856, L.1,390,926; for 1857, L.1,017,092; for 1858, L.753,787; for 1859, L.803,842. The great falling off after 1856, and the slow recovery, are very striking. The exports show similar characteristics. They were for 1856, L.441,067; for 1857, L.130,133; for 1858, L.127,436; for 1859, L.181,096. The bad harvests of 1857 and 1858 left terrible traces in these figures. The exports are chiefly flour, wheat, oats, pease, barley, wool, planks, and shingles. Toronto has no manufactures of any importance. A distillery is in operation in the east part of the town, and there are a furniture factory and one or two stove foundries. Like all the rest of Canada West, it is nearly altogether dependent on agriculture. One of the larger imports is coal brought from Ohio, which has, to a large extent, taken the place of wood as fuel. The public buildings, besides those already enumerated, are the City Hall, the House of Providence, a Roman Catholic hospital, St Lawrence Hall for public meetings, &c., the New Mechanics' Institute a very fine building, the Post Office, the Masonic Hall, the Exchange, the Temperance Hall, the Rossin Hotel an enormous building, which is only partially used, the old Parliament Buildings a range of three large plain red brick houses. Besides the English and the Roman Catholic cathedrals, there are 17 Protestant and 3 Roman Catholic churches. The cemeteries, by a wise arrangement, lie outside the city. The Church of England and the Roman Catholics each have one, and a third, the Necropolis, receives the dust of those whose friends decline the funeral services of these bodies.

The Toronto banks have stood the terrible trial of the past three years without flinching. They are—the Bank of Upper Canada, established in 1821, while Toronto was yet only a small village; the Commercial Bank of Canada, the Bank of British North America, the Bank of Montreal, the City Bank of Montreal, the Bank of Toronto, the Quebec Bank, and Molson's Bank. There are, besides, two savings'-banks. There are 20 fire insurance, and 11 life assurance agencies—a number of offices taking risks of both kinds.

The situation of Toronto, its present size, the presence of the courts and of the university, will prevent its growing much less at any time than it is; but what its future size may be, it is hard to conjecture. In the meantime it is trying to raise itself slowly from the commercial calamities of the last three years, and promises itself that it will enter on a new career of prosperity, if the province be blessed with good harvests. That it should ever be a large city seems unlikely. Its position, its want of manufacturing facilities, the smallness of the market open to its products if it had any of importance, the precariousness of its main support the wheat harvest—all seem to indicate a respectable rather than a splendid future. (J. G—E.)

Toropetz ‖ Torquay.

TOROPETZ, a town of European Russia, in the government and 148 miles S.E. of Pskov, on the Toropa. The houses are for the most part built of wood, and the streets paved with planks. There are here a cathedral and many other churches, convents, schools, tanneries and other manufacturing establishments. An active trade is carried on in corn, hemp, flax, manufactured goods, and colonial produce. Pop. 6000.

TORQUAY is a town situated in the Haytor Hundred, on the S.E. coast of Devonshire, 220 miles from London by railway, and 26 from Exeter. It occupies a sheltered cove of Torbay, at a short distance from Hope's Nose, the rocky promontory which forms the northern horn of the bay. The town is entirely modern, being described in 1810 as "a small cluster of fishing huts;" so that within fifty years has sprung up the busy, opulent, and beautiful town which now contains not fewer than 16,000 inhabitants. With the exception of the streets devoted to trade, and of some handsome terraces and crescents, the residences generally are detached villas or mansions, each surrounded by its own pleasure-ground, varying in extent from 1 acre to 6 or 8 acres. These are erected on the sides and summits of three nearly parallel hills, sloping gently to the sea, and in the richly wooded valleys that intervene; each dwelling contributing to the beauty of the entire scene, and all commanding views highly picturesque, varied, and extensive. Torquay, in proportion to its population, occupies an extent of land greatly exceeding any other place in the kingdom; and combines, in singular degree, the conveniences of town with the sanitary benefits of country. Its sheltered and beautiful situation, and the

Torre-del-Greco.

peculiar salubrity of its climate, have rendered it a favourite resort of invalids; and it is particularly suited for such as suffer from, or are susceptible of, bronchial or pulmonary disorders. From a series of meteorological observations, extending through many years, the maximum temperature at Torquay is found to be about 7° lower, and its minimum temperature about 12° higher, than the average of other places. The range being thus nearly 20° more limited than elsewhere, the evils of extreme heat and extreme cold are alike escaped. In the hottest weather the heat is less oppressive, and in mid-winter the cold is less severe. The average number of rainy days in a year is found to be fifteen less than the average throughout the kingdom, and the average humidity in the atmosphere is in like manner less than in most other places; so that Torquay, instead of being, as has been supposed, damp and relaxing, is in truth one of the driest places in Great Britain. In addition to these advantages the air is found to possess a soothing and sedative influence, which renders it singularly agreeable and beneficial to the classes of invalids resorting hither.

Torquay is amply provided with accommodations for bathing. A sheltered cove is appropriated to the use of ladies for open sea-bathing; and for private use by both sexes, a spacious handsome structure of recent date contains ranges of baths, at all times supplied abundantly with hot and cold water, and all the requisite conveniences for every variety of bathing.

There are seven Established churches, one Roman Catholic chapel, and twelve chapels belonging to various denominations of Protestant Dissenters. The charitable and religious institutions dependent on voluntary support are numerous and well sustained. Literary and scientific associations are liberally patronised; and schools for the children of the poor are adequately supplied with requisite funds, and conducted by competent teachers.

Comprising, together with the entire parish of Tormoham, and the ecclesiastical districts of Upton and Torwood, parts of two other parishes, the precise number of the inhabitants is not easily deduced from the census returns. It is certain, however, that the population, which in 1841 was stated to number 5982, and in 1851 had increased to 11,474, at this time (1860) exceeds 16,000. The number of inhabited houses in 1841 was 926; in 1851 there were 1624, and at the present time there are not fewer than 3150.

Among the objects of interest in the vicinity, within moderate distances, are the following:—Torre Abbey, a modern mansion, remarkable only as including portions of an ancient monastic edifice; Ansty's Cove, a deep recess in the limestone cliff, with a combe of most romantic beauty; Kent's Cavern, ossiferous, and of great extent; Babbicombe, with its Swiss-like cottages, secluded bay, and elevated downs; Watcombe, another charming cove, surmounted by rocks of red conglomerate, whose accessories are of more than wonted grandeur even on this magnificent coast; Petit Tor, with marble quarries of great value; Bishopstowe, the Italian villa residence of the venerable Bishop of Exeter; Berry Pomeroy Castle, extensive ruins, most beautifully situated, and possessing much historical interest; the ancient towns of Totnes and Dartmouth, with steam-packet passage on the River Dart; and lastly, the wild romantic scenery of Dartmoor.

TORRE-DEL-GRECO, a town of the kingdom of the Two Sicilies, in the province and 8 miles S.E. of Naples, at the S.W. foot of Vesuvius, on the shore of the Bay of Naples. It is built chiefly of lava, and contains a fine collegiate and a parish church, three convents, and a large hospital. In the outskirts of the town are many beautiful villas and gardens. Torre-del-Greco has been destroyed by eruptions of Vesuvius in 1737 and 1794, when immense streams of lava flowed through the town and into the sea beyond. But after each destruction the people have returned, and rebuilt the town on the same spot; the advantages derived from the rich land on the flanks of the volcano, and the proximity to the sea and to the capital, being enough to overcome the apprehensions of the danger to which the place is exposed. The inhabitants are mostly employed in fishing, and the neighbouring country is famed for its fruit and wine. Pop. 13,000.

Torrens, Lake || Torricelli.

TORRENS, LAKE, a salt lake or marsh in the interior of Australia. It was discovered by Eyre in 1840, who came upon its southern extremity in travelling northwards from Spencer Gulf, and found it to be from 15 to 20 miles in breadth, and to extend 40 or 50 to the north, without any termination visible. Eyre afterwards travelled northwards along the west foot of the Flinders range, and traversed the low country beyond these mountains in three different directions. In each of them his progress was arrested by a marshy sheet of water similar to that of Lake Torrens. Hence he concluded that these formed parts of one large lake, which, in the form of a horse-shoe, encircled the plains at the end of Flinders range. The water of the lake was salt, and its shores were for the most part inaccessible, on account of the marshes that skirted them. The length of this lake was supposed to be about 400 miles, and the breadth to be almost uniform throughout; but the greater part of the area thus occupied was stated to be dry, though consisting of such soft sand and mud as to be impossible to cross. In recent years, however, fresh discoveries have been made in this region, which have shown that the inference drawn from the explorations of Eyre, as to the existence of a large lake of a horse-shoe form, was erroneous; and that, instead of one lake, there is only a chain of smaller ones, between which there is at least one broad tract of dry land, affording access to an extent of good pasturage country to the N.W. beyond. This discovery was made in 1858, by an expedition sent out by the South Australian Government under Mr Babbage, who was afterwards joined by Mr Gregory; while the regions to the N.W. were traversed in the same year by a private explorer, Mr Macdougall Stuart. The name of Lake Torrens is now restricted to the most southerly of the chain, that of Lake Gregory being given to the one further to the north.

TORRES NOVAS, a fortified town of Portugal, in the province of Estremadura, in a flat country near the Tagus, 15 miles N.E. of Santarem. It has a strong castle, four churches, a school, almshouses, and cotton-factories. Pop. 4250.

TORRES VEDRAS, a town of Portugal, in the province of Estremadura, 25 miles N. by W. of Lisbon. It has old walls and a castle, several churches, hospitals, and schools, and some trade in wine. The name has been rendered famous in history, by the lines which Wellington erected here in 1810 for the defence of Lisbon, and which he held against the French till they were compelled to retreat. Pop. 3326.

TORRICELLI, EVANGELISTA, an eminent Italian mathematician and philosopher, was born on the 15th of October 1608. It seems doubtful whether he was born at Modigliana, a country-seat in Romagna, or at Piancaldoli, in the diocese of Imola. He was trained in Latin literature by his uncle, a monk of Faenza; and after cultivating mathematical knowledge for some time without a master, he studied under Father Benedict Castelli, professor of mathematics at Rome. Having read Galileo's dialogues, he composed a treatise on motion, on his principles. This recommended him to the notice of Galileo, who took him home as an assistant; but Galileo died in three months after. He became professor of mathematics at Florence, and greatly improved the art of making telescopes and microscopes. But he is best known for discovering a

Torrigiano ‖ Tortosa.

method of ascertaining the weight of the atmosphere by quicksilver—the barometer being called, from him, the Torricellian tube. (See BAROMETER and HYDRODYNAMICS.) He published a volume entitled *Opera Geometrica*, Florent. 1644, 4to. He died in the year 1647.

TORRIGIANO. See SCULPTURE.

TORRINGTON, GREAT, a municipal borough and market-town of England, Devonshire, on the right bank of the Torridge, 35 miles S.W. of Exeter, and 194 W. by S. of London. It is an old town, irregularly built of stone, on the sides and summit of a hill; and it has an old church, Methodist, Independent, and Baptist chapels, a market-house, National and other schools, &c. Formerly there was a castle here; but only a few fragments now remain, and the site is occupied by a bowling-green. Cloth and gloves are manufactured here. General Monk was born in the vicinity, and received the title of Viscount Torrington; and Howe, the great Puritan divine, was minister here for some time. Pop. of the parish, 3308.

TORSHOK, or TORJOK, a town of European Russia, in the government and 36 miles W.N.W. of Tver, on the Tvertza. It was destroyed by fire in 1767; but has since been rebuilt in a very regular style, the private houses of wood, and the public buildings of stone. Of the latter the principal are the cathedral, 22 other churches, 2 convents, a government-house, and a bazaar. The principal manufacture is the embroidery of silk and leather, for making shoes, gloves, and other articles. The position of the town on a navigable river and on the road between Moscow and St Petersburg, is favourable for commerce; and a considerable trade is carried on, three annual fairs being held. Pop. 10,160.

TORTOLA, one of the Virgin Islands, West Indies, belonging to Great Britain, N. Lat. 18.24., W. Long. 64.32., between Virgin Gorda and St John's. It is 12 miles long by 4 broad, and is chiefly occupied by a chain of steep and rugged mountains, about 1600 feet high, stretching from end to end. On the north side is a harbour, on which stands Tortola, the chief town. The island has an unhealthy climate, and exports sugar, molasses, rum, copper, &c. Tortola is the most important of the Virgin Islands, and the seat of the lieutenant-governor and the administrative council (consisting, since 1854, of 6 elective and 3 non-elective members) of the group. It came into British possession in 1666. Pop. 4600.

TORTONA, a town of the Sardinian kingdom, capital of a province, in the division and 14 miles E.S.E. of Alessandria, on a hill near the right bank of the Scrivia. It is an old town, ill built, with narrow, irregular streets, and was formerly a place of strength, but its fortifications were all destroyed by the French after Marengo, so that only a few vestiges of them now remain. Here are a fine cathedral, several other churches, two convents, a college, several schools, a theatre, barracks, and hospital. Silk and other articles are made here, and there is some trade in corn and wine. Pop. of the commune, 10,821.

TORTOSA, a town of Spain, Catalonia, in the province and 43 miles S.W. of Tarragona, on the Ebro, 22 miles above its mouth. It consists of an old and a new town, both strongly fortified, although some parts of the defences are of considerable antiquity. The streets are narrow, crooked, and ill paved; but the houses are for the most part lofty, and solidly built of granite. Near the river stands the cathedral, a tasteless and over-ornamented edifice, in a variety of styles, but in some portions extremely ancient. Next to it, the most important buildings are the episcopal palace, town-hall, numerous churches, and nine convents, some of them suppressed. Tortosa has also a college, several schools and hospitals, manufactures of leather, paper, earthenware, linen, starch, soap, ropes, cordage, &c. There is an important fishery in the river; and an active trade is carried on through the ports of El Fangar and Los Alfaques at its mouth, as well as directly, for vessels of 100 tons burden can come up to the town. Corn, wine, oil, wool, silk, and fruits are among the articles exported. Near Tortosa are rich marble quarries, and the whole surrounding country is very fertile and beautiful. Pop. 20,573.

Toscanella ‖ Toul.

TOSCANELLA, a town of the Papal States, on the right bank of the Marta, in the delegation and 23 miles N.N.E. of Civita Vecchia. It is defended by embattled walls and towers, and contains two ancient churches. Sulphur is obtained in the neighbourhood. Pop. 4000.

TOTNES is a town of great antiquity, in the south-eastern part of Devonshire, 223 miles from London by railway. It consists mainly of one long street on the acclivity of a steep hill. The river Dart, flowing at the base of the hill, is crossed by a bridge, communicating with Bridgetown, a modern suburb in the parish of Berry Pomeroy. The river, whose entire course has much beauty, is navigable to this place, and steam-packets pass several times daily between it and Dartmouth. Totnes was formerly surrounded by walls and defended by a castle, and of these some fragmentary ruins are still visible. It is a corporate town and a parliamentary borough, returning two members to Parliament. The church, which is spacious and has a lofty tower, contains an elaborate stone rood-screen, a sculptured stone pulpit, and some monuments. A weekly market for provisions, and a monthly cattle market, are much frequented. Pop. (1851), 3849.

TOTONICAPAN, a town of Central America, capital of a department in the state and 100 miles N.W. of Guatemala. It is a widespread town, consisting chiefly of flat-roofed houses; and has manufactures of earthenware, woollen cloth, and wooden articles. In the neighbourhood there are medicinal springs. Pop. 12,000.

TOTTENHAM, a village of England, Middlesex, near the sea, 5½ miles N.N.E. of St Paul's, London. It consists of a single street, extending along the road from London to Ware; and most of the houses are substantially and handsomely built, though irregularly arranged. The old parish church has a square, ivy-covered tower, and some interesting monuments; and the village has another Episcopal church, besides Baptist, Independent, Methodist, Quaker, and Wesleyan places of worship; a grammar school, almshouses, flour and oil mills, a brewery, and potteries. Pop. of the parish, 9120.

TOUCH-NEEDLE, among assayers, refiners, &c., little bars of gold, silver, and copper, combined together in all the different proportions and degrees of mixture; the use of which is to discover the degree or purity of any piece of gold or silver, by comparing the mark which it leaves on the touchstone with those of the bars. The metals usually tried by the touchstone are gold, silver, and copper, either pure or mixed by fusion with one another, in different degrees and proportions. In order to discover the purity or quantity of baser metal in these various admixtures, when they are to be examined they are to be compared with these needles, which are mixed in a known proportion, and prepared for this use. The metals of the needles, both pure and mixed, are all made into laminæ or plates, one-twelfth of an inch broad, and of a fourth part of their breadth in thickness, and an inch and a half long. These being thus prepared, a mark is to be engraved on each, indicating its purity, or the nature and quantity of the admixture. The black rough marbles, the basalts, or the softer kinds of black pebbles, are the most proper for *touch-stones*.

TOUL, a fortified town of France, in the department of Meurthe, on the left bank of the Moselle, 12 miles W. of Nancy. The fortifications are strong, consisting of walls and bastions, and the town is for the most part well, though

Toulon. irregularly built. The ancient cathedral is a fine Gothic building, and the Episcopal palace is now used as the town-hall. Toul has also a college, arsenal, barracks, and hospitals, manufactures of lace, calico, leather, and pottery, and some trade in wine and brandy. Pop. 8506.

TOULON, an important seaport, and the second naval arsenal of France, capital of an arrondissement in the department of Var, at the head of one of the best harbours on the Mediterranean, 32 miles E.S.E. of Marseilles, and 190 S.S.E. of Lyons. It occupies a fine situation, on a piece of ground rising gradually from the sea to the lofty ridge of Mount Pharon, which runs east and west, and sends out lower branches, enclosing the town and harbour on either side. The harbour forms a large and secure roadstead, nearly land-locked, and opening only towards the east. It is divided by two headlands, which approach very near each other, into an outer and an inner road; and on the north side of the latter are two artificial basins, the old or mercantile, and the new or naval harbour. These are formed by piers, and entered by narrow openings, admitting only one ship at a time; and they communicate with one another by a swing-bridge. The old harbour is surrounded with spacious quays, lined on the north side with good houses, among which are the town-hall: the new harbour is surrounded by the dockyards and other buildings connected with the naval establishment. The town itself consists of an older and a newer portion, the former on the lower ground close to the old harbour, and the latter higher up. There is also a suburb called La Malgue to the south-east. The houses are for the most part well built, but very crowded, the streets being narrow, and in the older parts irregular; and the squares, with the exception of the *Place d'Armes*, small. Toulon has few important public buildings unconnected with the arsenal. Besides the town-hall, which has two colossal statues by Puget, the principal are the cathedral and three other churches, none of them very good buildings; the exchange, court-house, and theatre. There are a college, several schools and hospitals, a public library, museum, observatory, and botanic garden. But the most conspicuous feature in the town is the arsenal, with the establishments connected with it, which are on a scale of almost unrivalled magnificence, occupying 87 acres of ground. On the north side of the naval harbour are the arsenal and storehouses, dockyards, and ship-building slips, various workshops, and naval schools; and beyond these a rope-manufactory, occupying a freestone building 2000 feet long. On the mole, to the east and south-east of the same harbour, stands the *bagne* or convict-house, with accommodation for 4000 or 5000 convicts; and west of the harbour is the artillery depôt and government bakehouse. Various other basins and dockyards for ship-building have been formed in a different part of the town, east of the commercial harbour. Toulon is very strongly fortified. On the land side there are very complete defences, entered by two gates—that of France on the N.W., and that of Italy on the N.E.; and the town is still further protected by an entrenched camp, and various forts and outworks on all the commanding positions. The suburb of La Malgue is commanded by a fort of the same name; both the outer and inner roadsteads have forts at their entrances; and the old and new harbours are defended by bomb-proof batteries level with the water; so that altogether the place is considered nearly impregnable. Neither the manufactures nor the trade are of much importance, if we except the extensive business connected with the government establishments. Besides ship-building, the principal manufactures carried on are those of woollen cloth, hosiery, leather, soap, candles, and chocolate. The trade has increased considerably since the occupation of Algeria; wine, brandy, oil, fruits, corn, flour, and other productions of the fertile country round about, being the chief articles exported. Toulon is mentioned by the ancient geographers under the name of *Telo Martius;* but it did not become important till modern times. To defend it from the African pirates, Louis XII. founded a tower, which was completed by Francis I. To Henry IV. Toulon owes its mercantile harbour; and to Louis XIV. the naval arsenal and complete fortifications by Vauban. In 1707, it was assailed without success by the Duke of Savoy by land, and the English and Dutch by sea; but in 1793 the English and Spaniards, to whom it had been given up by the royalists, could not hold it against the armies of the Republic, in which Napoleon then served as an officer of artillery. Pop. (1856) 47,075. Toulouse.

TOULOUSE, a town of France, capital of the department of the Haute Garonne, on the right bank of the Garonne, 132 miles S.E. of Bordeaux, and 200 N.W. of Marseilles. It stands on a sort of peninsula; for the river, which here curves slightly to the west, washes it on the west side, while the Canal du Midi passes it on the east, and joins the Garonne a short distance north of Toulouse. On the south side of the town rise the heights of Pech David; and on the east, beyond the canal and the little river Lers, those of Mont Rave. The shape of the town is an irregular oval; part of it occupies a small island in the Garonne; and on the other side, reached by a freestone bridge of seven arches, lies the suburb of St Cyprian. Though in a beautiful situation, Toulouse is far from being a fine town. Narrow, crooked, and dirty streets, are lined with mean houses, built of brick and cemented with bad mortar; while many of the older houses are in a very dilapidated condition. But in recent years much has been done for the improvement of the town, and many parts of it are acquiring a more regular and handsome appearance. The walls and gates, which were almost entire in 1814, are fast disappearing; as the town is spreading in all directions, and several new suburbs, in addition to St Cyprian, have risen. The principal public place is a large quadrangle, in which the markets are held. It has fountains in each corner, and the east side is occupied by the town-hall, a large building, having a portico of red marble columns, and containing, besides various halls for municipal purposes, a theatre in one of the wings, and a gallery of busts of illustrious men connected with Toulouse. The cathedral has a very irregular appearance. The nave and portal belonged to a building of the thirteenth century; but in the sixteenth a new building was designed to replace the old, and the choir actually built, but the design was never carried further, and the new choir, though one of the finest in France, accords ill with the old nave, with which it is not even in a line. The church of St Servin is the most ancient in the town, and is said to occupy the site of a temple of Apollo: it is in the Romanesque style, and has a lofty octagonal tower. Probably some parts of it are as old as the ninth century, but much is far more recent. Among the other ornaments, the architect has given vent to his sectarian feelings, by inserting a caricature of Calvin as a hog in a pulpit, with the inscription below, "*Calvin le porc prêchant.*" The town had at one time a very large number of churches, but many of these have been turned to other uses. The church and cloisters of the *Grands Augustins* now serve to contain a picture gallery and museum, and that of the Jacobins is used for barracks. Of the modern buildings in the town, the best, next to the town-hall, is the prefect's residence, formerly the archbishop's palace. Toulouse also contains the convent in which the Inquisition held its sittings; two large hospitals; a Calvinistic chapel; Jewish synagogue; and court-house, the hall of the ancient parliament of Toulouse. Before the first revolution, there was here one of the most celebrated French universities; but there is now only a university-academy, with faculties of law, science, literature, and theology; a Protestant theological college; various

Tournament.

schools and scientific societies; a public library of 60,000 volumes; an observatory; and a botanic garden, the largest and best in the kingdom next to that of Paris. On the island in the Garonne stand the ruins of the castle of Narbonnais, formerly the residence of the Counts of Toulouse. The manufactures and trade of the town are both very important. It has bell-foundries, copper-mills, a large manufactory of sickles and other cutlery, and several iron-works; leather, both common and morocco; woollen and cotton cloth, paper, starch, wax candles, tobacco, pottery, and porcelain are made; and there are, besides, breweries, distilleries, dye-works, oil and flour-mills, &c. The duck-liver pies of Toulouse enjoy a high reputation, and are sent to all parts of France. The situation of the town is very favourable to trade; since, by railway, river, and canal, it communicates with all the chief towns of France. Wheat and flour are the chief exports, and are conveyed to Spain, to Bordeaux, to Marseilles, and to various parts of France. Wine, brandy, colonial produce, and hardware are also important articles of commerce. There are two great annual markets for flowers and salt pork, besides numerous fairs, some lasting for eight days. Toulouse is the seat of a high court for four departments, an assize court, and inferior tribunal; it is the head-quarters of the 12th military division, and contains government offices, an imperial cannon-foundry, a mint, and an arsenal. It was anciently called *Tolosa*, and belonged to the Volcæ Tectosages; and when it fell into the hands of the Romans, 106 B.C., it was found to contain immense treasures in gold and silver. Many fine edifices were built here by the Romans; but the course of time, and the ravages of the Visigoths and the Franks, who successively overran and possessed the country, have left very few traces of them. In the middle ages, Toulouse was subject to counts of its own, who rose to great power and importance; but in 1271 their lands were annexed to the French crown. The only important historical event connected with it is the battle fought here in 1814, between Wellington and Soult, in which the latter was defeated, and obliged to evacuate the town. Cujas, the celebrated French jurist, was a native of Toulouse. Pop. (1856) 92,223.

TOURNAMENT, a martial sport or exercise which the ancient cavaliers used to perform, to show their bravery and address. It is derived from the French word *tourner*, *i.e.* "to turn round," because, to be expert in these exercises, much agility both of horse and man was requisite. The first tournaments were only courses on horseback, in which the cavaliers tilted at each other with canes in the manner of lances; and were distinguished from jousts, which were courses or careers, accompanied with attacks and combats with blunted lances and swords. The prince who published the tournament used to send a king-at-arms, with a safe-conduct and a sword, to all the princes, knights, &c., signifying that he intended a tournament and clashing of swords in the presence of ladies and damsels, which was the usual formula of invitation. They first engaged man against man, and then troop against troop. After the combat, the judges allotted the prize to the best cavalier and the best striker of swords; and he was accordingly conducted with pomp to the lady of the tournament, where, after thanking her very reverently, he saluted her, and likewise her two attendants.

These tournaments formed the principal diversion of the thirteenth and fourteenth centuries. Munster says it was Henry the Fowler, Duke of Savoy, and afterward emperor, who died in 936, who first introduced them; but it appears from the *Chronicle of Tours* that the true inventor of this famous exhibition, at least in France, was one Geoffrey, Lord of Preuilli, about the year 1066. Instances of tournaments occur among the English in the reign of King Stephen, about the year 1140; but they were not much in use till Richard's time, towards the year 1149. After this period these diversions were performed with extraordinary magnificence in the Tiltyard near St James's, Smithfield, and other places in Britain.

Tournay || Tournefort.

Tournaments were in time found to be productive of bad effects, and the occasions of several fatal misfortunes; as in the instance of Henry II. of France, and of the tilt exhibited at Chalons, which, from the numbers killed on both sides, was called the *little war of Chalons*. These and other inconveniences resulting from such dangerous pastimes, induced the princes of Europe gradually to discourage and suppress them. The last tournament on record is that held by the Earl of Eglinton at his castle in Ayrshire, on the 29th of August 1839.

TOURNAY (Flem. *Doornik*), a town of Belgium, capital of an arrondissement in the province of Hainault, on the Scheldt, 27 miles N.W. of Mons. It is divided into two parts by the Scheldt, which is spanned by several bridges and lined with spacious quays. The old town stands on the left bank, and the new town, which is distinguished by its neat regular streets and well-built houses, on the right. In the former, the most remarkable building is the cathedral, a large, ancient, and beautiful edifice in the Gothic style, with five pointed towers. The interior is very majestic, especially the choir, and contains some fine paintings by Rubens, sculptures in marble, and interesting ancient remains. Near the cathedral is the market-place, in which stands the belfry, a lofty tower of unknown origin, but supposed to have been part of an old castle in the thirteenth century. Several of the churches of Tournay are ancient and interesting; and there is also an ancient convent, now used partly as a town-hall and partly as a museum; a large and imposing guard-house; and a concert-room with a colonnade and dome. The town contains courts of law, a public library, athenæum, theatre, picture-gallery, school of arts, episcopal seminary, primary schools, hospitals, &c. It is enclosed by strong fortifications, and defended by a well-constructed citadel. Many and important manufactures are carried on here, chiefly of woollen and cotton cloth, hosiery, linen, carpets, hats, paper, leather, porcelain, pottery, bronze articles, cutlery, &c. The trade of the place is also very considerable, as ships of 150 tons burden can ascend the river to Tournay, and railways connect it with all the chief towns of Belgium and France. Tournay is supposed to be the *Civitas Nerviorum* of Julius Cæsar, and at a later period it was called *Tornacus*. It was one of the first places conquered by the Franks, and Clovis made it for a time his capital. In modern times, standing as it does on the very frontier between Belgium and France, Tournay has very frequently been besieged and taken in the various wars that have desolated this part of Europe. Pop. 30,000.

TOURNEFORT, Joseph Pitton de, a famous botanist, was born at Aix, in Provence, on the 5th of June 1656. He studied in the college of the Jesuits at Aix, and his father destined him for the church. He accordingly commenced his theological studies; but he felt a very early passion for the study of botany, and the death of his father in 1677 left him more at liberty to gratify his own inclinations. He wandered over the mountains of Dauphiny, Savoy, Catalonia, the Pyrenees, and the Alps, in search of new species of plants, which he collected with great industry. In 1679 he repaired to Montpellier, where he continued for two years to prosecute the study of medicine. He made a botanical excursion to Spain in 1681, and afterwards returned to the university. Having taken the degree of M.D. at Orange, he returned to his native city, where, however, he did not long remain. In 1683 his reputation procured him the appointment of professor of botany in the king's garden; and by the king's order he travelled into Spain, Portugal, Holland, and England, where he made

Tourneur || Tours.

very extensive collections of plants. In 1698 he was received as M.D. in the University of Paris. In obedience to another order, he proceeded in 1700 to the isles of the Archipelago, the coasts of the Black Sea, Bithynia, Pontus, Cappadocia, Armenia, and Georgia; making observations on natural history, ancient and modern geography, religion, manners, and commerce. In this learned voyage he spent three years, and then resuming his profession, was made professor of physic in the Royal College. He died in consequence of an accidental bruise of his breast by a cart-wheel, which brought on a spitting of blood and hydrothorax, that proved fatal on the 28th of November 1708.

Tournefort produced various works, of which we shall only enumerate the most considerable:—*Elémens de Botanique, ou Méthode pour connaitre les Plantes*, Paris, 1694, 3 tom. 8vo. This work he enlarged and published in Latin under the title of *Institutiones Rei Herbariæ, sive Elementa Botanices*, Paris, 1700, 3 tom. 4to. *Histoire des Plantes qui naissent aux environs de Paris, avec leur Usage dans la Médecine*, Paris, 1698, 12mo. In 1725 an edition of this work was published by Bernard de Jussieu, in 2 vols. 12mo; and in 1732 an English translation by Martyn, in 2 vols. 8vo. *Relation d'un Voyage du Levant, contenant l'Histoire ancienne et moderne de plusieurs Isles d'Archipel, de Constantinople*, &c., Paris, 1717, 2 tom. 4to. Bernier was the editor of his posthumous *Traité de la Matière Médicale; et l'Histoire et l'Usage des Médicaments, et leur Analyse chimique*, Paris, 1717, 2 tom. 12mo.

TOURNEUR, Pierre Le, a useful French writer, who devoted the best part of his life to translations chiefly from the English, was born at Valognes in 1736. Having distinguished himself early in the College des Grassins at Coutances, he repaired to Paris in his thirty-second year, where he engaged in a series of translations of English and German authors, which occupied him till his death in 1788. After publishing a thin preliminary volume or two of quasi-original composition, he brought out his "amended edition" of Young's *Night Thoughts* in 1770, which was well received by the French public. This determined him to engage on a translation of Shakspeare's *Works*, with which he got assistance on the first two volumes, but completed the remaining eighteen himself in 1782. Until Hugo's late version, this translation of Shakspeare was considered the most correct in the French language. Meanwhile he had translated Hervey's *Meditations*, 1770; Johnson's *Lives of Savage and Thomson;* Macpherson's *Ossian;* Soame Jenyns' *View of the Evidences of Christianity*, in 1777. He likewise gave a French version of *Clarissa Harlow* and of Pennant's *Arctic Regions* to the reading public of Paris and of France. Except Sparmann's *Cape of Good Hope* and the *Memoirs of Baron Trenck*, Le Tourneur translated little from the German. For a correct outline of the leading incidents in the biography of this humble but industrious writer, the reader is referred to the *Biographie Universelle.*

TOURNON, a town of France, in the department of Ardeche, on the right bank of the Rhone, which is crossed by a fine suspension-bridge, 9 miles N.N.W. of Valence. It has an old castle, now used as a prison, a law court, a national college; and carries on an active trade in timber, wines, woollen and silk fabrics. Pop. 4861.

TOURNUS, a town of France, department of Saône-et-Loire, on the right bank of the Saône, 17 miles N. of Mâcon. It has an ancient church, a town-hall, two hospitals, and a pillar supposed to have belonged to a Roman temple. Hats, silk, and beet-root sugar, are made here; and there is some trade in corn, wine, and building-stones. Pop. 5324.

TOURS, a town of France, capital of the department of Indre-et-Loire, on a flat piece of ground at the confluence of the Loire and Cher, 65 miles S.W. of Orleans, and 120 S.S.W. of Paris. It is surrounded by boulevards, occupying the site of the former fortifications, and beyond these are several suburbs. The principal approach to the town is by a magnificent stone-bridge, of fifteen arches, over the Loire, 475 yards long and 16 broad. From its termination, a straight, broad, and handsome street extends through the town, to a bridge over the Cher on the other side. Besides this street, a great part of the town is new, and consists of handsome houses and good streets and squares; but in some quarters there still remain the old, mean, and dirty lanes and houses, that formerly characterized the entire town. The chief building in Tours is the cathedral, which was rebuilt after the destruction of a former one in the twelfth century, but not completed till 1550. The west front, erected by Henry V. of England, has three high and richly carved portals, surmounted by a window of great size, and flanked by two towers 205 feet high. The interior is rich rather than elegant; it contains much fine painted glass, and many interesting monuments. The other churches of Tours are small and gloomy. Two towers are all that remain of the large abbey of St Martin, which existed for twelve centuries, but was destroyed at the Revolution. There are also here an archbishop's palace, one of the finest in France, a town-hall, court-house, public library, picture-gallery, museum, hospital, college, and various schools. Tours is an important manufacturing town, and is especially famous for silk fabrics, woollen cloth, hosiery, and leather. Corn, wine, brandy, fruits, hemp, and wool, are the chief articles of trade. Along the rivers' sides there are spacious quays, which, being lined with trees, form agreeable promenades; and there are also beautiful walks in the outskirts of the town. Tours was anciently called *Cæsarodunum*, and was the chief town of the Turones, and afterwards the capital of a division of Gaul under the Romans. In modern times it had risen to great prosperity by the silk trade, and had a population of 80,000, when, by the revocation of the edict of Nantes, it was deprived of half its inhabitants, and nearly all its industry. From this blow it has never entirely recovered. It suffered greatly in the inundation of 1856. Tours is a favourite residence of the English in France. Pop. (1856) 33,204.

Toussaint || Tracy.

TOUSSAINT. See Hayti.

TOWER HAMLETS, a parliamentary borough of England, county of Middlesex, comprising that part of London east of the City and Finsbury, and including the parishes of Shoreditch, Bethnal Green, Spitalfields, Limehouse, Poplar, Hackney, &c. It returns two members to Parliament. Pop. 539,111. See London.

TRACY, Antoine Louis Claude Destutt de, Count of Tracy, Peer of France, a member of the Constituent Assembly, of the Conservative Senate of the first Empire, of the Class of Moral and Political Sciences of the Institute, and of the French Academy, was the eldest son of Claude Charles Louis Destutt de Tracy, Marquis of Tracy, by his marriage with Marie Emilie de Verzure, and was born on the 20th July 1754.

Descended from a long line of distinguished soldiers (the founder of which in France, Walter Stutt, had come over with John Stewart, Earl of Buchan, and had helped him to win from Charles VII. the baton of constable of France, as the reward of his services against the English),[1] the young De Tracy followed the family career; became at the age of twenty-two, lieutenant-colonel of the Royal Regiment of cavalry; married Mlle. de Durfort Civrac; took an active part in the proceedings of the provincial states of the Bourbonnais in 1788–89; was elected by the nobi-

[1] *Mercure de France*, Juin 1753, part ii, 185.

Tracy. lity of that province a member of the States General, and distinguished himself in the Constituent Assembly by his labours on questions of educational and social reform. With Lafayette, he served on the frontier, as commander-in-chief of the cavalry; and when that general left his army, De Tracy too retired to Auteuil, where he exchanged the life of a legislator and a soldier for that of a student.

At the outset, his attention was chiefly bestowed on the physical sciences, and especially on chemistry. During the Reign of Terror, he was dragged from his retirement, and confined in the Carmelite Prison. Here he read Locke and Condillac; meditated deeply on the processes of his own mind; and, on a memorable day, the 23d July 1794 (5 Thermidor, year II.), whilst the dismal corridors of the old monastery were echoing with the long roll-call for the guillotine, in which he had reason to expect that at any moment he might hear his own name, he marked the outlines and wrote down the main propositions of that system of "Ideology," which it was to be the grand aim of his unexpectedly prolonged life to embody in detail. Four days afterwards, Robespierre fell, but many months elapsed before De Tracy could return to his home.

At Auteuil, the fascinating widow of Helvetius was long the centre of a brilliant circle, in which the philosophers of the day played no unimportant part. Sieyès, Volney, Garat, Cabanis, De Tracy, met there habitually. The two last named were soon linked in close friendship. Together, they became members of the newly founded National Institute, at whose meetings the dissertations in which De Tracy first gave to the world his views of ideology, alternated with those in which Cabanis worked out, physiologically, the famous theory of Condillac, that all our intellectual operations, whether passive or active, are but transformed sensations.

An eminent historian of recent philosophy in France has characterized and discriminated the respective labours of the three most eminent members of this Auteuil circle, by calling Cabanis, the physiologist; Volney, the moralist; and De Tracy, the metaphysician, of the sensational school.[1] To marshal into rigid order, our "means of knowing," to elicit the laws which govern, and the secret links which connect, the formation, the expression, and the deduction of our ideas, was the task which De Tracy had in the Carmelite Prison marked out for himself, or for his unknown successor. "Ideology is a branch of Zoology;" "to think is to feel;" such are the epigrammatic axioms in which he expresses his characteristic thoughts.

According to De Tracy, our intellectual impressions are of four kinds: (1.) Those resulting from the present action of objects upon the nervous system; (2.) Those resulting from the past action of objects, by means of an influence superinduced upon that system; (3.) Those of things which have mutual relations, and admit of comparison; (4.) Those which arise from our wants, and impel us to satisfy them. When our sensibility receives impressions of the first class, it simply *feels;* of the second, it recalls feeling, or *remembers;* of the third, it feels relations, or *judges;* of the fourth, it feels desire, or *wills*.[2] These propositions are worked out in clear and vigorous language, and with a clinching logic to which nothing can be denied, *if* the premises be but granted.

The *Projet d'Elémens d'Idéologie* was well received, especially in those central schools of the Republic to which the author had expressly addressed himself. Several professors made it a text-book for their lectures. But ideology Tracy. was soon banished, by authority, from the curriculum of the central schools, to its author's great dissatisfaction. The second part of the *Elémens*, containing an elaborate and valuable treatise on grammar, appeared in 1803. The third part—a treatise on logic—followed two years later. Ten more years elapsed before the publication of the fourth and of a part of the fifth divisions of the work, which were published together in 1815. The bulk of this latter volume is, in substance, a treatise on social economy, and deserves analysis, did the needful limits of this article admit of it.

Had the author's plan been carried out, the *Elémens d'Idéologie* would have comprised three main divisions, each consisting severally of three parts. Thus, (1.) The introduction to ideology; (2.) The *grammar;* and, (3.) The *logic*, together, formed (I.) a "history of our means of knowing." In like manner, treatises on (4.) *Social Economy;* (5.) *Morals;* (6.) *Government;* formed (II.) "The application of our means of knowing to the study of the will and of its results;" and finally, treatises on (7.) *Physics;* (8.) *Geometry;* (9.) *Calculation* (*calcul*); formed, collectively, (III.) "The application of our means of knowing, to the study of beings extraneous to ourselves (*l'étude des êtres qui ne sont pas nous*).[3] Like so many other vast designs, however, its fate was to be scarcely half completed. "Nothing more of all this is now permitted to me. This fragment is my last writing,"[4] are the touching words with which he breaks off.[5] The gradual coming on of blindness, which after a time became total, to be followed by an only partial restoration of sight, would probably not, of itself, have sufficed to daunt the perseverance of so resolute a man. Indeed, he so underwent a very painful operation as to show that the fortitude which had been evinced so signally in the Carmelite Prison was still intact. But the mind had lost its elasticity. Its dearest friendships had been broken by death. The days had come when the strongest is forced to say, "I have no pleasure in them." To this man they brought a special sorrow. The bright era he had hailed as ensuring "a development of reason and an increase of happiness which we vainly seek to estimate by the example of past ages,"[6] had but dawned, to vanish quickly behind thick clouds:

"Another race had been, and other palms were won."

How far the chastened spirit ever realised to itself the hollowness of that philosophy which conjoined the highest conceptions of the dignity and sacredness of man's rights and capacities upon earth, with utter insensibility to his power of living a divine life within himself, and of maintaining the faith "that looks through death," we cannot know.

It is certain that the long and deep melancholy that settled around the close of a stirring and brilliant career, never obstructed those acts of habitual beneficence which testified how much the man was better than his teaching. Sensationalism is a creed which tends to "disenchant earth and to depopulate heaven." But many a deed of mercy contained the implicit refutation of a doctrine to which the doer still lovingly clung. The man to whom belief was humiliation; who neither knew, nor, according to his own theories, could know, whether or not he had an immortal soul; whether or not there is a God; could yet find it in his heart to build a church for the consolation of humble believers, to whom faith is instinctive and doubts unknown.

---

[1] Damiron, *Histoire de la Philosophie en France au XIXe Siècle*, i. 109.

[2] *Elémens d'Idéologie*, i. 39–74, *seq.*

[3] Id. iii. 520–521.

[4] Id. v. 523.

[5] It is stated by the continuators of Quérard (*La Litterature Française Contemporaine*, iii. 251), that Compagnoni's Italian translation, published at Milan in 1819, contains an additional portion of the fifth part, which has not appeared in French. We are not able to verify a statement so opposed to M. de Tracy's express assertion, or to deny it. But no such additional matter appears in the subsequent translation of a selection of De Tracy's writings in the *Collezione dei Classici Metafisici* (Pavia, 1822–26), now before us.

[6] *Elémens d'Idéologie*, ii. 11.

Trade Museums and Trade Schools.

Of the minor works of De Tracy, we have scarcely room to speak. The most noticeable of them is the *Commentaire sur l' Esprit des Lois*, first published in Philadelphia in 1811. This treatise had been sent to Jefferson, in the original French, in June 1809. At that day, it was not at all suited for the meridian of Paris. Jefferson caused it to be translated, and called it "the most precious gift the present age has received." In 1814, the anonymous American book attracted the attention of Dupont de Nemours, who brought it to De Tracy, as a book well worthy to be naturalized in France. At first, De Tracy evaded any expression of his opinion. When Dupont, shortly afterwards, resumed the subject, and spoke of an intention to translate the work he took the MS. from the drawer, and placed it in his hands. When, at length, the book appeared in French, it passed quickly through several editions, and was thrice translated into Spanish.

The political career of De Tracy closed with the fall of Napoleon, whose deposition from the throne he proposed to the senate, on the 2d April 1814. He had always been one of the small knot of temperate but firm opponents of the prevalent policy, who redeemed the senate from political insignificance. He was now one of the five senators appointed to draw up the project of a "constitutional act." Three others of the five were members of the old circle at Auteuil. Louis XVIII. made De Tracy a peer of France under the new constitution, but he rarely appeared in the chamber. The course of events was little in harmony with his convictions or his hopes. To listen to a few favourite authors; to converse occasionally with the sadly lessened group of familiar friends; to keep up the accustomed round of kindly deeds,—were now the only employments which diversified the home-life of an affectionate family. As age crept on, his thoughts dwelt more and more apart. He was wont to spend not a little of his time in gazing from a window on the passing clouds—his eyes still sufficed for that. "I suffer, therefore I am," he would sometimes say. To the last he entertained a fond remembrance of his early pilgrimage to Ferney; and Voltaire was always the author he most preferred to have read to him. The courtier of Marie Antoinette (the rigid ideologist had once been known as *le beau danseur de la reine*), the fellow-soldier of Lafayette, the senator who moved the dethronement of Napoleon, lived to wander, curiously peering about him, amidst the barricades of July, and to hear of, if not to witness, the many stirring incidents of the first six years of the reign of Louis Philippe. He died on the 6th March 1836, at the age of eighty-two. The wish expressed by M. Flourens beside the grave, that his writings, which are very widely scattered, should be collected, as his fittest memorial, has not yet been accomplished. (E. E.)

TRADE MUSEUMS AND TRADE SCHOOLS. The maxim that, by most men, what is seen is much better known and remembered than what is only heard or read of, is sufficiently trite. But the lesson laid up in that maxim, as to the right methods of teaching men how to make the most of those callings by which they have to win both their daily bread and their means of mental culture, is but now beginning to be learned. Between the artisan who works with a clear knowledge of the materials he handles and transforms, and the other artisan who treads his daily round of routine with little more real apprehension of what he is doing than the horse who helps to compose a railway-train has of the steam-engine which propels it, the disparity is very obvious. Yet in many of our great centres of industry, workmen have, in the year 1860, no means of comparing their own treatment of a commercial product with its treatment elsewhere, and even manufacturers themselves are very much at the mercy of chance for their accurate knowledge of the raw materials on which their several enterprises depend.

Trade Museums and Trade Schools.

When copper ore first attracted the attention of the tin-miners of Cornwall, they were wont to give it the contemptuous name of "poder," and to say, by way of proverb, "the poder comes in and spoils the tin." Sometimes, if much of it came, the mines were abandoned. Certain Bristol merchants made for a while no small profit by buying the casual product at some L.3 or L.4 a ton. When, at length, the yellow ore came to be better appreciated, the miners found a new grievance, for now ores of darker colours persisted in obstructing their operations. Many thousands of pounds' worth of the rich black ore (oxide of copper) were washed into the sea.[1] In the same county, only ten years ago, the attention of Mr Warrington Smythe, one of the inspectors of mines, was attracted by a lump of white mineral which lay on the window-sill of a mining-office, and was recognised at a glance. To the question, "What have you there?" the agent replied, "Nothing but 'spar,' of which we have had to throw many tons into the rubbish-heaps." When told that his "spar" was calamine (containing in its pure state above 60 per cent. of oxide of zinc), his surprise was instructive. This incident was related by Mr Smythe at the Government School of Mines, and the story was capped by Dr Lyon Playfair, to whom a lead-smelter had, not long before, brought another lump of white mineral, as a specimen of a large quantity of sulphate of baryta, which he had put aside, to be used in adulterating white-lead. Dr Playfair had to tell him that it *was* white-lead, and much richer than the ore he was accustomed to smelt. Instances of like ignorance of elementary facts, about things which are handled daily, abound in the annals of industry. Nor is it less striking to observe for how long a time processes may be used in the works of one district without attracting any attention from persons pursuing the same occupation in another, although vitally affecting their interests. Thus, in the trial respecting the validity of the late Mr Josiah Heath's patent for his process of employing certain proportions of carburet of manganese in the manufacture of cast-steel, it was deposed on oath by credible witnesses, that the very method in question had been used in the iron-works of Derbyshire in 1824. The Sheffield manufacturers derived from Mr Heath's patent their first knowledge of a process which cheapened the production of cast-steel from 40 to 50 per cent.; which made English iron available, when before only Swedish or Russian could be used; and which brought into Sheffield cutlery important improvements of detail, dependent on the new property of being weldable, which the manganese communicated to the steel thus manufactured. And the interval of total ignorance in the Yorkshire iron-works of what was being done in the Derbyshire iron-works, was an interval of fifteen years, in an era of vast commercial progress.

What may be hoped for from museums and schools of industry.

The best conceivable provision of Trade Museums and Industrial Schools will not convince all men of the short-sightedness of that policy which has so often rendered manufacturers far more ready to make a common purse for the ruin of an inventor than for his reward; but it will at all events make it unlikely that the hard-won recompense of inventive genius and long labour, shall be lost for want of a record of what had been precedently attained. To secure from loss what has once been gained, and to make the humblest worker share in the acquirements of the most gifted, are among the prominent objects of that thorough industrial education which is destined, we hope, to achieve great things, although it is as yet but in the cradle.

Probably, Descartes was the first thinker who planned, with something like precision, a methodical Trade Museum.

[1] Pryce, *Mineralogia Cornubiensis*, 62.

Trade Museums and Trade Schools.

Bacon's idea of a trade museum;

and that of Descartes.

Vaucanson's museum.

But in this particular, as in some others, he may well have been indebted to our own Bacon for the suggestion. The outline of such an establishment is plainly indicated in that passage of the *New Atlantis* which describes the "two very long and fair galleries containing patterns and samples of all manner of the more rare and excellent inventions;" and in that other passage which records the duties of the "merchants of light," of the "depredators," and of the "three that collect the experiments of all mechanical arts."

Descartes' scheme was to gather for each trade (*corps de métier*) the tools, machinery, and other apparatus needful to its practice, and to attach to these collections a lecture-hall, with competent teachers. But it was destined to remain only a scheme for almost a century and a half. The Academy of Sciences, indeed, in the discharge of its function of reporting from time to time on new discoveries and processes, collected a multitude of machines and models, but it never exhibited them to the public, nor did it take much pains even for their preservation. It was not until a few years before the Revolution that the mechanician Vaucanson at length formed a museum, destined eventually for public and permanent instruction. At his death he bequeathed the collection to the State. The then Comptroller-general of Finance acquired by purchase the house (Hotel de Mortagne) in which it was placed, and appointed Vandermonde to be keeper. A law was also passed which required from all inventors who should receive public encouragement or reward the deposit of specimens or models of their respective inventions. Between 1783 and 1792 the collection was augmented by 300 new machines and models.

Conservatoire Impérial des Arts et Métiers (Paris).

In the stormy times which followed, the museum was preserved, and even somewhat increased, but no efficient organisation was given to it until the period of the Consulate, when, under the superintendence of Joseph Bonaparte, as Home Minister, the *Conservatoire des Arts et Métiers* (the erection of which had been decreed by the Convention in 1795) was definitively established. In 1810, under Chaptal, a school for spinning was attached to the Conservatory. The accessions to the museum during the Empire were considerable. Ferdinand Berthoud bequeathed to it his fine collection of time-keepers and of horological mechanism; and the remarkable "Cabinet de Physique," formed by Dr Charles, was obtained by purchase. In 1819, three professorships were founded—(1.) Mechanics, Charles Dupin; (2.) Chemistry, Clément Désormes; (3.) Industrial Economy, J. B. Say. A fourth chair, that of Physics applied to the Arts, was created in 1829, and was filled by M. Pouiller, who retained it for twenty years with much distinction, and also discharged the office of administrator or director.

Government of the Imperial Conservatory.

Under the Restoration (from 1817) and until 1839, the general management of the Conservatory was entrusted to (1.) an ordinary committee, of which the professors were members; and (2.) a board of improvement (*Conseil de perfectionnement*), composed of six members of the Academy of Sciences, and six merchants, manufacturers, and agriculturists; and renewable by thirds, triennially. Of this board, Berthollet, Chaptal, Arago, Gay Lussac, Mirbel, and Molard, were members. In 1839 ten additional chairs for the applications of the several sciences to arts and trades were established, and their respective professors formed the "Board of Improvement." Under this new organisation, the schools seem to have been fostered at the cost of the museum. Ten years afterwards, Colonel (now General) Morin became chairman of the board and chief administrator, and addressed himself to the task of giving development to both departments evenly. In 1853 three new professorships were created:—(1.) Spinning and weaving; (2.) Preparing, dyeing, and printing woven fabrics; (3.) Zootechny. The board was also reconstructed, much on the plan of 1817.

The establishment is placed under the control of the Minister of Commerce. Its staff includes a director, a sub-director (who is an engineer), fourteen professors, a financial officer, a keeper of the museum, a librarian, and several subordinate officers. Each professor must give two lectures weekly during the six months of the session of the schools (November to April). The budget is defrayed from national funds.[1]

Trade Museums and Trade Schools.

Classification of the museum.

The museum includes illustrations of every important manufacture and industrial pursuit of France. Its classification is as follows:—(1.) Motive power machines (*récepteurs*); (2.) Hydraulic machines; (3.) Geometry; (4.) Metallurgy; (5.) Calculating machines; (6.) Measuring and astronomy; (7.) Timekeepers; (8.) Arts of construction; (9.) Cinematics (*Cinématique*); (10.) Dynamometric apparatus; (11.) Hoisting and shifting machinery; (12.) Machine-tools; (13.) Printing, engraving, and papermaking; (14.) Heating, lighting, and domestic economy; (15.) Ceramic arts; (16.) Physics; (17.) Agriculture; (18.) Weights and measures; (19.) Locomotion; (20.) Miscellaneous manufactures; (21.) Spinning and weaving; (22.) Preparing, dyeing, and printing woven fabrics; (23.) Tunisian and Chinese collections; (24.) Chemical apparatus and products; (25.) Industrial fine arts.[2]

The Ceramic collection is very fine, as is also that illustrative of the weights and measures of various nations. Amongst the more especial curiosities of the museum is Vaucanson's loom, the primitive type of the Jacquard loom; a series of models of descriptive geometry in silk thread, so made that the surfaces may be modified or transformed at pleasure; and the original arithmetical machine of Pascal, with this autographic inscription: "*Esto probati instrumenti symbolum hoc: Blasius Pascal, Arvernus, inventor*, 20 *Maii* 1652." The Conservatory occupies the site of that ancient royal priory of St Martin-in-the-Fields, which furnished so large a contingent to the illustrious phalanx of literary Benedictines.

Musée des Thermes et de l'Hotel de Cluny (Paris).

The Museum of the Hotel de Cluny is largely illustrative of arts and trades, especially of mediæval times; and, like the Imperial Conservatory, is placed in a building rich in historical associations. The Hotel de Cluny occupies the site, and includes some of the remains of that palace of the Cæsars in which Julian the Apostate was proclaimed emperor in the year 360, and which became the residence of the kings of the first and second races. Here, towards the close of the fifteenth century, the Benedictines of Cluny raised their sumptuous hotel, partly on the Roman foundations; here Mary Tudor, sister of Henry VIII., lived during her mourning for Louis XII.—her chamber is still called the chamber of the White Queen;—and here James V. of Scotland was married to the daughter of Francis I. During the Revolution, part of this edifice was let to a cooper, and was afterwards granted to the Hospital of Charenton.

The rich collections of the cabinet-work, pottery, painted glass, manufactures in metal, woven fabrics, and other industries of the middle ages and of the period which followed, were first brought together by the late Alexandre du Sommerard, who acquired the Hotel de Cluny for their reception in 1833, and died in 1842. The museum was purchased for the public in 1843, and has since been augmented. In 1855 it received a liberal bequest from Count Honoré de Sussy, including some fine tapestries of Beauvais, which had once belonged to Sully's country-house at Rosny. Amongst the later industrial productions, English visitors sometimes notice—not without wondering how it came thither—a grand cabinet of ebony, labelled as having been "sent from Spain by Nelson." This museum is placed under the general control of the Ministry of State, by which its annual budget is prepared.[3]

Ecole des Arts et Manufactures (Paris).

The *School of Arts and Manufactures* was established, chiefly by private enterprise, in 1829, with the special object of educating good machinists, metallurgists, and chemists, fit to become the managers and foremen of workshops and factories. Students under eighteen years of age are not admitted; and a good elementary training is the condition of admission above that age. The school received assistance both from Government and from the Councils-General of the Departments, more particularly by the provision of exhibitions for poor students; and it has been signally successful. In 1852, it was ascertained that more than 500 foreigners had passed through the establishment, coming not only from the known industrial countries of Europe, but also from North and South America, the East and West Indies, Turkey, and the Mauritius.[4]

Musée de Sèvres.

The great *Museum of Pottery, Glass, and Enamels at Sevres*, has been forty years in course of formation, and is now estimated to be worth L.25,000 sterling. Besides many thousands of ceramic specimens, arranged in the main so as to illustrate the technical history of the art, it has plaster-casts of the most remarkable productions of the Sevres manufactory, with models of figure-pieces by the best modellers of France. In 1852, there were here exhibited single panes of plate-glass nearly five feet six inches square,

[1] Morin, *Catalogue des Collections du Conservatoire Impérial*, &c., *passim*; Block, *Dictionnaire de l'Administration Française*, 535-537.

[2] The catalogue of the museum has some interesting notes, but it is impossible to praise its execution generally. Scarcely any pains are taken to supply dates, nor does it seem that the compiler regards chronological order as at all important. In Class I., for example, "Frison's steam-engine, deposited in 1804," appears as No. 5; James Watt's steam-engine is No. 14.

[3] *Ministère d'Etat: Musée des Thermes*, &c., *passim*.

[4] Playfair, "Notes on Foreign Trade Schools," &c., in *Appendix to Second Report of Commissioners for the Exhibition of* 1851, 60-70.

Trade Museums and Trade Schools.

La Martinière (Lyons).

and half an inch thick, admirably painted, and valued at L.400 each.

At Lyons there is a School of Arts and Trades, called *La Martinière*, which was founded by the city in 1833, in pursuance of the last will of Major-General Claude Martin, who entered India as a French soldier under Lally, served with bravery, but soon, in resentment of what he deemed to be oppressive conduct on the part of his superior, deserted to the British. In this new service he attained the rank of colonel, and laid the foundation of the enormous fortune which he afterwards realised as banker to the Nabob of Oude. At his death he bequeathed large sums, chiefly for educational purposes, to the cities of Calcutta, Lucknow, and Lyons. The Trade School and Museum of Lyons thus established have already given to its factories chemists and foremen, by whom the ancient renown of that centre of industry has been largely increased.

Trade schools of Prussia, Bavaria, &c.

Prussia had, in 1852, twenty-five provincial trade schools, affording an extensive course of technical instruction to about 1200 scholars, of whom the most successful pass, in due course, into the Central Trade Institute at Berlin, which is maintained, from national funds, at an annual cost of about L.7000. Here the curriculum occupies three years, and those students only exhaust it who evince satisfactory progress in the early stages.[1] Bavaria has a central school of trade and agriculture at Munich, with a rector and 13 masters, which was attended in 1854 by an average number of 330 students; another at Nuremberg; and a third at Augsburg, each with about 250 students. Each of these three cities has also a superior polytechnic school. That of Munich devotes itself chiefly to the arts and trades connected with building; that of Nuremberg chiefly to manufactures in metals; that of Augsburg to woven fabrics and to dyeing. The aggregate number of pupils in 1854 was 470. In an able report addressed to Lord Clarendon (then Foreign Secretary) in 1854, Mr Consul-General Ward testifies to the good working of the system, which dates from 1833.[2] Most of the other states of Germany have like institutions, liberally supported; so that, in the whole of that country, not less than 13,000 students receive the high technical and scientific training of the trade schools and polytechnic institutions, and more than 30,000 workmen annually receive like instruction of a more elementary kind.[3] Belgium has been slow to enter into this field, but is now making progress in it.[4]

Trade museums and schools in Great Britain—effects of Exhibition of 1851.

Among the beneficent results of the Great Exhibition of 1851, not the least conspicuous has been the attention it awakened to the importance of systematic industrial instruction; to the poverty of the then existing means and appliances for promoting it in this country; and to the fact that, in spite of our immense commercial advantages, and our well-won commercial successes, there really were some matters, closely affecting commerce, in which Britons might profitably go to school to foreigners. It chanced that the financial prosperity of that Exhibition made means available for an important contribution towards the direct supply of the much-wanted Trade Museums and Trade Schools. But what has thus been done directly, valuable as it is, is of less weight than the impulse which has been given, indirectly, to other energies; and, above all, to the thorough working out of institutions of which we had the germs already, although up to that time they had been turned to small account.

Museum of Economic Geology (London).

The first steps towards anything deserving to be called a "Trade Museum," in the United Kingdom, had arisen incidentally out of the geological survey, and were taken in 1837. In the course of that survey, many specimens of rocks, minerals, metallic ores, and earths, were from time to time collected, and for these the late Sir Henry De La Bèche had obtained a place of deposit in Craig's Court, London. Under his auspices, the collection grew apace. In 1839, the late Mr Richard Phillips was appointed its curator; a library was commenced; facilities for chemical and mineralogical analyses were provided; and a foundation was laid, by classes for instruction in chemistry and metallurgy, for what is now rapidly becoming an excellent school of science applied to mining and the allied arts. But that Great Britain, whose mineral products are estimated to be worth L.28,000,000 annually, should have remained without any adequate mining museum or mining school until 1851, will hereafter look more wonderful than it looks now.

The Museum of Practical Geology was inaugurated on the 14th May 1851, and the School of Mines in the following November. The building is itself an illustration of some of its objects. The façade towards Piccadilly is constructed of Yorkshire dolomite, or magnesian limestone; the steps of Peterhead red granite; the doorway slab is Penrhyn slate; the inner-steps are Portland stone; the base within the vestibule is Irish granite; the upper portion, Derbyshire alabaster; the pilasters are of Peterhead grey granite. The Museum is classified into these nine divisions:—(1.) Pottery and Porcelain; (2.) Glass; (3.) Enamels; (4.) Mosaics; (5.) British minerals and metals; (6.) Foreign minerals; (7.) Colonial ores; (8.) Models; (9.) Palæontological collection. The mineral ores are so arranged as to show all the varieties and their uses. A separate series of specimens and models is so arranged as to exhibit many of the conditions under which mineral lodes are discovered. Like their forefathers, who condemned the rich copper ore as "poder," the mass of miners are loath to give credence to anything which seems strange to them. They express proverbially their disinclination to believe in discoverable laws by saying, "*Where* it is, there it is." But here, in a model of part of a mining district in Cornwall, they are made to see how, at some distant period, cracks have been made in the rocks traversed by the mineral lodes; how those cracks became channels through which water passed to a considerable depth; and how, in process of time, those cracks became full of earthy or metallic minerals, which, by the force of crystallisation, not only enlarged the original fissures, but formed new lateral ones. There is also a series of models of coal formations, of steam and water-pressure engines, and of mining apparatus of all kinds. Amongst the minor curiosities is a gilt copper cup, such as the German miners show to travellers, with the inscription—

Trade Museums and Trade Schools.

"Gott zeigt an mir sein grose Macht,
Der aus Eisen Kupfer macht."

The cost of the museum and school, together with that of the Office of Mining Records (begun in 1838, and now of very great public value), is about L.6300 a year, of which sum L.3900 is devoted to the establishment (including eight lecturers); about L.1300 to the purchase of specimens, models, books, and records; the residue being applied to miscellaneous and incidental expenses. The school was attended in 1858 by 12 matriculated and 55 other students; the chemical laboratory by 74, and the metallurgical by 17 students. There were four courses of lectures, attended by from 440 to 600 working-men; and the museum during the year was visited by 24,877 persons, showing an increase of more than 7000 as compared with the visitors of 1857.[5]

Museum of Economic Botany (Kew).

The *Museum of Economic Botany* in the Royal Gardens at Kew was commenced in 1848, and is intended to contain vegetable products of all kinds, both raw materials and their results, whether woods, dry-stuffs, drugs, resins, or fibres, used in arts, manufactures, medicine, or domestic economy. The collection is large, well chosen, and of great practical value for commercial purposes. And in its formation, we may boast to have set an example to most of the great capitals of Europe, since, in this department, nearly, if not quite, all of them have been neglectful. Neither its cost nor its number of visitors can be stated separately from the cost and frequentation of the splendid gardens with which it is connected; but it may be mentioned that the annual aggregate number of visitors, which in 1848 was 91,708, had increased in 1856 to 344,140.[6]

Schools of design 1837–1849.

The Museum of Economic Botany is still, as the Museum of Economic Geology was formerly, under the general control of the Board of Works. But the latter, like all the other trade museums and schools, both metropolitan and provincial, is now a branch of the Department of Science and Art, and therefore under the control of the Education Board. The department itself has grown, by a series of developments, out of the Normal School of Design, founded by the Board of Trade towards the close of 1836, in pursuance of the recommendation of Mr Ewart's committee (of that and the preceding years) "on the best means of extending a knowledge of the arts of design." From 1837 to 1849, the original school and its provincial off-shoots gave more or less of instruction in design to upwards of 15,000 pupils. The schools assumed, of necessity, a more elementary character than had been at first contemplated. Their proper business, as defined by the council, was "to teach the art of designing ornament, both in respect of its general principles and its specific applications to manufactures."[7] An elaborate inquiry by another committee of the House of Commons established the fact, that this end had been very insufficiently attained. And hence, in 1852, its further prosecution was entrusted to a department of the Board of Trade, called Department of Practical Art, with a general superintendent (at L.1000 a year) and an art-superintendent at

Schools of design under "Department of Practical Art."

[1] Playfair, *ut supra*.

[2] Ward, "Report on Bavarian Educational Institutions for Practical Science and Art," in the *Appendix to Third Report of Commissioners on Exhibition of* 1851, 244–262.

[3] *Second Report of Commissioners of the Exhibition of* 1851, p. 13.

[4] Piercot, *Etat de l'Instruction supérieure* (1854), pp. 22, 101, *et seq.*

[5] *Estimates for Civil Services*, Class IV.; Hunt, *Descriptive Guide to the Museum of Economic Geology* (1857), *passim*.

[6] Hooker, "Report on Kew Gardens," appended to *Estimates for Civil Services*, Class I., pp. 21–24.

[7] *Report from Select Committee on the School of Design* (1849), iv.

Trade Museums and Trade Schools.

L.300). During the first succeeding year, 20 local schools, with 4868 students, shared amongst them a parliamentary grant of L.7500, to which sum another of nearly equal amount was added from school fees, subscriptions, and other sources. Lectures, scholarships, and special classes for technical instruction were established, and a Museum of Manufactures was begun by means of a parliamentary grant of L.5000.[1]

Establishment of a Museum of Manufactures, &c.

At this period the final settlement of the accounts of the "Exhibition of 1851" showed an available balance of L.186,436. Suggestions for its application had been previously invited from the principal towns and corporations which had contributed by public subscription towards the creation and the financial success of the Exhibition itself. The replies were, of course, very diversified. But on mature consideration of all the plans and suggestions which had been submitted, the commissioners determined to apply their surplus towards the establishment of a great metropolitan institution, which should serve to increase the means of industrial education, and extend the influence of science and art upon productive industry: and so to apply it as to elicit like action, and, if possible, like contribution, on the part of parliament. Toward this end they

Appropriation of the surplus funds of Exhibition of 1851.

appropriated L.150,000 for the purchase, in part, of an estate at South Kensington, and obtained parliamentary grants for the completion of the purchase and for building thereon, amounting to the further sum of L.177,500. The commissioners had already been permanently incorporated by charter; in 1854 they received statutory powers for "facilitating the formation of a site for institutions connected with science and the arts."[2]

The parliamentary grant previously made towards the formation of a Trade Museum, with a special view to purchases from the Exhibition of 1851, was aided by large voluntary contributions from the exhibitors. Of the 7381 British and Colonial exhibitors, 1232 made valuable gifts; and of the 6556 foreign exhibitors, 803 did the like. The merely commercial value of the articles thus given is estimated at L.8718, but probably no collection of equal intrinsic value could have been formed even with an expenditure of thrice that sum. The result was largely increased by the labours of Pro-

Museums of Animal Products and of Food.

fessor Solly, carried on with the special purpose of forming as complete a collection as might be possible of animal products applied to industrial purposes, no such series having been previously formed within the United Kingdom, and also by those of Dr Lyon Playfair in the formation of the admirable "Food Museum," now exhibited at South Kensington, in conjunction with the other collections which illustrate the building arts and the multifarious applications of the arts of design to trade and daily life. The Economic museums, both of geology and of botany, shared in the advantages of the parliamentary grant and in the liberality of the exhibitors of 1851. All these collections were placed under the management of the "Department of Science and Art."

Large resort of the public to South Kensington Museums.

During the 54 public days on which the new museum was open in its first year, it received 42,134 visitors; and during the 47 student days, 3426 students. In 1854, the aggregate number of visitors to the museum of the department collectively was 104,823. In 1855, it had increased to 331,000; the aggregate number of visitors in 1858 to all the museums and collections under the department, was 875,898.[3] In 1858, the visitors to the South Kensington Museum alone amounted to 456,288; and in 1859, to 475,365. On the 31st March 1860, the aggregate number of visitors to this one museum, amounted to 1,351,594 persons. This rapid and remarkable progress (extending both to students and to the public at large) is due to two causes:—First, to the energetic improvement and liberal management of the collections; secondly, to the system of opening some of them to the public during the evening (at South Kensington, from seven o'clock until ten, on two public and on one students' evening in each week) as well as during the ordinary hours of the day.

On this point, the select committee appointed by the House of Commons in 1860, to consider what further facilities could be afforded "for promoting the healthful recreation and improvement of the people," by increased access to public institutions, report that the experiment has been tried with the most successful results; that not the slightest complaint has been made, either as to the effects of gas-light or the behaviour of the visitors; that in like manner, "the National Gallery, and portions of the British and other public museums could safely be visited in the evening, if proper precautions against fire can be taken;" and finally, that in order to extend the advantages of such museums throughout the country, there should be loans of the articles they contain (of course under prudent and necessary restriction) "wherever responsible parties would provide suitable premises for their exhibition."[4]

Circulating museums.

To some extent the plan of a circulating trade museum has been tried already. A collection specially prepared for this purpose has visited 22 different localities, including our chief manufacturing towns, and has been seen by 238,882 persons. In five Irish towns alone, nearly 100,000 persons came to see it.

Trade Museums and Trade Schools.

The *Scottish Industrial Museum* at Edinburgh, which includes a fine museum of natural history, was organised in 1853. Parliament granted L.7000 towards a site. The Lord Provost and Town Council presented an additional piece of land, and also, jointly with the University, transferred to the Crown their rights in the collections (chiefly of natural history) theretofore kept at the University. The Highland Society gave a valuable collection of ores and models. A further parliamentary grant of L.10,000 towards the erection of the new museum was made in 1858. This institution has had two directors of eminent endowments—Professor Edward Forbes and Dr George Wilson,—and has had the misfortune to lose both of them by early deaths. The Industrial collections are not yet available; but the Natural History Museum was visited in 1858 by 88,831 persons.[5]

Scottish Industrial Museum.

The *Museum of Irish Industry* was founded in 1845. Its galleries contain collections of the rocks, metallic ores, minerals, clays, &c., of Ireland, and of her Fauna and Flora as far as relates to their industrial applications. Each material is traced through its industrial history, so as to exhibit its treatment and its products. Where the raw material is not fully turned to account in Ireland, illustrations from other countries are shown so as to indicate its capabilities. A separate department is devoted to the exhibition of specimens of rocks and fossils collected by the officers of the Irish Geological Survey. The total expenditure on this museum from 1st April 1845 to 31st March 1854, was L.23,255: of which sum, rent, buildings, fittings, and furniture cost L.14,640; specimens and books, L.1176. The salaries amounted to L.5510, and the incidental expenses to L.1929. The establishment includes a director, four lecturers, and two chemists. The number of visitors to the museum in 1858 was 33,341. In addition to the Industrial Museum, the *Royal Dublin Society*, the plan of which includes similar objects, and which possesses a valuable museum as well as schools, receives a yearly grant of about L.6000.

Museum of Irish Industry.

Industrial schools and classes in the provinces.

The most important assistance which the Department of Science and Art gives to industrial schools and classes throughout the country, consists in the supply of trained and certificated teachers; in annual grants of L.10, L.15, or L.20, according to the several grades of competency; in systematic inspection and examinations; in according prizes to successful students; and in diffusing a knowledge of the best methods and appliances of industrial instruction. In 1858, the number of masters and mistresses in training at South Kensington was 65. In the same year, the number of associated provincial schools, teaching design and its applications to trade, was 77, with 68,212 students. The total amount of school fees was L.12,735. The number of associated "Trade and Navigation Schools" was 18, with 3302 students. The School of the Board of Manufactures at Edinburgh was also brought into connection with the department in that year.

The results of this expenditure, as given in the following table—which, for the United Kingdom, amounts, in the aggregate, to L.547,138, 12s. 9d.—immature as they must needs be, already more than justify it. When compared with the magnitude of the interests which are at stake, it becomes insignificant. No public expenditure, when once brought under efficient parliamentary control, is more certain to ensure abundant fruit in the elevation and wellbeing of the workman, in the extension and security of trade, and in the increase of public contentment by means of the increased participation of public wealth in some of its highest forms.

What is now being done in this direction, whilst it broadens that public domain in which rich and poor have a common interest, is so done as to incite, not to deaden, private exertion. What is now most wanted is an increase of municipal action on a like principle. The Act of the 18th and 19th Vict. c. 70, enables towns and boroughs to levy a rate for the support of schools of art or industry and of museums, or of either; but it has yet to be brought into effective operation. The first necessity in establishing either an industrial school or a museum is the provision of suitable premises. This is usually the chief difficulty, and is sometimes an insuperable one. Here the Act will intervene most advantageously, whenever public opinion shall have

[1] *Estimates for Civil Services*, class iv.

[2] 17 and 18 Vict. I. (*Local Acts*).

[3] *Reports of the Department of Science and Art*, 1852–1858, *passim*; *Minutes of Evidence before Select Committee on Public Institutions*, 1860, pp. 1–10, *et seq.*

[4] *Report of Select Committee on Public Institutions*, 1860, iv.

[5] *Estimates for Civil Services, ut supra*; *Reports, ut supra*.

aroused itself to the value of such institutions, locally supported and locally governed, but sharing in the advantages of national inspection and of nati onal co-operation.

The following table exhibits the total expenditure of the department, classified as accurately as the character of the returns made to Parliament will permit:—

Expenditure on Museums and Schools within the Department of Science and Art, 1851–60.

Year.	London Museums and Schools, and General Management.	Provincial Schools and Circulating Museum.	London and Provincial Institutions, collectively.	Irish Industrial Museum and Royal Dublin Society.	Edinburgh Industrial Museum.	Total for United Kingdom.
	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
1851–52	... ...	... ...	19,098 18 4		... ...	
1852, April–December	... ...	... ...	14,643 16 1		... ...	
1853–54	23,276 0 0	15,050 0 0	38,326 0 0	50,786 5 10[1]	... ...	168,599 3 6
1854–55	25,022 8 0	20,721 15 3	45,744 3 3		... ...	
1855–56	30,702 11 10	23,302 10 11	54,005 2 9	11,651 17 2	7,738 17 6	73,395 17 5
1856–57	17,888 2 5	28,773 10 2	46,661 12 7	11,647 17 5	2,287 9 0	60,596 19 0
1857–58	27,765 7 6	34,461 0 0	62,226 7 6	10,926 15 0	1,933 16 0	75,086 18 6
1858–59	31,492 0 6	30,762 3 10	62,252 4 4	10,882 11 6	11,922 2 0	85,056 17 10
1859–60	32,832 4 6	37,860 0 0	70,692 4 6	10,986 16 0	2,723 16 0	84,402 16 6
Total to 1860	188,978 14 9	190,931 0 2	413,650 9 4	106,882 2 11	26,606 0 6	547,138 12 9

(E. E.)

TRADITION, something handed down from one generation to another without being written. Thus the Jews pretended that, besides their written law contained in the Old Testament, Moses had delivered an oral law, which had been conveyed down from father to son; and thus the Roman Catholics are said to value particular doctrines supposed to have descended from the apostolic times by tradition.

TRAFALGAR, a cape on the S.W. coast of Spain, in the province of Cadiz, N.W. of Gibraltar, N. Lat. 36. 10., W. Long. 60. 1. It is low, and terminates in two points, on the most easterly of which stands a round tower. Trafalgar is memorable for the victory of Nelson, October 21, 1805, in which he was mortally wounded. For an account of the battle, see BRITAIN and NELSON.

TRALEE. See KERRY.

TRAJAN. See ROMAN HISTORY, § 47.

TRALLIANUS, ALEXANDER, or Alexander of Tralles, a medical writer, was a native of Tralles, a city of Lydia, and lived about the middle of the sixth century. He is the author of a work, divided into twelve books, in which he treats of bodily distempers. He was the first to open the jugular vein, and to use cantharides as a blister for the gout. Though he appears, on the whole, to have been a rational physician, yet there are passages in his writings that savour of enthusiasm and superstition. Dr Friend, in his *History of Physic*, styles him one of the most valuable authors since the time of Hippocrates. See likewise Dr Milward's *Trallianus Reviviscens; or, an Account of Alexander Trallian, one of the Greek Writers that flourished after Galen, being a Supplement to Dr Friend's History of Physic*, Lond. 1734, 8vo. The Greek text of his principal work was first published by Jac. Goupylus, Lutet. 1548, fol. It was reprinted, and was then accompanied with a Latin version by Jo. Guinterius, Basil, 1556, 8vo. He is likewise the author of an epistle on worms, *De Lumbricis*, which was published, in Greek and Latin, by Mercurialis, in his *Variæ Lectiones*, Venet. 1570, 4to.

TRANENT, a village of Scotland, in the county of Haddington, near the Firth of Forth, 9 miles east of Edinburgh. It contains a substantial parish church, Free and United Presbyterian churches. The people are mostly employed in coal pits and sandstone quarries in the vicinity. Pop. 2096.

TRANI, a seaport of Naples, on the Adriatic, in the province and 25 miles N.W. of Bari. It is enclosed by walls and bastions, and has a citadel, but is not a place of any great strength. Some of the streets, especially near the harbour, are good, and lined with handsome houses; but, for the most part, the town is ill built. The cathedral is a large and ancient building, with a lofty spire, but its rich ornaments are not in very good taste. There are many other churches, several convents, a theatre, school, and orphan hospital. In the vicinity an esteemed sweet wine is produced; and the figs of Trani form, along with corn, oil, and silk, profitable articles of trade. The harbour was once deep and good, but has got silted up. Some cotton, grown in the vicinity, is here made into coarse cloth. Pop. 14,000.

TRANQUEBAR, a town of British India, presidency of Madras district, and 51 miles east of Tanjore, on a small inlet of the Bay of Bengal. It is surrounded by walls and bastions, and protected by a small fort, in which stand the government offices. The chief other buildings are a Roman Catholic and several Lutheran churches. The territory of Tranquebar has an area of 15 square miles. It has a healthy and not very hot climate, and produces rice, palms, mangoes, and various fruits. The territory formerly belonged to Denmark, but was ceded to England in 1845 for a pecuniary compensation. Pop. of the territory (1844) 23,426.

TRANSCAUCASIA. See RUSSIA.

TRANSFIGURATION, that miraculous event in the life of our Saviour which is recorded in Matt. xvii., Mark ix., Luke ix. We are there told that he took Peter and James and John up into an high mountain, and was transfigured before them, his face shining as the sun, and his raiment appearing white as the light. Moses and Elias were seen in conversation with him, and a voice came out of a cloud saying, "This is my beloved Son, in whom I am well pleased; hear ye him." An ancient tradition assigns Mount Tabor as the scene of this event; but as this height is 50 miles from Cæsarea Philippi where Christ last taught, it is now generally supposed to have been a mountain much less distant—namely, Mount Hermon. There can be no doubt that one of the objects to be served by this event was to strengthen the faith and encourage the hearts of the disciples, who were destined soon to see Him in whom they believed taken from them and put to an ignominious and shameful death. The apostle Peter, in his second Epistle (i. 17, 18), and probably only a short time before his death, alludes with peculiar satisfaction to the voice from heaven, which "we heard when we were with him in the holy mount."

[1] This item includes the expenditure on the *Museum of Irish Industry* from its foundation in 1845.

Transmigration ‖ Treason.

TRANSMIGRATION. See METEMPSYCHOSIS.

TRANSPORTATION See PRISON DISCIPLINE.

TRANSUBSTANTIATION, in theology, the conversion or change of the substance of the bread and wine in the eucharist, into the body and blood of Jesus Christ; which the Romish church supposes to be wrought by the consecration of the priest.

TRANSYLVANIA. See HUNGARY.

TRAPANI. See SICILIES, TWO.

TRAVANCORE, a native state of Southern India, under the superintendence of the presidency of Madras, lying between N. Lat. 8. 1. and 10. 21., E. Long. 76. 14. and 77. 38.; bounded on the N. by Cochin and the British district of Coimbatoor, E. by those of Madura and Tinnevelly, S. and W. by the Indian Ocean. Area 4722 square miles. The whole country is traversed from north to south by the chain of the Western Ghauts, which is here very irregular, and forms in some places the eastern boundary of Travancore. They terminate in a bold hill, a little distance from Cape Comorin; and the range in some places attains the height of 7000 feet above the sea. From these mountains the various rivers that water the country flow, generally westwards, into the sea, which they enter either directly, or through what are called the Back Waters, a series of shallow lakes parallel to the coast, and communicating with the sea. The largest river, the Perryaur, flows north-west from the mountains, and falls into one of these. The coast, which is about 160 miles in length, is low and sandy, in many places covered with trees to the water's edge. There are many roadsteads, which afford safe anchorage in fair weather, but no good harbours along the coast. Cape Comorin, remarkable as the extremity of the Indian peninsula, is a low sandy point, and there are nowhere more than a few low cliffs along the coast. Although the whole of the country lies in a very warm latitude, the heat of the climate is moderated in the east by the elevation of the ground, and in the west by the nearness of the sea and the abundance of rain; for the climate is remarkable for moisture, which makes it enervating, though not unhealthy, for Europeans. The mountains consist chiefly of granite and other primitive rocks, but iron is the only important metal that exists in the country. In the loftier regions a light gravelly soil prevails; but in the lower ground there is a deep rich mould, on which rice, palm trees, mulberries, and other vegetables flourish. In the more secluded parts of the mountains there are large forests of teak and other timber, in which elephants, tigers, leopards, wild boars, buffaloes, elks, and other wild beasts abound. Of birds, the country contains the vulture, hawk, raven, pea-fowl, parrots of various kinds, and great numbers of water-fowl. The rivers and lakes abound in fish and alligators, and the latter are often very ferocious and destructive. The majority of the people are Hindoos; but there is also a large number of Mohammedans, chiefly the descendants of Arabs who have settled on the coast; and there are proportionally more Christians in Travancore than in any other part of India. The Christians are either of the Syrian or Jacobite church, subject to the Patriarch of Antioch, or Romanists, or (a comparatively small number) Protestants, and their entire numbers are estimated at 150,000. The state is governed by a Hindoo rajah; but there is a British resident at the capital, Trivandrum; and the British government is bound to protect and assist the rajah on all needful occasions. The first alliance between Travancore and the East India Company took place in 1784. Pop. 1,011,824.

TREASON, a general appellation to denote not only offences against the king and government, but also that accumulation of guilt which arises whenever a superior reposes a confidence in a subject or inferior, between whom and himself there subsists a natural, a civil, or even a spiritual relation; and the inferior so abuses that confidence, so forgets the obligations of duty, subjection, and allegiance, as to destroy the life of any such superior or lord. It is a general name, in short, for treachery against the sovereign or liege lord. Treason was up to 1828 divided into *high* and *petty* treason. Now, however, petit treason has been abolished. High treason (which is equivalent to the *crimen læsæ majestatis* of the Romans, as Glanville denominates it also in the English law) is an offence committed against the security of the king or kingdom, whether by imagination, word, or deed. In order to prevent the inconveniences which arose in England from a multitude of constructive treasons, the statute 25 Edw. III., stat. 5, c. 2, was made; which defines what offences only for the future should be held to be treason. Two late acts were passed in 1842 and 1848 for the protection of her Majesty's person.

Treasure-Trove ‖ Trebizonde.

TREASURE-TROVE (French *trouver*, to find, Latin *thesaurus inventus*), is where any money or coin, gold, silver, plate, or bullion, is found hidden in the earth or any private place, the owner thereof being unknown; in which case the treasure belongs to the king; but if he that had hid it be known, or afterwards found out, the owner and not the king is entitled to it.

TREASURY, the place where the revenues of a state are received, preserved and disbursed. The treasury is one of the most important departments of the executive government in England. It has under its control every branch of the revenue and expenditure of the country. The lord high treasurer was formerly the sole head of the treasury. On the Union with Scotland in 1707, he became lord high treasurer of Great Britain; and in 1816, after the Union with Ireland had taken place, he was made lord high treasurer of the United Kingdom. The office was first put in commission in 1612, and since the reign of George I. it has always been executed by the lords commissioners of the treasury, who now form the treasury board. This board consists of the prime minister, or first lord of the treasury, the chancellor of the exchequer, and three junior lords. They are appointed during pleasure by letters patent under the great seal. The offices which are more or less immediately subordinate to the treasury are—the commissariat; the treasury solicitor's office; the paymaster-general's; the exchequer; the national debt office; the public works and loan office; the royal mint; her Majesty's works and public buildings; her Majesty's commissioners of woods, forests, and land revenues; the general post office; the customs; the inland revenue office; the audit office; and the stationary office. The treasury board sits twice a-week, on Tuesdays and Fridays, and is never attended by the prime minister, or very rarely by the chancellor of the exchequer.

TREBIZONDE, or TREBISOND, a pashalic of Asiatic Turkey, bounded on the N. by the Black Sea; E. by the district of Guriel and the pashalic of Akhalzik; S. by that of Erzeroom; and W. by that of Sivas. It is almost entirely a mountainous country. The mountains rise gradually from the very edge of the sea to the height of 4000 or 5000 feet; and they are for the most part covered with forests, so that the coast has a very picturesque appearance. Chestnut, beech, walnut, alder, poplar, willow, and other trees constitute the forests; while towards the tops of the mountains fir is the prevailing growth. The rugged nature of the surface, and the cold, rainy, changeable climate of the country, render it impossible for the productions to supply the home consumption, although every spot capable of cultivation is made use of. There are, however, some fertile tracts, which yield maze, wheat, barley, hemp, flax, and tobacco. Vines and figs are also grown; but are very late of ripening. The chief exports are timber, tar, charcoal, linen, leather, soap, salt fish, and wine. The inhabitants are a laborious and hardy race, skilled in the use

Trebizonde || Tredegar.

of the rifle, with which they are almost universally armed The chief towns are Trebizonde, the capital, Kerehsun. Tirehboli, Rizah, and Batam, all on the coast.

TREBIZONDE (anc. *Trapezus*), the capital of the above pachalic, on the coast of the Black Sea, 120 miles N.W. of Erzeroom. It is surrounded by walls, and defended by a citadel on a flat-topped rock to the west of the town. Outside the walls there are many houses scattered among trees and gardens; and it is here that the Christian part of the population live. Here also are the principal bazaars and khans of Trebizonde. The houses in all parts of the town are for the most part only one story high, built of stone, and roofed with tiles. Those of the Greeks are generally surrounded with gardens, which the Turkish houses, though larger and better, have not. Trebizonde has numerous Greek churches and mosques, the latter of which have for the most part been originally Christian churches. One of the finest buildings is a public bath-house built of marble. The trade of Trebizonde is extensive and important. Copper and alum are brought down from the mines of the interior, and the former is made into articles for culinary use. English cottons, printed goods, hardware, glass, fire-arms, &c., are imported from the west. There is also an extensive commerce with Armenia, Persia, and Georgia; silk, wool, shawls, carpets, tobacco, opium, oil, timber, and other articles being conveyed to Trebizonde from these countries. The port has regular communication by means of steamers with Constantinople, Odessa, and the Danube. The following table exhibits the number and tonnage of the vessels entered and cleared in 1858, with the values of the cargoes:—

Country.	Entered.			Cleared.		
	No.	Tonnage.	Value of Cargoes.	No.	Tonnage.	Value of Cargoes.
			L.			L.
Great Britain...	19	8,798	514,492	19	8,798	18,416
Austria	45	30,920	1,168,038	45	30,920	352,016
France	51	15,742	681,080	50	15,390	267,247
Russia	63	10,675	23,728	63	10,675	46,039
Turkey	89	27,030	1,040,703	89	27,030	375,000
Egypt.....	14	5,242	201,412	14	5,242	61,581
Greece	34	6,034	35,212	34	6,043	5,018
Holland	2	736	60,301	2	736	200
Prussia	1	555	21,390	1	555	...
Wallachia	3	340	...	3	340	...
Total	321	106,070	3,146,356	20	105,740	1,125,519

The ancient Trapezus was a colony of Sinope, and existed at the time of Xenophon, who on the occasion of his celebrated retreat with the 10,000 halted here, and was hospitably treated by the inhabitants. But it was not till under the Romans that it became a place of any importance; it was made by Trajan the capital of Pontus; and in the reign of Hadrian it was the principal seaport on the Euxine. In the thirteenth century it was for some time the capital of an independent state, but finally fell under the Turkish dominion. Pop. estimated to range from 20,000 to 30,000.

TREDEGAR, a market-town of England, Monmouthshire, 16 miles N.W. of Newport, in a populous district, containing important coal pits and iron mines. The town has entirely grown up since 1800, when there were only three houses here; and it now consists of five principal streets, with a square and several smaller streets, and contains a good town-hall, market-house, parish church, Iudependent, Baptist, Wesleyan, and Calvinistic Methodist chapels, and several schools. The people are for the most part employed in the iron and coal mines, and blast houses. A weekly market and three annual fairs are held here; and large quantities of coal and iron are exported by railway and the Monmouthshire canal. Pop. 8305.

Tredgold || Trent.

TREDGOLD, THOMAS, an able engineer, was born at Brandon, near Durham, on the 22d August 1788, where he received the small share of learning which is usually bestowed upon a youth destined to a mechanical trade. At the age of fourteen he was apprenticed to a carpenter in his native village, whom he served for six years. He afterwards came to Scotland in 1808, where he worked five years as a journeyman. From Scotland he proceeded to London, and there obtained employment in the office of William Atkinson, an architect, and a relative of his own, with whom he remained for ten years. The intervals of labour are too often wasted by artisans in listless inactivity or debasing pleasures; but Tredgold employed his leisure hours in a different manner. Under circumstances as little favourable for such pursuits as can well be imagined, he applied himself to the study of chemistry, geology, and the mathematics; with what success is well known, and has been acknowledged by the most competent judges in this country, in America, and in France, where many of his works have been translated. In 1823 he began to practise as a civil engineer, and it was during the period in which he was so engaged that he published the scientific treatises, which have entitled him to an honourable place among those who have made important exertions for the advancement of the useful arts. We subjoin a list of his principal publications. *Elementary Principles of Carpentry*, Lond. 1820, 4to.; *Practical Essay on the Strength of Cast Iron and other Metals*, 1824, 8vo.; *Principles of Warming and Ventilating Public Buildings*, &c., second edition, 1824, 8vo.; *A Practical Treatise on Railroads and Carriages*, 1825, 8vo.; *The Steam Engine, comprising an Account of its Invention and Progressive Improvement; with an Investigation of its Principles*, &c., 1827, 4to.; *Treatise on the Steam Engine*, in 2 vols. 4to, 1827; *Tracts on Hydraulics*. He was likewise the author of some valuable contributions to the present work. He died on the 28th of January 1829; and it is painful to add, that, notwithstanding the unwearied exercise of his talents, he left his family without any adequate provision. His only son, who was bred to the business of his father, was engineer in the Office of Stamps of the East India Company at Calcutta, where he died in 1853.

TREE. See PLANTING and TIMBER.

TRENT, or TRIENT, a town of the Austrian empire, capital of a circle in the Tyrol, stands in a beautiful situation on the Adige, 25 miles N.W. of Venice. Seen from a distance, it has a very picturesque appearance, with embattled walls, large ruined castle, and numerous towers and spires. The streets are broad and regular, and the houses well built, for the most part in the Italian style. In the middle of a handsome square there is a fine marble fountain; and down many of the streets there run canals of pure water. The cathedral is a very fine edifice, entirely of marble, in the Byzantine style. The church of St Maria Maggiore, a modern red marble building, occupies the site of the council chamber, now destroyed, where the celebrated Council of Trent sat (1545–63); and has a painting with portraits of all the members. Trent has also a town-hall, several monasteries, an hospital, a number of silk-mills and distilleries, and an extensive trade in silk, wine, and brandy. It was the ancient Tridentum, and was a Roman colony and an important city in the middle ages, when the bishops were independent princes. Pop. 12,900.

TRENT, a river of England, rises in Staffordshire, four miles N. of Burslem; flows in an irregular course, at first S.E. then E., and finally N.E. and N., through the counties of Derby, Nottingham, and Lincoln; and after a course of 170 miles, unites with the Ouse to form the estuary called the Humber. It drains an area of 4082 square miles; and receives the Dove, Derwent, Idle, and Tarn, from the left, and the Tame, Soar, and Devon, from the right. The

Trent, Council of ‖ Treves.

Trent is navigable by vessels of 200 tons to Gainsborough, and by barges to Burton.

TRENT, *Council of*, in Ecclesiastical History, denotes the council assembled by Paul III. in 1545, and continued by twenty-five sessions till the year 1563, under Julius III. and Pius IV., in order to correct, illustrate, and fix with perspicuity, the doctrine of the church, to restore the vigour of its discipline, and to reform the lives of its clergy. The decrees of this council, together with the creed of Pope Pius IV., contains a summary of the doctrines of the Roman Catholics. These decrees were subscribed by 255 clergy, consisting of four legates, other two cardinals, three patriarchs, twenty-five archbishops, 168 bishops, besides inferior clergy. As 150 of these came from Italy, the council was entirely under the influence of the pope. For a more particular account of the Council of Trent, see the elaborate histories of Sarpi, Pallavicino, and Bungener. For the history of this council, a great mass of materials was collected by Le Plat: *Monumentorum ad Historiam Concilii Tridentini potissimum illustrandam spectantium amplissima Collectio.* Lovanii, 1781–7, 7 tom. 4to.

TRENTON, a town of the United States of N. America, capital of New Jersey, on the left bank of the Delaware, 30 miles N.E. of Philadelphia, and 57 S.W. of New York. It is regularly laid out, and for the most part well built; and the principal public buildings are the Capitol, a large stone structure, the court-house, town-hall, Presbyterian, Methodist, Baptist, Episcopalian, Quaker, Lutheran, and Roman Catholic churches. It is an important manufacturing town, having paper-mills, iron-foundries, a locomotive factory, flour, saw, and other mills. Near Trenton, General Washington gained one of his victories, Dec. 26, 1777. Pop. 6460.

TREPTOW, NEW, a town of the Prussian monarchy, Pomerania, on the Rega, 50 miles S.E. of Stettin. It is walled, and contains an old castle, two churches, one of which has a lofty tower, several hospitals, a court of law, and public offices. Woollen cloth, serge, and hosiery are manufactured, and there is some fishery and a trade in cattle. Pop. 5350.

TREVES, Ger. *Trier*, anc. *Augusta Trevirorum*, a town of Prussia, capital of a government in the province of the Rhine, in a rich valley on the Moselle, here crossed by a stone bridge of eight arches 690 feet long, 60 miles S.W. of Coblenz. It consists of the town proper, enclosed by walls and entered by eight gates, and nine suburbs. Its form is oblong, and it includes within its limits many large gardens. The streets are narrow and irregular, and the houses but indifferently built. The cathedral of St Peter and St Helena is an irregular Byzantine edifice, and contains pillars supposed to have belonged to an original edifice of the empress Helena. A more elegant church is that of Our Lady, in pure Gothic, of which it is one of the earliest specimens. The Episcopal palace, now used for barracks, is a large and handsome edifice, partly erected on the site of a Roman building of which there are still some remains. Treves is chiefly remarkable for its Roman antiquities, in which it is the richest town north of the Alps. Besides those already mentioned, there is a gate of the city, and remains of extensive baths, and an amphitheatre at a little distance. The former university has been degraded to a gymnasium, which has a valuable library, including, among other curiosities, the *Codex Aureus*, given to the abbey of St Maximin by the sister of Charlemagne. There are also various other schools, a museum, theatre, convents, hospitals, &c. Linen, woollen, and cotton fabrics are made; small vessels are built; and some trade in wine, corn, and timber is carried on. In the time of Julius Cæsar, Treves was a large and important town, the capital of the Treviri; and under Augustus it was made a Roman colony. At a later period it rose to such prosperity as to be reckoned the second capital of the empire. It was almost destroyed by the irruptions of the Barbarians, but it revived under the archbishops, who were powerful princes and electors of the German empire. Treves was taken by Marlborough in 1704, and suffered much in the wars of the French Revolution. Pop. 19,639.

Treviso ‖ Trichinopoly.

TREVISO, a fortified town of the Austrian empire, in the government and 16 miles N. of Venice, on the Sile, which is here navigable for large boats, and communicates by canals with the lagoons of Venice. It is an old town, for the most part well built, with irregular but broad streets, lined with colonnades and several fine squares. The ancient cathedral of St Peter, a fine but unfinished building, contains paintings by Titian, Domenichino, and other artists; and the Gothic church of St Nicholas has also some good works of art. The town has several other churches, an episcopal palace, town-hall, theatre, public library, hospital, and various schools. The university of Padua was originally established here. The fortifications of Treviso consist of walls and bastions, with a wet ditch; and have a circuit of about three miles. Silk and cotton goods and cutlery are the chief manufactures of the place, and an active trade is carried on in corn, fruit, and cattle, especially at a large fair which is held here annually. Treviso, the ancient Trevisium, was a free town under the Romans; and after the fall of the empire was conquered in turn by the Huns, Ostrogoths, and Lombards. Thereafter it was for a time independent, and at length, in 1344, voluntarily submitted itself to the republic of Venice. Pop. 17,974.

TREW, CHRISTOPH JACOB, a celebrated anatomist and botanist of Germany, was born at Lauf near Nürnberg, on the 26th of April 1695. After receiving his medical degree at Altdorf in 1716, he began practice in his native town. Having had a strong desire to see a little more of Europe before he should settle down to the close and fatiguing practice of a medical man, he accordingly spent the next year or two in visiting Switzerland, France, and Holland. In 1720 he again returned to Lauf, and was made a member of the College of Physicians at Nurnberg. The margrave of Anspach shortly after appointed him physician-in-ordinary and counsellor to the court. In 1746 he was chosen president of the *Académie des Curieux de la Nature*, which included the titles of count palatine, aulic councillor, and physician to the emperor. Besides the numerous admirable works of which Trew was the author, he published a great number of experiments and observations on botany and anatomy in the *Commercium Litterarium* and the *Acta Curiosum Naturæ*. He died on the 18th of July 1769, aged seventy-four.

The principal works of Trew in anatomy were his *Dissertatio Epistolica*, 4to, Nürnberg, 1736; his *Epistola ad Alb. Hallerum*, 4to, 1734; and his *Tabulæ Osteologicæ Corporis Humani*, 1767. In botany, he published a splendid work, in which he was assisted by the magnificent designs of Ehret the painter. This work was entitled *Plantæ Selectæ*, and appeared in 1750-73. In 1757-67, appeared his *Cedrorum Libani Historia et Character Botanicus*. He likewise published an improved edition of Blackwell's *Herbal*, and the *Icones posthumæ Gesnerianæ*, in 1748.

TRIANGLE, a figure of three sides and three angles.

TRIBUNE. See ROMAN HISTORY.

TRICHINOPOLY, a district of British India, in the presidency of Madras, lying between N. Lat. 10° 37′ and 11° 31′, E. Long. 78° 13′ and 79° 37′, bounded on the N. and N.E. by the district of South Ascot; S.E. by that of Tanjore; S. by the native state of Poodovcottah and the district of Madura; W. and N.W. by those of Coimbatoor and Salem. Its length is about 94 miles, its breadth 60, and its area 3243. It is quite a flat country, being broken only in some places by granitic or trap rocks of inconsiderable height. The chief river is the Cauvery, which flows through the district from west to east, and divides near the capital into two branches, the northern called the Coleroon,

Trichinopoly || Trieste.

and the southern retaining the name of Cauvery. The stream is very low in the early part of summer, but in the beginning of June the annual inundation raises the water to such a volume as to fill all the tanks and canals for irrigation, and render the river a vast torrent miles wide. From this state it gradually falls during the rest of the year. The soil is very fertile, but as the climate is hot and dry, it depends much for its moisture on the rivers and canals. Rice, millet, maize, and cotton are the chief crops raised in the district. Sugar-canes and tobacco are also grown; and there are some plantations of cocoa-nut tree. Cotton cloth, indigo, and nitre, are exported; glue, oil, pepper, &c., imported. Pop. 709,196.

TRICHINOPOLY, the capital of the above district, on the Cauvery, 30 miles W. of Tanjore, and 190 S.W. of Madras. It is regularly laid out, with straight and broad streets; but the houses are of the most wretched description, being for the most part mere huts, low, dark, and dingy in the extreme. It is pretty strongly fortified by walls about two miles in circuit, lofty, thick, and in some places double. There is also a fort built on a sienite rock about 600 feet high, commanding a wide view over the plain. In it stand the arsenal, commissariat, various storehouses, hospital, and jail. The inhabitants of Trichinopoly are celebrated for their skill in making hardware, cutlery, and jewellery; and there are also manufactured here good saddlery and harness, and large quantities of cheroots from the excellent tobacco grown in the vicinity. Two or three miles S.W. of the town is a large cantonment, containing barracks for a large number of troops, the residences of civil and military officers, an English church, and a small Roman Catholic chapel. Trichinopoly was subject to a Hindoo rajah until 1732, when the Nabob of Arcot gained possession of it; and in 1741 he was in turn dispossessed by the Mahrattas. During the wars between the French and English, the place was much contested; and in 1757, when besieged by the former, it was relieved by the rapid march of an English force under Captain Calliaud. Pop. estimated at 30,000, exclusive of the military.

TRIDENT, a kind of sceptre which the painters and poets put into the hands of Neptune, in the form of a spear or fork with three teeth. See NEPTUNE.

TRIESTE, or TRIEST (anc. *Tergeste*), the principal seaport of the Austrian empire, capital of a government and of the crown land of Illyria, at the head of the Gulf of Trieste, in the N.E. of the Adriatic, 73 miles E.N.E. of Venice. The older part of the town is built on the slope of a hill, which is crowned by the castle; the new town on the level ground close to the semicircular bay that forms the harbour. The former is remarkable for its steep narrow streets and black walls; the latter, separated from it by a broad street called the *Corso*, is well built and regularly laid out. In the old town the most important building is the cathedral, which stands near the castle on the hill. It is a very ancient building in the Byzantine style, founded in the fifth century, and consists of a nave and four aisles. It has been constructed of fragments of older buildings, and was somewhat spoiled by additions and alterations in the fourteenth century. The tower is believed to stand on the foundations of an ancient temple of Jupiter. In the adjoining churchyard is the grave of Fouché, Napoleon's celebrated minister of police, and that of Winckelmann the antiquary, who was murdered in Trieste in 1768. In the new town, which is divided into two parts by a broad canal, among the principal buildings are the Greek church, richly and brilliantly adorned in the interior, and the *Tergesteum*, a large square edifice containing bazaars, a concert and ball room, exchange, reading-rooms, &c. Since the erection of this building the old exchange, near which is a fountain and statue of Leopold I., has been disused. Trieste has several churches besides those already mentioned, two theatres, a custom-house, post-office, hospital, barracks, governor's palace, various schools, &c. The harbour is not without its disadvantages, as it is not sufficiently protected from storms; but it is on the whole good, and has contributed largely to raise the town to its present importance. Its form is semicircular, and it is deep enough to admit large merchantmen to the inner part; but ships of the line have to anchor in the roadstead outside. It is divided into several smaller portions by small piers, and lined with spacious quays. The mole of St Theresa, which has a fort and lighthouse, bounds the harbour on the south, and opposite to it is the new lazaretto, with a basin capable of containing seventy ships in quarantine. Trieste is the only great town of the German confederation on the Adriatic. It is connected by railway with Vienna and other large towns in Germany and Italy; and its many advantages have enabled it to take the place which Venice formerly occupied as the great commercial mart in this part of Europe. The number and tonnage of vessels that entered and cleared at the port in each year, from 1852 to 1857, were as follows:—

Trieste.

Year.	Entered.		Cleared.	
	No.	Tonnage.	No.	Tonnage.
1852.....	2749	427,908	2647	425,484
1853.....	3015	450,210	3013	461,290
1854.....	2676	442,195	2973	458,471
1855.....	2455	390,963	2354	386,002
1856.....	2542	415,627	2388	398,734
1857.....	2215	382,692	2239	399,796

The value of the imports and exports from 1850 to 1855 was as follows:—

Year.	Imports.	Exports.
1850.....	L.3,554,213	L.1,445,312
1851.....	3,121,490	1,697,096
1852.....	3,529.585	2,139,395
1853.....	3,032,173	2,315,589
1854.....	2,408,451	2,378,240
1855.....	2,569,245	2,783,134

The navigation is chiefly under the Austrian, Neapolitan, Papal, and French flags; and the principal exports are metals, linen and woollen cloth, calico, hemp, wool, hides, furs, timber, tobacco, corn, rice, wine, and oil; while cotton, silk, raisins, wheat from Odessa, and all kinds of colonial produce, are the articles most largely imported. The Austrian Lloyd's Steam-packet Company, formed in 1833, is one of the principal establishments of the town. It has forty or fifty steamers, which ply between Trieste and the principal ports in the Adriatic, the Levant, and the Black Sea as far east as Trebizonde. Trieste has some importance as a manufacturing town, though it is chiefly remarkable for its commerce. Shipbuilding is carried on to a large extent, and there are several extensive docks for that purpose. There are also made here earthenware, leather, wines, spirits, soap, white lead, &c. The inhabitants of Trieste are a motley multitude, collected from almost all countries of the world; Germans, Italians, Greeks, Jews, Armenians, English, and Americans. A great variety of languages is heard, but Italian is the most common, except in the public offices, where German is spoken; and among the peasantry, who use a Slavonic dialect. The ancient Tergeste existed in the time of the Romans, but was then a place of no great importance, being outrivalled by the neighbouring town of Aquileia. In the middle ages, Venice was the great seaport and commercial mart in this part of the Adriatic; and Trieste did not rise to its present importance till about the middle of the eighteenth century, when the enlightened policy of Maria Theresa conferred on the town many favours, and laid the foundation of its commercial greatness. Pop. (1852) 70,846.

TRIGONOMETRICAL SURVEY.

Trigonometrical Survey.

THIS designation is usually applied to those surveys of a country which are effected by means of trigonometry. It is well known that when the base of a triangle has been measured or calculated, and the angles at the ends of the base have been measured, this science affords the means of ascertaining the length of the two remaining sides. (See TRIGONOMETRY). The distance, therefore, between two points on the surface of a country having been measured for a base, and the angles which it forms with some third point, taken as the vertex of the triangle, having been measured, the length of the other sides can be calculated. These sides will then serve as the bases of other triangles, the length of whose remaining sides may in the same way be ascertained; and by thus extending a series of triangles over a country, its dimensions may be obtained with the greatest accuracy.

Any survey carried on from a measured base, by means of angular measurements, may be called a trigonometrical survey; but the term is usually confined to such as extend over a considerable extent of country, and require a combination of astronomical and geodetical observations. When conducted on a large scale, and when extreme accuracy is required, the work, simple in itself, becomes one of immense labour and ingenuity. When it is necessary to have regard to the curvature of the earth's surface, the effects of temperature, refraction, altitude above the sea, &c., in order that minute accuracy may be attained, not only is the utmost care necessary in observation, with instruments of the very finest character, but long and intricate processes of calculation in the highest branches of mathematics are involved.

The fundamental operation, and the one demanding the greatest degree of accuracy, is the measurement of the base line, for an error committed here will affect all the distances deduced from it,—triangulation doing nothing more than determining how many times, or fractions of a time, the measured base is contained in the observed distances. To measure a line 5 or 6 miles in length, so that the greatest possible error cannot exceed a very few inches, is manifestly a work of extreme care, and requiring instruments of the very nicest description. In order to insure the greatest possible accuracy of observation, it has been usual, in the survey of this country, not only to observe each angle a considerable number of times, but also from each point to observe the angular distances of all the other principal stations which are visible from it. The discrepancies that then arise are reduced to the nearest probable mean by the theory of probabilities. The degree of accuracy that may be attained by such measurements is shown by the fact, that the length of the base on Salisbury Plain, as calculated by means of a series of triangles, extending from the Lough Foyle base, in the north of Ireland, differed only about 5 inches from its measured length.

The object of a trigonometrical survey may be either to ascertain the form and extent of a country, with the relative distances and bearings of its principal points, for the purpose of constructing an accurate map; or to determine the figure and magnitude of the earth by ascertaining the curvature of a given portion of its surface. The latter of these objects having been already sufficiently noticed under FIGURE OF THE EARTH, we shall confine our attention in the present article to the former; and perhaps the subject cannot be treated better than by giving an account of that great trigonometrical survey that for the last three quarters of a century has been carried on in this country under the direction of the Board of Ordnance, and which is, undoubtedly, the most magnificent work of the kind that has hitherto been attempted in any country. We shall first, then, give a brief historical sketch of that great undertaking, and afterwards some account of the manner in which it is carried out.

Trigonometrical Survey.

History.

The first Government trigonometrical survey in Great Britain was commenced in the Highlands of Scotland in 1747. After the suppression of the rebellion of 1745, government directed its attention to the establishment of military posts, and the opening up of roads of communication in the remoter parts of the Highlands. Lieutenant-General Watson, who was stationed at Fort Augustus, with the view of carrying out these objects, conceived the idea of at the same time making a map of that part of the country; and the sanction of the Duke of Cumberland having been obtained, operations were forthwith commenced, under the direction of General Roy, the assistant quarter-master-general. Though the work was at first intended to comprise only the Highlands, it was subsequently extended to the Lowlands, and at length included the whole of the mainland of Scotland. The war of 1755, however, put a stop to the undertaking, and the map was never published. General Roy afterwards characterised it as "a work of considerable merit, though, from having been carried on with instruments of a common, or even inferior kind, it is rather to be considered as a magnificent military sketch than a very accurate map of a country." On the conclusion of the peace of 1763, the subject of a general survey of Great Britain engaged the attention of government, but the breaking out of the American war prevented any steps being taken to carry it into effect.

The present undertaking dates from the year 1783, when, on the conclusion of the peace in that year, a memorial drawn up by M. Cassini de Thury, the French astronomer, was presented to the English government, recommending a trigonometrical measurement of the distance between the observatories of Paris and Greenwich, with a view of determining the exact difference of longitude between them. The proposal having met with the warm approval of the Royal Society, to whom it was referred, government agreed to carry it out, and General Roy was appointed to superintend the operations.

Hounslow Heath base

The first step in the process was the accurate measurement of a base; and, in order that this might form the basis of any future survey of the United Kingdom, it was resolved that it should be done with the utmost possible care, and with the best instruments that could be furnished by Ramsden, at that time acknowledged to be the first maker in the world. Hounslow Heath, which, besides its proximity to the capital and Greenwich Observatory, presented the advantages of great extent and levelness of surface, free from local obstructions, was selected as the site for a base, and a line upwards of 5 miles in length was marked off for measurement. Up to that time, deal rods had been generally employed in the measurement of those bases in other countries that had been effected with the greatest appearance of care and exactness; and three such rods, of the best seasoned timber, were carefully constructed, each 20 feet 3 inches long, tipped at each end with bell metal. The preliminary operations having been completed, the measurement was commenced about the middle of July 1784. The weather proved wet and unfavourable, and, before the measurement was half completed, the deal rods were found, notwithstanding all the care that had been taken in their preparation, so liable to sudden and irregular variations of length from the state of the atmosphere, as to afford little assurance that that accuracy would be attained which was desirable. As, however, so much of the work had been done, it was resolved to complete it, so that the result obtained might afterwards be compared with that given by more accurate instruments. The measurement with the deal rods being completed, and allowance made for expansion, the distance between the centre of the pipes terminating the base, reduced to the level of the lower extremity at Hampton Court, and at the temperature of 63°, was found to be 27,406·26 feet of the standard scale from which the lengths of the measuring rods were laid off.

At the suggestion of Lieut.-Col. Calderwood, hollow glass rods were next adopted. Three of these, about an inch in diameter and upwards of 20 feet in length, were selected and placed in cases to which they were made fast in the middle and braced at several other points, so as to prevent them from bending or shaking, but allowing them freely to expand or contract. At one end of each rod was a fixed apparatus or metal button, and at the other a move-

Trigonometrical Survey.

able apparatus or slider, pressed outwards by a slender spring. In contacts the fixed extremity of each rod was pressed against the moveable apparatus of the preceding, until a fine line on the slider was brought into exact coincidence with another fine line on the glass rod, in which state the distance between the extremities was exactly 20 feet. The new measurement was commenced on the 18th and concluded on the 30th of August 1784. After the rate of expansion of the rods had been determined and allowed for, the length of the base in temperature 62°, reduced to the level of the sea, was found to be 27,404·0137 feet, or 5·19 miles.

1787. The triangulation was not proceeded with till the summer of 1787, when Ramsden had completed his theodolite for the measurement of the angles. This was the finest instrument of its kind that had yet been constructed, having its horizontal circle 3 feet in diameter, and was the first to show that, in consequence of the spherical form of the earth, the sum of the three angles of a triangle on its surface exceeds that of two right angles. The same year Messrs Cassini, Mechain, and Legendre, distinguished members of the French Academy of Sciences, met General Roy at Dover, and the connection was established between the triangulation of the two countries. In order to ascertain the accuracy of the operation, a base of verification was measured on Romney Marsh, near the termination of the triangulation, and was found to be 28,535 feet 8·128 inches, at temperature 62°, and at the level of the sea. The measurement was made by a steel chain 100 feet in length, constructed by Ramsden, and of which the accuracy had been previously tested by measuring with it a portion of the Hounslow Heath base simultaneously with the glass rods. The measured length was found to exceed the computed length by about 28 inches, which was probably as near a coincidence as was to be expected, and may be taken as a conclusive proof of the general accuracy of the whole of the operations.

The illness soon after this of General Roy, followed by his death in 1790, seem to have for a time put a stop to any attempt to extend the operations already begun to a survey of the whole island. Indeed, the renewal of operations is ascribed to the accidental circumstance of the Duke of Richmond, as Master-General of the Ordnance, having purchased a very fine theodolite by Ramsden, similar to that used by General Roy, but with some improvements; as also two new steel chains of 100 feet each, by the same great artist. This theodolite is said to have been ordered by the East India Company for the purpose of surveying their possessions in the East, but some misunderstanding having arisen about the price, the directors refused it, and it was thrown upon the hands of the artist.

1791. In 1791 the Ordnance survey was commenced under Colonel Williams, Captain Mudge of the Royal Artillery, and Mr Dalby, by the remeasurement of the base on Hounslow Heath. Instead of measuring-rods, the two steel chains already mentioned were used. Each chain consisted of 40 links of 2½ feet each. At first both chains were used in measuring, but afterwards one only, the other being kept as a standard by which the measuring-chain was compared. In the act of measuring, the chain was laid out in a succession of deal coffers, supported by trestles and stretched by a weight of 28 lbs. After all reductions had been made, the length of the base by the new measurement was found to be 27,404·3155 feet, or about 2¾ inches greater than by General Roy's measurement with the glass rods. The mean of the two results, or 27,404·2, was therefore assumed as the true length of the base in the future calculations.

In prosecuting the survey, it was resolved, in the first instance, to carry a series of triangles southwards from the base, in order to ascertain the position of some of the principal stations on the seacoast: and also to determine the length of a degree of longitude by measuring the distance between Beachy Head on the coast of Sussex, and Dunnose in the Isle of Wight,—two stations lying nearly east and west of each other, above 64 miles apart, and visible from each other in clear weather. An opportunity would also thus be afforded of connecting this series with the triangles of General Roy, and of thereby testing the accuracy of both operations. The triangulation was commenced in 1792, and the principal work of the following year was determining the directions of the meridians of Dunnose and Beachy Head. In 1794, a base of verification was measured on Salisbury Plain by steel chains, in the same manner as on Hounslow Heath, the one being used for measuring, and the other kept as a standard. After making the different reductions, the correct length of the base was found to be 36,574·4 feet, and on computing the distance by means of different combinations of the triangles from the Hounslow Heath base, the greatest and least results were found to be 36,574·8 and 36,573·8 feet, the mean being 36,574·3 feet, or about one inch short of the measurement. The distance between Beachy Head and Dunnose, as deduced from a mean of four different series of triangles, was found to be 339,397·6 feet (= 64·28 miles), and the greatest difference from the mean was less than four feet. On computing from this and the observed angles made by the straight line joining the two stations with the meridians at each, the length of a degree of the great circle, perpendicular to the meridian at latitude 50° 41′ (nearly that of the middle point between Beachy Head and Dunnose), was found to be 61,182·3 fathoms = 367,093·8 feet; and hence the degree of longitude at the two stations (which is found by multiplying the degree of the perpendicular circle by the cosine of the latitude) was obtained as follows:—Beachy Head, 232,312 feet; Dunnose, 232,914 feet, the assumed latitudes being, respectively, 50° 44′ 24″ and 50° 37′ 7″ (see FIGURE OF THE EARTH).

Trigonometrical Survey.

Salisbury Plain base.

During the years 1795 and 1796, the triangulation was continued along the coasts of Dorsetshire, Devonshire, and Cornwall, to Land's End. The operations of 1797 commenced with the observation of the pole-star at Black Down early in April; and in the course of the summer the great theodolite was taken to twenty-one other stations, at which the angles were determined, all included between the meridian of that station and St Agnes Beacon. It was judged inexpedient to carry the operations from this point into the north of Devonshire until a new base had been measured, the triangles at present being dependent upon those made in Cornwall in the previous year. In 1798, a series of secondary triangles was observed for completing the survey of Kent and Essex; but the principal operation of the year was the measurement of a new base of verification on King's Sedgmoor, in Somersetshire. This measurement was conducted, like those on Hounslow Heath and Salisbury Plain, by steel chains—only, on account of the irregularities of the ground, it was thought expedient to have a new chain of 50 feet for those parts where the longer chain could not well be used. The reduced length of this base was found to be 27,680 feet, or nearly 5¼ miles, and it was supposed by Captain Mudge that the amount of error could not exceed nine inches. 1795–96.

The measurement of an arc of the meridian had been contemplated from the commencement of the survey, but was delayed for some years on account of the zenith sector with which the celestial arc was to be determined not having been completed by Mr Ramsden, whose health was then declining, and who in fact died before the instrument was altogether finished. The meridional line passing from Dunnose to the mouth of the Tees was that selected, as being the freest from obstruction and of sufficient length. The point selected for the northern extremity was Clifton, a small village in the vicinity of Doncaster, nearly on the meridian of Dunnose; and a plain of sufficient extent for the measurement of a base of verification was found at Misterton Carr, in the northern part of Lincolnshire. The two extreme stations were connected by a chain of twenty-two triangles, lying nearly in the direction of the line to be measured. Of these, eleven, extending from Dunnose to Arbury Hill, near the middle of the line, had already been observed, and their sides computed from the Hounslow Heath base; the angles of the remaining eleven were measured in 1801 and 1802, and the distances computed from the new base. The base on Misterton Carr was measured in the same manner as Sedgmoor, and after making the necessary reductions, the length was found to be 26,342·7 feet. As the correct determination of this base was of great importance, every precaution was taken to insure accuracy, and General Mudge was of opinion that the error in excess or defect could not exceed two inches. On computing the distance between Arbury Hill and Corley, near the middle of the arc, by the first eleven triangles, it was found to be 117,463, and by the other eleven triangles, from Misterton Carr, 117,457·1 feet, a difference of less than six feet, upon an extent of somewhat more than 22 miles; a discrepancy which cannot be considered great, seeing that the length of the whole line from Dunnose to Clifton is nearly 200 miles. Had the computation been carried on from Dunnose to Clifton, the length of the base on Misterton Carr, as deduced from Hounslow Heath, would have been found to be only about one foot greater than its measured length. The whole length of the arc from Dunnose to the parallel of Clifton was found to be 1,036,337 feet, or 196·26 miles. Misterton Carr base.

In 1806, another base was measured on Rhuddlan Marsh, near St Asaph, North Wales, in the same manner as the former. After the necessary reductions were effected, its length was found to be 24,514·26 feet. As evidence of the agreement between that and former measurements, it was found that the distance between Castle King and Weaver Hill (two stations in Staffordshire), as computed from the base on Misterton Carr, was 111,144·1 feet, and 111,148·4 feet, as computed from the new base on Rhuddlan Marsh; the difference in a line upwards of 21 miles in length being only 4·3 feet. From this base several series of triangles were carried in different directions. One series extended to Anglesea, and thence by Snowdon down the western coast of Wales, joining, near Aberystwith, a series proceeding from the triangles formerly observed in Gloucestershire. A second series proceeded southward from the base, and joined the southern triangles in Glamorganshire. Rhuddlan Marsh base.

Trigonometrical Survey.

A third series branched towards the east, and united with those proceeding westward from the base on Misterton Carr; and a fourth series was carried through Lancashire, Westmoreland, and Cumberland, into Scotland, and connected with another series extending from Misterton Carr base, through Yorkshire and Northumberland, and the east part of Scotland, as far as the north side of the Firth of Forth. Thus, down to 1809, the survey of nearly all England, the south of Wales, and a part of Scotland, had been made. The arc of meridian between Dunnose and Clifton was also extended northward to Burleigh Moor, about 3 miles north of Gisborough in Yorkshire; and another meridional length was determined between Dunnose and Delamere Forest in Cheshire, about 5 miles north of Tarporley. The triangulation of Scotland was continued first along the east coast to the borders of Ross-shire, and was subsequently extended to the Shetland Islands. A series was also carried from the Cumberland triangles along the western coast, through Dumfriesshire, and to the summit of Ben Lomond, connecting all the remarkable points of Perthshire. From 1811 to 1816 the survey was all but stopped on account of the war. In 1817, a new base of verification was measured with the steel chains

Belhelvie Links base.

on Belhelvie Links, near Aberdeen, the length of which, after making the various reductions, was found to be 26,515·6509 feet. In 1818 and 1819, the principal triangulation of Scotland was proceeded with, but was suspended in 1820. In 1821, it was recommenced in the Shetland, Orkney, and Western Islands of Scotland, and was carried on in these districts in 1822. In 1823, the use of the large theodolite being required in order to proceed with the triangulation in South Britain, the principal triangulation in Scotland was suspended. In 1824, the scene of operations was transferred to Ireland, an accurate survey of that country being considered of more urgent importance.

When the Ordnance survey was first undertaken, it was intended to produce only a military sketch map of the south of England; but as the work advanced it came into favour as a road map, a travelling map, and a general geographical map. When the survey of Ireland was undertaken, it was thought advisable to secure some farther social advantages, especially to make it subservient to the proper assessment and collection of the grand jury cess and other local taxes. Accordingly a committee of the House of Commons, of which Lord Monteagle was chairman, having examined the question, recommended that a scale of 6 inches to the mile should be adopted for Ireland, as the 1-inch scale on which the English maps were constructed was not sufficiently large to admit of the insertion of the townland boundaries and other minute territorial divisions, which were required for the purpose of making a valuation. (A townland is the smallest of the territorial divisions, and is almost always co-extensive with the private estates. There are 60,760 townlands in Ireland, and 2460 parishes.) The original intention was, that the survey should be confined to an exact description of the contents and boundaries of the townlands; but as it advanced, it was found desirable to include the subdivisions of fields and homesteads; and that was accordingly done in the centre and southern parts of the island. The advantages of including the subdivisions of fields were found to be so great that they were afterwards extended to the northern parts.

Lough Foyle base.

In 1827, a new base was measured on the east shore of Lough Foyle, in the north of Ireland. Doubts having arisen respecting the accuracy attainable by means of steel chains, Colonel Colby adopted an ingenious compensating apparatus, consisting of two bars, one of iron and the other of brass, 10 feet in length, connected together at their centres, and having at each end an ingenious apparatus for measuring the degree of expansion or contraction of each. (An account of this apparatus will be found in the article FIGURE OF THE EARTH). The whole line measured was nearly 8 miles in length (exactly 41,640·8873 feet); and it was calculated that the greatest possible error could not exceed two inches. It was also prolonged northward by triangulation to Mount Sandy, whereby two additional miles were given to it. From this base a series of triangles were extended all over the island, and were connected with those formerly observed in Wales, the Isle of Man, Scotland, and the Hebrides.

1838.

In 1838, the principal triangulation of Ireland having been completed, that of Great Britain was again taken up. All England, with the exception of the six northern counties, had been surveyed on the scale of 2 inches, and engraved and published on the scale of 1 inch to the mile; and a small portion of Scotland had been surveyed on a similar scale. It was found, however, that the thickly peopled manufacturing, mining, and colliery districts of the northern counties could not be properly represented on the 1-inch scale, and representations were made to the Treasury by various scientific societies and others to that effect. The matter being referred to the Duke of Wellington, the Treasury, in accordance with his advice, issued a minute, of date the 5th October 1840, stating that "My lords are satisfied, from the consideration they have given to the subject, that the scale on which the English survey has hitherto been conducted falls much short of what is required by the existing circumstances of the country. That scale was originally fixed principally with a view to military considerations, while the demand of the present day is for such a national survey as shall be permanently useful in aiding the improvement of the country, by serving as a basis and guide in the formation of railroads, canals, and other public works, besides assisting in the development of the geological structure of the country, and promoting in various other ways the progress of science and statistical knowledge. . . . . My lords have no hesitation in giving their consent to the remainder of England and the whole of Scotland being surveyed on the Irish scale of 6 inches to the mile; and my lords think themselves fortunate in having their opinion on this important subject confirmed by the concurrence of so high an authority as that of his Grace the Duke of Wellington."

Trigonometrical Survey.

At this time the county of Wigton, and one half of the counties of Ayr and Kirkcudbright, had been surveyed and drawn for the 1-inch scale in Scotland. In 1840, therefore, the survey of Scot- 1840.
land was commenced anew for the 6-inch scale; but the work for some years proceeded very slowly. The old base on Salisbury Salisbury Plain base remeasured
Plain not being found to agree very accurately with that of Lough Foyle, it was resolved to re-measure the former with the compensation bars employed in the measurement of the latter. The re-measurement was effected in 1849, and either from the guns which marked the extremities of the base having shifted their position, or from the original measurement having been defective, the result obtained was about a foot in excess of the previous measurement. This difference in a length of nearly 7 miles may seem small, but it sufficed to remove the greater part of the discrepancy which had been detected between the English and Irish bases.

The general work of the survey was proceeding so slowly, that in 1851 only Lancashire and Yorkshire in England, and Wigtonshire, 1851.
Kirkcudbrightshire, Edinburghshire, and the Isle of Lewis in Scotland, had been surveyed. In that year, therefore, a committee of the House of Commons, Lord Elcho being chairman, was appointed to inquire into the state of the survey, and in particular to determine whether a 1-inch or a 6-inch scale should be adopted. The committee, in their report, came to the unanimous conclusion, that the scale of 6 inches, and the system of contouring, ought to be abandoned, on the ground that the 6-inch map alone was not of sufficient public utility to justify the large expenditure of public money, and that the 1-inch map was better adapted to geographical purposes. They appear also to have been influenced by the belief that the latter would be much more speedily executed. Orders were accordingly issued by the Treasury and Ordnance, in conformity with this report, that the remaining four counties of England, and the rest of Scotland, should be done on the 1-inch scale. These instructions produced great dissatisfaction, both in Scotland and the unsurveyed parts of England, and numerous representations were made by various public bodies and others, in 1852 and 1853, to induce the Treasury to rescind the 1852–53.
orders in favour of the 1-inch scale. Some of these memorials were referred by the Treasury to the Board of Ordnance in June 1852; and a determination was meanwhile come to by these departments, that the survey of Fife, which was then going on, should be conducted on the 6-inch scale, and that the question as to the scale of the rest of the country should be reserved for future consideration. By this time the desirableness of even a larger than the 6-inch scale was agitated in influential circles, and in February 1853 Lord Elcho, then a lord of the Treasury, drew up a very able memorandum on the survey, and suggested a scale of 26⅔ inches as that best adapted for correct plans of estates, and for other civil purposes. This, with numerous letters on the subject, was transmitted, with a Treasury circular letter, dated 16th April 1853, to a large number of scientific societies and experienced persons in the kingdom, requesting them to state their opinion on the comparative merits of a 6-inch, as contrasted with any larger scale, for the purposes of a national survey. At the same time, an order was issued to the survey department to carry on the survey of Ayrshire and Dumfriesshire "with that degree of accuracy which would admit of the plans of the cultivated districts being hereafter drawn on the scale of 24 inches to a mile if desired." Of the replies to the circular letter, 20 were in favour of a 6-inch scale, and 120 in favour of a larger scale, among whom were the Registrar-general, the President of the Geographical Society, Sir Henry de la Beche, Mr A. C. Ramsay director of the Geological Society, the President of the Geological Society, the Society for the Amendment of the Law, the Metropolitan Commissioners of Sewers, the Ecclesiastical Society, the Poor-Law Board, the Board of Supervision for Relief of the Poor, the Commissioners of Woods, the General Board of Health, the Statistical Society, the Statistical Conference, &c. The weight of authority being thus decidedly in favour of a larger scale, and generally for a scale, in the manuscript plans, of 24

or 26⅔ inches to a mile of the rural districts, and 120 inches to a mile of the towns, and half of these scales for the engraved plans, a second Treasury letter was issued to the same parties on the 16th of January 1854, requesting them to state whether the 24-inch, 25-inch (properly 25·344 inch, or $\frac{1}{2500}$ of the linear measure of the ground, or 1 square inch to the acre), 26⅔ inch (*i.e.*, an inch to 3 chains) scale would be preferable for the rural districts, and whether the scale of $\frac{1}{1000}$ of the linear measure = 10 feet 6⅔ inches to a mile would be preferable for the towns. The replies to this circular were submitted to a committee, consisting of Sir John Burgoyne, Mr Blamire, and Mr Rendel, who unanimously reported that the weight of evidence in the correspondence before them was in favour of the $\frac{1}{2500}$ scale for the rural districts, and $\frac{1}{1000}$ for the towns. A treasury minute was accordingly issued, of 15th July 1854, directing that the surveys of Ayrshire and Dumfriesshire should be drawn on the scale of $\frac{1}{2500}$, and that, until a final determination should be arrived at, the same scale should be applied to the other districts. This order, however, contained no instructions as to the scale for the towns; and Colonel James, who had been newly appointed superintendent of the survey, addressed a letter to the Treasury, of date 26th August 1854, requesting instructions upon this head, and recommending the scale of $\frac{1}{1000}$. On 20th July 1854, a commission of eminent persons, Lord Ellesmere being chairman, appointed to consider whether the advantages of contour lines to the public are commensurate to the cost of their production, recommended that levels should be marked upon permanent objects, as churches, bridges, &c., and stated that such levels having been provided contour lines to a certain extent, would be a useful addition to a map on the 6-inch scale, and that contour lines selected from those obtained for the large surveys (if of a different colour) would be a useful addition to the 1-inch map. They further urge the extreme importance of expediting, in the greatest possible degree, the completion of the general 1-inch map. On 18th May 1855, a Treasury minute was issued, directing the uncultivated districts to be drawn on the scale of 6 inches to a mile; the cultivated districts on the scale of 25·344 inches to a mile; towns containing more than 4000 inhabitants on the scale of $\frac{1}{1000}$, or 126·72 inches to a mile, and that the 1-inch map should be proceeded with as rapidly as possible.

1854.

1856. In March 1856, a select committee of the House of Commons was appointed to report on the ordnance survey in Scotland. It found that, as general attention had come to be more immediately directed to the survey, there had been a gradual progress of public opinion in favour of the larger scale of 25 inches to the mile. The Lord Advocate of Scotland gave valuable evidence as to the facilities which a 25-inch scale would afford in the transference of landed property, by superseding written descriptions, and introducing "a system of conveyancing infinitely more simple, as well as more secure, than anything we have hitherto had." The committee found that delays had been occasioned by the want of a definite idea of what sort of a survey is required, which had been productive of much unnecessary labour, confusion, and expense; and that the time had now arrived when it was "necessary for Parliament to consider and finally determine the comprehensive question, What is the nature of the survey they are prepared to sanction as the one which will most conduce to the general interest of the nation at large?" "Your committee," they continue, "have come to a decision in favour of the $\frac{1}{2500}$ scale for a cadastral survey of the country. In doing so they are influenced by the great advantages which may be anticipated from the prosecution and completion of such a national work, on principles which have been successfully acted upon in the surveys of France, Bavaria, Switzerland, and other countries in Europe." The difference of the cost of surveying between the 25-inch and the 6-inch surveys, they found, would be comparatively immaterial; and that, while it was possible to reduce, it was impossible to enlarge a parent map.

On 19th June 1856, a discussion took place in the House of Commons upon the report of the committee; and a motion by the Right Hon. E. Ellice, for a reduction in the amount to be voted for the survey, on the ground of his objecting to the 25-inch scale, was rejected by a majority of 91. On the 18th June 1857, another debate took place in the House of Commons, on the motion of Sir D. Norreys, when the house decided by a majority of 10, that the plans of the cultivated districts on the 25-inch scale should be discontinued, and that the survey should be carried out on the 6-inch scale only, as was done in Ireland, in Yorkshire and Lancashire, and in several counties of Scotland. A treasury letter was accordingly issued (2d July 1857), directing that the parish plans on the 25-inch scale be discontinued after the completion of those parishes then actually in progress, and that the 6-inch scale was to be adopted in the further progress of the survey.

Royal Commission, 1857. On the 24th December 1857, a royal commission was appointed to inquire into and report upon—

1. The principal purposes which the national survey should subserve.

2. The progress which has been made in the survey, and the scales upon which the maps and plans have hitherto been drawn and published.

3. The change or changes in those scales, or in any of the details of the survey, which, according to your judgment, should be made.

4. The estimated cost of completing the surveys of England and Wales, Scotland, and Ireland respectively, on the scales and in the manner which you recommend to be adopted.

The commissioners found that the purposes which a national survey should subserve may be divided into two classes. "The first includes the wants of the State either for military purposes, for levying taxes or rates on real property, or in carrying into effect any legislative measure relating to land over which the State may exercise a direct superintendence, as, *e.g.*, measures for the registration of the titles to lands, measures giving facilities to the transfer of landed property, and so forth." "The second class includes the wants of the public as individuals, where such wants are not confined to any particular section of the community, and where they cannot be satisfied by private enterprise." The principal among these is the necessity for a general geographical map of the country; next, the supply of commercial data, or definitions of the positions of well marked points by which private surveys may be facilitated, and surveys of limited districts may be connected as parts of one great plan; third, Such surveys of special districts as are likely to produce in their contingent applications important public benefits, whether as aiding in other surveys, in tracing the course of railways or canals, in giving materials for plans in reference to water supply to towns, drainage, and so forth, or in promoting the sciences of geology, geodesy, and others. When the Tithe Commutation Act passed in 1836, the Ordnance Survey maps were found to be too small for the purposes contemplated in the Act, and hence a demand arose for first class plans of a scale as large as 20 to 26⅔ inches to the mile. About two millions sterling are said to have been expended in procuring these plans, which were for the most part hastily and carelessly got up, so that many of them are imperfect and inaccurate, and only about one-sixth of them are described as being first class plans. They had, moreover, been constructed on no uniform principle, and could never be juxtaposed so as to form a national cadastre. The commissioners found further, that owing to the frequent alterations in the instructions issued to the superintendent, the survey was in a very unsatisfactory state as regards uniformity. Thus, all England, with the exception of the six northern counties, had been surveyed for and mapped on the scale of one inch to the mile only. Of the six northern counties, the whole of Yorkshire and Lancashire had been plotted and engraved and published on the 6-inch scale, while Durham, the greater part of Westmoreland, and the southern part of Northumberland, had been plotted on the 25-inch scale. In Scotland, the counties of Edinburgh, Haddington, Fife, Kinross, Wigton, Kirkcudbright, and the Island of Lewis, had been plotted for, engraved, and published on the 6-inch scale; the county of Linlithgow had been published both on the 6 and 25 inch scales; and the counties of Ayr, Dumfries, Renfrew, Peebles, Berwick, Lanark, Forfar, Roxburgh, and Selkirk, had all been plotted for the 25-inch scale, and some of those last named were in course of publication on the 25 and 6 inch scales. In Ireland the whole country had been plotted, engraved, and published on the 6-inch scale, and seven of the counties in which accurate details had not been taken in the first instance, have been revised and made complete for valuation and assessment purposes. Armagh alone remained for revision. In Ireland also, it had been necessary to enlarge the plans of about 700 towns from the 6-inch scale, on account of its insufficiency for valuation purposes. In the case of transfers of land also, under the Encumbered Estates Act, the 6-inch plans of upwards of 2,000,000 acres had to be enlarged for the purposes of sales. Several towns throughout the United Kingdom had been surveyed, plotted, and published on various scales, from about 60 to 126·72 ($\frac{1}{2500}$) inches to the mile, and some of these, and indeed of other surveys performed by the Ordnance Corps had been paid for by the parties requiring them. They recommended, 1st, That the 1-inch map of the United Kingdom be forthwith completed, engraved, and published, as beyond all question the most important object in a national point of view. 2d., That the survey of the northern counties of England and the counties of Scotland proceed contemporaneously, and be completed and published,—the cultivated districts on the 25-inch scale, and the whole on the 6 and 1 inch scales, except the Highlands of Scotland, to be surveyed on the 1-inch scale only. 3d, That the revision of the 6-inch plans of Ireland be completed. 4th, That the final determination of the question as to the expediency of extending the survey on the $\frac{1}{2500}$ scale to Great Britain or the whole of the United Kingdom, be left to the decision of the legislature, when the contemplated measures with which it is more immediately connected may have been adopted. The expense required for the 25-inch scale exceeded by so small proportion that required for the 6-inch,

Trigonometrical Survey.

as to leave no doubt that when either is adopted, the preference should be given to the former, which will also furnish materials for the 6 and 1 inch scales. The estimated expense of carrying out the various plans was—

1. The completion of the United Kingdom on the 1 inch scale only L.279,972
2. The completion of those portions of the United Kingdom not already surveyed on the following scales, viz.—Cultivated parts 25-inch, moorland parts 1-inch, ... 553,066
3. The completion of the United Kingdom on the 25-inch scale (towns on the $\frac{1}{1\,2\,5\,0}$ scale), except those parts which have already been completed on the 6-inch scale, ... 2,285,129
4. The completion of Great Britain on the 25-inch scale (towns on the $\frac{1}{1\,2\,5\,0}$ scale), and of Ireland with revision on the 6-inch scale, ... 2,430,764
5. The completion of the survey of the United Kingdom on the 25-inch scale, with towns on the $\frac{1}{1\,2\,5\,0}$ scale, ... 2,686,764

The sums expended on account of the survey up to 31st March 1858, were—

England and Wales, ...L.1,051,678.
Scotland, ... 374,746.
Ireland, ... 979,166.

On the receipt of the report of the Royal Commission, the Treasury, at the suggestion of the Secretary-of-State for War, directed the readoption of the 25-inch scale for the cultivated districts in the meantime, till the matter could be brought before parliament. Some doubts having been expressed in parliament as to the accuracy of the method of reducing the plans by means of photography, a committee of scientific gentlemen was appointed to inquire into and report upon the subject. They stated in their report that, in their opinion, the system of making reductions by photography is more accurate than by the pentagraph or any other known means of reducing plans; that, as regards time, it is for plans of rural districts only one-fourth, and for plans of towns only one-ninth, of the time required to make reductions with the pentagraph; that the saving effected by the introduction of photography has been at the rate of L.1615 per annum, and that the saving which will be effected by its introduction during the progress of the survey will amount to at least L.31,952.

Present state of survey.

The present state of the survey will be best shown by giving a few extracts from the last published report of its progress, which comes down to 31st December 1859:—"The surveys of the six northern counties of England and Scotland are proceeding according to the recommendation of the royal commissioners on the survey, and the orders contained in the Treasury minute of the 11th September 1858. The detail survey of the six northern counties of England will be finished in the present year, and with the exception of the hill sketching of a small portion of country, we shall this year complete the 1-inch map of England. We shall also complete this year the outline 1-inch map of Ireland; 108 sheets are already published, and a great number of others are in progress. By the 31st March next we shall have finished the detail survey of the counties of Dumbarton, Stirling, and Clackmannan. All the southern counties of Scotland are surveyed, and we are now engaged in Perthshire and Forfarshire. With the exception of Aberdeen, all the great towns of Scotland have been surveyed, and as the greater part of the remainder of Scotland consists of mountainous country and very open work, I have no doubt but that we shall complete the survey of Scotland within the time, and at a cost within the estimates which I gave the royal commissioners on the survey." He strongly recommends that the subject of proceeding with the survey of England on the 25-inch scale should be taken into consideration by Government and Parliament this year, that he may be enabled to make the preliminary arrangements such as ascertaining the boundaries of the townships, parishes, &c., for proceeding without any costly delays with the survey of the remaining three-fourths of England and Wales, the estimated cost of completing which, on the scales now adopted, being estimated at L.1,450,000. "If," he adds, "the remaining three-fourths are not finished in the same way, it will be the only portion of the United Kingdom without a cadastral survey, and we shall be almost the only state in Europe without one." As compared with 1857, the year ending 30th September 1859 exhibited a reduction on the actual cost of the plans of from 11·49d. to 9·47d. per acre, or about one-sixth on the $\frac{1}{1\,2\,5\,0}$ scale; and from 6·2d. to 5·5d. per acre, or about one-seventh on the 6-inch scale. As regards Scotland, the estimates by these two items alone will be reduced by L.70,000. The saving effected by means of photography had also been increased, and was estimated to amount to L.35,000 on the cost of the survey.

Trigonometrical Survey.

The engraved plans of Ireland on the 6-inch scale have been found of great value for many important purposes connected with the valuation of property, &c.; but for the transfer of land under the Encumbered Estates Court, they were found to be utterly insufficient. The judges of the court therefore applied to the Lords of the Treasury to have the plans required for the transfer of property under the authority of the court made as part of the ordnance survey, and on the $\frac{1}{1\,0\,5\,6}$ scale; and by Treasury letter of 11th September 1858, their lordships approved of this arrangement, provided that effectual care be taken that the whole of the expense incurred in preparing the plans is repaid by the Encumbered Estates Court. The plans are first drawn on the $\frac{1}{1\,0\,5\,6}$ scale by means of the notes of the original 6-inch survey, and are then subjected to a rigid examination on the ground in order to correct them to the present date, and also to perfect the details in a manner suitable to the increased scale.

Encumbered Estates Court plans, Ireland.

The sums stated as requiring to be provided for in the estimates for 1860–61, were as follows:—

For the prosecution of the survey in England....	L.29,000
" " Scotland ...	30,500
" " Ireland.....	13,500[1]
Towards engraving a geographical map of Great Britain, 4 miles to an inch	1,000
Engraving geological survey, &c.....	600
Publication of the maps and levelling	5,500[2]
Survey of military stations	4,000
Annual repairs to survey offices at Southampton and Dublin	500
Topographical department—Salaries, extra pay of officers, and contingencies, including the purchase of maps and books	5,400
	L.90,000

The number of royal engineers, civil assistants, and labourers employed on the surveys in each of the three kingdoms were—

	England.	Scotland.	Ireland.	Total.
Royal Engineers	184	114	49	347
Civil Assistants.	435[3]	192	136	763
Labourers	253	209	55	517
Total	872	515	240	1627

Principal triangulation.

The principal triangulation of the United Kingdom, which was commenced in 1783 under General Roy, has recently been completed, and an account of all the operations connected therewith is given in a volume entitled, *Account of the Observations and Calculations of the principal Triangulation; and of the Figure, Dimensions, and Mean Specific Gravity of the Earth, as derived therefrom. Drawn up by Captain Alexander Ross Clarke, R.E., under the direction of Lieut.-col. H. James, R.E., F.R.S., &c.* London, 1858, 4to. pp. 782. It consists of a series of great triangles, extending over the whole country, connecting and showing the distances and bearings of all the principal points. There are in all 218 points in the principal triangulation, and the observed bearings amount to 1554.

Bases.

The following table gives the lengths of the several bases as measured and reduced to the same standard, and their lengths as shown in the triangulation, in accordance with the adopted scale of linear measure:—

Date.	Base.	Length in terms of Ramsden's Scale.	Length in terms of Ordnance Standard.	Length in Triangulation.	Difference.
1791	Hounslow Heath.	27404·24	27406·190	27406·363	+ 0·173
1794	Salisbury Plain...	36574·23	36576·830	36577·656	+ 0·826
1801	Misterton Carr...	26342·19	26344·060	26343·869	— 0·191
1806	Rhuddlan Marsh.	24514·26	24516·000	24517·569	— 1·596
1817	Belhelvie	26515·65	26517·530	26517·770	+ 0·240
1827	Lough Foyle	...	41640·887	41641·103	+ 0·216
1849	Salisbury Plain...	...	36577·858	36577·656	— 0·202

[1] About L.3000 of this sum is required to meet the expense of surveys made for the Landed Estates Court, Ireland, which will be repaid.
[2] This amount will be covered by the sale of the maps. In the year ending 30th June 1859, the sum so received was L.5366, besides the value of maps supplied to public departments during the same period, amounting to L.908, being in all L.6274.
[3] The large number of assistants in England arises from the head-office being at Southampton.

Trigonometrical Survey.

The base lines from which all the trigonometrical distances have been computed are those which were measured on Salisbury Plain, and on the shore of Lough Foyle in Ireland. They are respectively 6·93 and 7·89 miles long, and the difference between their measured lengths and their lengths as computed through the triangulation from each other is only about 5 inches. This difference was divided in proportion to the square roots of the lengths of the measured bases, whence was obtained the mean base which has been used in the triangulation, and there is therefore a difference of about 2½ inches between the measured and computed length of each of these bases. Of the four other base lines measured, the greatest difference between the measured lengths, and the lengths as computed from the mean base, does not amount to 3 inches in three of them. The fourth base, on Rhuddlan Marsh in North Wales, was measured in an unfavourable position, and the difference between its measured and computed length is 1·596 feet.

Triangulation.

The mean length of each side of a triangle, in the principal triangulation is 35·4 miles. There are 37 sides, whose lengths are between 80 and 90 miles, 18 whose lengths are between 90 and 100 miles, and 11 exceeding 100 miles in length. The longest side in the triangulation is 111 miles. The sum of all the distances or sides in the principal triangulation is 206,710,000 feet, or, in round numbers, exactly ten times the radius of the earth.[1] The horizontal angles, as well as the azimuthal bearings of the stations, have been principally obtained from observations with Ramsden's great three feet theodolites; and the perfection of these instruments may be judged from the fact, that the sum of the angles in the triangles rarely differed 3″·4 from the true sum. For an account of these, and the other instruments used in the survey, see the work already referred to. One of the operations frequently demanding great labour, was the setting up of the theodolite, which had sometimes to be raised by scaffolding to a great height; sometimes a solid foundation had to be made for it in a bog; and sometimes a site had to be prepared for it on the rocky summit of a mountain. In exposed situations on the tops of mountains, a stone wall had generally to be built close round the lower part of the observatory,—a precaution which on one occasion saved the instrument from certain destruction. In placing the framework for receiving the feet of the instrument, every care had to be taken to have it as nearly concentric with the station as possible: the circular mahogany tray upon which the instrument rests was then placed on the table, and accurately brought over the centre mark by means of a plumb-line suspended from the orifice in its centre. The next step, after placing the instrument in position, was to select a spot for the referring object,—an object which, from its position, should be visible under all circumstances, and to which the bearings of all other objects could be referred. It was so constructed as to present a fine vertical line of light of any required breadth, and it was usually placed at the distance of one or two miles. As the adjustments of the theodolite are liable to be deranged by travelling, the first operation at a station was to correct any deficiencies of this nature. The general adjustment consists in this, that the line of collimation of the telescope should be perpendicular to its axis of rotation; this axis perpendicular to the revolving axis of the instrument; and the latter perpendicular to the plane of the horizon. The runs of the micrometers should also agree with the divisions on the limb. The observations then proceed as follows:—The instrument being perfectly levelled, and the lower part or body firmly clamped to the table, the observer directs his telescope upon the referring object, and, having carefully clamped the upper limb, brings the intersection of the cross-hairs, by the motion of the tangent-screw, to bisect the vertical line of light in the referring object. He then reads the degrees, minutes, and seconds given by the divided circle and each of the micrometer microscopes. The upper limb is then unclamped, and the telescope directed to the next object to be observed, which is bisected, and the readings recorded. Similarly all the other points to be observed, and then, finally, the referring object is bisected and read again. The agreement of this last reading with that at the commencement of the series is some test of the care of the observer and the steadiness of the instrument. Each such series is called an "arc," and they are numbered consecutively from the commencement to the close of the station. The first arc being completed, the telescope is reversed in its Y's, the horizontal circle turned through 180°, and the levels adjusted if necessary. The second arc is then proceeded with precisely in the same manner as the first, closing as well as commencing with the referring object. The second arc being completed, the lower limb of the instrument is moved through a small angle, 20° or 30°, and clamped, so as to get readings on another part of the circle; and in this position the third arc is taken. This being completed, the telescope and horizontal circle are reversed, as in the second arc, and so on. As the readings of the microscopes at each observation are read out by the observer, they are recorded—invariably in ink—by the booker in the observation-book. A copy of the day's work is made every evening, and, being carefully compared by the observer with the original, is transmitted to the head-office every two or three days. The original record of the observations is retained by the observer until the book is filled. From each point the angular distances of all the principal stations visible from it are observed, and in this way a number of values are obtained, which correct one another. Each of these values, again, is the result of numerous repetitions of the same observation, and thus the greatest possible degree of accuracy is secured. In order to obtain the mean of a number of observations, so as to give due weight to those of them which there is reason to believe to be most nearly correct, the "method of least squares," a result of the theory of probabilities, is adopted. See article PROBABILITY, § X.

Trigonometrical Survey.

Astronomical observation

Besides determining the directions and distances of the principal points of a country, it is necessary for the construction of a map to determine the latitudes and longitudes of the several points, and the inclinations of the sides of the triangles to the meridian. In order to effect this, the latitude and longitude of one station at least, and the inclination of a side of one of the triangles to the meridian, must be determined astronomically, and hence the geographical latitudes and longitudes of all the other stations, and the inclinations of their several sides to the meridians which pass through their extremities, may be computed. As, however, a small error in the computation would lead to errors of considerable magnitude in the latitudes and longitudes deduced from it, it is necessary to verify the computed results by a number of astronomical observations at different stations in course of the survey.

Latitudes.

The latitudes of thirty-two of the stations were determined in course of the survey with Ramsden's zenith sector of 8 feet radius, which was destroyed in the fire at the Tower in 1841, and with Airy's zenith sector of 20·5 inches radius by Troughton and Simms. From the very close approximation of the observed zenith distances of the stars with each instrument, and the perfection of the instruments

[1] In Airy's Figure of the Earth the equatorial radius is 20,923,713 feet, and the polar radius 20,853,810 feet, giving an ellipticity of $\frac{1}{299 \cdot 33}$; but from the ordnance and other more recent surveys abroad the axes are found to be 20,926,500 feet and 20,855,400 feet respectively, and the ellipticity about $\frac{1}{334}$. The mean density of the earth, as determined from observations at Arthur's Seat, is 5·316.

Trigonometrical Survey.

themselves, the surveyors have every confidence in the results obtained.

The longitudes of the different stations were in the first instance calculated on Airy's figure of the earth,[1] by using

Longitudes

the observed latitude of Greenwich, and the observed azimuth of the meridian mark, and transferring this azimuth with the differences to each station in succession; the observed latitudes and the observed azimuths were then used to determine corrections to Airy's Figure, and the Greenwich latitude and azimuth; the longitudes and latitudes then received their necessary corrections.

The longitudes were also determined chronometrically by the transmission of chronometers, and by transit observations; the difference of longitude obtained in this way between the extreme points, viz., Greenwich and Feaghmaan in the island of Valentia, including an arc of about 10°, was found to correspond to a difference of 461 feet in the position of the station as determined geodetically.

Altitudes.

The altitudes of many of the stations have been determined by actual levelling with the spirit-level, and are all referred to the mean tidal level at Liverpool; but the vertical angles or zenith distances of the stations were also reciprocally observed with the theodolites.

Minor triangulation.

Each triangle of the primary triangulation is broken up into a series of smaller triangles, the sides of which are from 5 to 10 miles long, and this secondary triangulation is again broken up into smaller triangles, whose sides are about 1 mile long, and which form the tertiary or minor triangulation. The length of each side of the minor triangles are then actually measured on the ground, the men noting in their "field-books" every fence, stream, or other object they may cross. They then measure cross lines from one side of the triangle to another, and by taking offsets from the measured lines to every object on the face of the country, they obtain in their field-books the data for plotting accurate plans of the country upon any scale which may be required. The plotting is done in the office from the field-books. The survey is first laid down upon paper, and is then traced on thin tracing-paper. A man is then sent to walk over the ground to see that the surveyor has made no omission, and that everything which should be supplied is there; and also with the view of putting in the character of the trees, the woods, the gardens, the names, and so on; in fact to put in that detail which enables the draftsman in the office to make a perfect plan of the country. The computed trigonometrical length of each side of a triangle is thus checked by actual measurement; and the accuracy of the lines within each triangle is checked by the plotting, so that no errors which may be made by the surveyor can escape detection. Of course, the same extreme care is not necessary in dealing with the smaller triangles as is required in the principal triangulation, as errors here are more easy of detection, and cannot be propagated beyond very narrow limits; while the calculations are also comparatively simple. The difference, therefore, in the expense of surveying for a large and a small scale is comparatively slight, a fact which seems to have been lost sight of by those who raised a cry in parliament against the larger scales on the score of expense. It is of course equally laborious and costly to measure the distances of a given number of objects on a large or on a small scale; the additional expense arises only on the last operations, and between a 25-inch and a 6-inch scale, it is less than ten per cent.

Engraving, &c.

But not only are all the surveying operations conducted under the Board of Ordnance, but also all the operations connected with the engraving and printing of the maps. The head-quarters of the survey of the United Kingdom is at Southampton, and from thence all orders connected with the administration and conduct of the survey are issued, and all the plans and maps of Great Britain are there engraved and printed; those of Ireland being engraved and printed at the survey-office in the Phœnix Park, Dublin. The superintendent resides at Southampton; and is assisted by an officer in charge of the general correspondence, and the publication of the maps of Great Britain at Southampton; an officer in charge of the trigonometrical branch of the work, and of the initial levelling; and an officer in charge of the examination and zincographing of the manuscript plans, and of their reduction to the 6 and 1 inch scales. There is also an officer in charge of the office and publication of the maps in Dublin. Division officers are employed upon certain districts, and have under them numerous parties of surveyors, draftsmen, and computers, acting under the direction of non-commissioned officers; and by this arrangement the whole force is systematically and effectually regulated. The division officers are supplied from the head-office at Southampton, with the trigonometrical distances, and the positions of the trigonometrical stations on the plans; they personally examine the plans on the ground, and certify to their accuracy before they are forwarded for publication. Each officer makes up the accounts of his division, which, after being examined at the head-quarter office, and certified by the superintendent, are forwarded to the accountant-general.

Trigonometrical Survey.

The plans of parishes on the 25-inch scale are published by lithography, zincography, or the anastatic process; the plans of the towns, counties, and the present map of the kingdom, are engraved on copper.

Zincography.

Zincography is now generally adopted in preference to lithography, on account of the facility of handling thin zinc plates rather than lithographic stones, which are necessarily very heavy, and are constantly liable to be broken. "We find," says Colonel James, "not only that the plates are cheaper than the stones, and not liable to break, but that the impressions are darker and clearer; and as we can at all times resort to new tracings, or to the anastatic process, for producing any additional copies that may be required, the same plates, after being cleared of the impressions, are again and again used for taking the impressions of other maps."

Anastatic process.

The peculiar advantage of the anastatic process consists in the means which it affords of reproducing from a drawing or print, however old, which has been made with a greasy ink, a new plate or any number of new plates of zinc, from which new impressions may be taken. It is first ascertained, by rubbing a piece of thin paper over some part of the drawing, whether the ink is so fixed as that no trace of it will come off by pressure; and if this is the case, the drawing is immersed for a few minutes in a hot solution of strontia (1 oz. of strontia to a quart of water), which has the effect of loosening the ink. It is then partially dried, and afterwards immersed in a solution of nitric acid (one to six of water). If the print be comparatively new, the strontia bath is not required, and it is only necessary to immerse it in the nitric acid. The drawing is then ready to be transferred to a zinc plate, previously polished as finely as possible with powdered emery, and etched by placing a sheet of paper over it damped with nitric acid, and passing it through the press. The transfer is effected by passing the plate through a copperplate printing-press, after which the drawing is removed, and the plate wiped over with gum-water. It is then charged with printing-ink, and subsequently etched with phosphoric acid, a few drops of which are mixed with gum-water, after which it is ready to be printed in the usual manner.

Photography.

Plans of towns on the $\frac{1}{500}$ scale, and of the cultivated districts on the $\frac{1}{2500}$ scale, are reduced to the 6-inch scale for engraving by photography. "The advantages," says Colonel James, "derived from the introduction of this method will readily be understood by those who are at all conversant with the tedious methods of reducing plans of towns by the pentagraph or the eidograph, by proportional compasses or

Trigonometrical Survey.

squares, or any of the methods formerly employed; and it is no exaggeration to say, that the reduction of a plan of a large town on the $\frac{1}{500}$ scale may be and is now made by photography, first to the $\frac{1}{2500}$ scale, and from this to the 6-inch scale, at one-hundredth of the cost at which we were previously able to do this work; and, what is scarcely less important, the reductions are made and copies printed so rapidly by this process, that no delay takes place in the publication of the same district on the different scales ordered—a most important consideration, when it is borne in mind that the survey is now proceeding at a rate of about 1,500,000 acres per annum, and that, in the conduct of so large a work, the rapid closing up and the final disposal of the work as it is produced are essentially necessary to success in the conduct of it. As a proof of the facilities which photography gives us in making the reductions, I may mention that during the last week one man, with the assistance of a printer and a labourer, reduced 32,000 acres from the 25-inch to the 6-inch scale; and that he produced 3 copies of 45 sheets, or 135 impressions, in six days, besides some other work. One hundred draftsmen could not have produced so much work." "I have made experiments to ascertain the relative power of the different colours for producing photographs, and I found the following scale of colours produced a scale of shades from nearly perfect white to jet black: blue, purple, red, orange, yellow. I have, therefore, had all the houses on the MS. plans coloured yellow."—*Report on the Ordnance Survey of the United Kingdom for* 1855–6. The lens of the camera is a single achromatic meniscus 3½ inches in diameter, with a principal focal length of 24 inches. The required scale of the reduction is obtained by tracing on the ground glass of the camera a rectangle corresponding on the reduced scale to the rectangle of the plan to be reduced. The curvature of the image and indistinctness of outline from spherical aberration are both remedied by reducing the diaphragm in front of the lens to a small aperture. The negative copy is taken upon glass by the collodion process, and is then placed in the printing-frame in contact with sensitive paper, and in this way as many positive prints are taken in succession as may be required. Recently, in place of nitrate of silver, a coating of bichromate of potash, gum, and lamp-black, or any other pigment, has been employed in preparing the printing-paper. The action of light on a coating of this composition has the peculiar effect of rendering it insoluble in water, and consequently, when a sheet of paper coated with it is placed in the printing-frame under the collodion negative, the outline of the plan is rendered insoluble in water, and remains on the paper when all the remainder of the composition is washed away; and thus a *positive* plan, in ink of any colour which may be required, is obtained. The prints, however, obtained by this process are less clear and sharp in their outline than those obtained from nitrate of silver; but, by the following mode of treatment, sharp, clear lines are produced:—The ink of the print, after being soaked in a saturated solution of caustic potash or soda, becomes, so to speak, disintegrated, and is then in a state in which the print may at once be rubbed down, and the outline transferred to the waxed surface of a copper plate for the engraver. This promises to be of great importance, as, after obtaining the photographed reductions of the maps, they have hitherto been obliged to make tracings from them in ink, for the purpose of transferring the plan to copper; the expense and delay of which will now be saved, whilst no risk is run of any error being made by the draftsman.

Chromo-carbon process.

Photo-zincography.

A new method of printing from a negative, extremely simple and inexpensive, has recently been tried, and promises to be of great use. By means of it the reduced print is in a state to be at once transferred to stone or zinc, from which any number of copies can be taken, or to the waxed surface of the copper plates. To effect this the paper, after being washed over with the solution of the bichromate of potash and gum and dried, is placed in the printing-frame under the collodion negative, and after exposure to the light, the whole surface is coated over with lithographic ink, and a stream of hot water then poured over it. As the portion which is exposed to the light is insoluble, whilst the composition in all other parts, being soluble, is easily washed off, the outline of the map, in a state ready to be transferred either to stone, zinc, or the copper plate, is at once obtained, or the photograph can be taken on the zinc at once. "From the perfect manner," says Col. (now Sir) H. James, "in which we are able to transfer the impressions to zinc, we can, if required, print any number of faithful copies of the ancient records of the kingdom, such as *Doomsday Book*, the *Pipe Rolls*, &c., at a, comparatively speaking, very trifling cost. I have called this new method photo-zincography, and anticipate that it will become very generally useful, not only to government, but to the public at large, for producing perfectly accurate copies of documents of any kind."—*Report for* 1859.

Trigonometrical Survey.

A considerable saving in the cost of engraving is effected by using steel punches to cut the woods, figures, rocks, &c., on the copperplates. A portion of the writing, also, is engraved by machine (Becker's patent); and the parks and sands are ruled by a machine with a steel dotting-wheel, the pressure of which, and the interval between the lines of dots, being regulated according to the tint required to be produced.

Electrotyping.

The process of electrotyping has been found to be eminently useful for the purposes of the survey. Instead of printing from the copperplates, which speedily become obliterated in parts, and thus lead to a constant expense for repairing or re-engraving, an electrotype copy of the plate is taken, from which the impressions are printed. The original plate is thus preserved in its perfect state, from which, when required, another electrotype copy can be taken, or rather from the "matrix" of the original. Another great advantage is the facility it affords for making alterations, it being much easier to scrape off obsolete details, &c., from the electrotype cast of an engraved plate where they are in relief, than to cut them out from the original copperplate. Copies can also in this way be obtained from the plates in their different stages of progress, so that different classes of information can be engraved upon a map the same in all other respects, as for instance, one copy of a map may be obtained with contours, boundaries, &c., another with the hill features, a third with the geological lines, &c. This process has also been very usefully employed in joining two or more engraved plates together, so as to form a single copperplate for printing. In this way maps of several of the counties of Scotland, to serve as indexes to the 6-inch county maps, have been formed out of the copperplates of the 1-inch map. In one instance, no less than seven plates have been thus joined together.

The peculiar and practical advantage of the 25-inch scale of the parish plans over the smaller scales is, that it enables the acreage of every single enclosure and garden in the country to be given with a distinct reference to it. Besides, as every square inch represents an acre, any one may, in point of fact, ascertain exactly what each field contains. Tables of areas of each separate enclosure are also published with these plans. Each sheet contains 960 acres, being a mile wide and 1½ mile long. The reference, therefore to any property is exceedingly simple, and may be described as consisting of the fields numbered so and so, represented on sheet No. —— of the Government Survey of the County of ———. Sixteen of the plans on the 25-inch scale go to form one sheet on the 6-inch scale, which therefore comprises 24 square miles, being 6 miles long by 4 wide. On the towns scale of $\frac{1}{500}$, or 10 feet 6 inches to a mile, not only is every house laid down, but the actual divisions of each (on the ground floor) are also given. (D. K.)

TRIGONOMETRY.

Trigonometry.

THE word Trigonometry, from the Greek τριγωνον and μετρεω, signifies the measurement of trigons or triangles. In general, a trigon is determined when three of its dimensions are known; the other dimensions may be computed from these data, and hence the complete measurement of a trigon includes the computation of those of its lines and angles which have not been ascertained by direct measurement. Now, this computation presents much greater difficulties than the operation of measuring does, and thus a treatise on trigonometry comes to be, virtually, a treatise on the art of computing the unknown parts of a trigon.

The ancient geometers sought to connect the numerical expression for an angle, with the rate of divergence of its sides, by cutting off from these two equal distances of a determinate length, and by ascertaining the value of the line joining their extremities. Since the extremities of these distances lie in the circumference of a circle, the connecting lines are the chords of the intercepted arcs; they were accordingly entered in tables as such.

The Arabian mathematicians, however, introduced tables of the half chords of the double arcs, to which they gave the name *jeib*, signifying *in the bosom* (whence the word *jeb*, a purse as carried in the bosom), which was translated into the Latin *sinus*, having the same signification. They also used tables of the lengths of the shadows of gnomons corresponding to various degrees of zenith distance, which are called by us *tangents*, but by them *zyll*, literally shadows. To these there have been added, in later times, tables of *secants*, or lines joining the vertex of the angle with the extremities of the tangents, in Arabic *katy'*, that which cuts.

Almost all the operations of trigonometry are carried on by help of these tables of *sines*, *tangents*, *secants*, or, since the date of Nepair's famous invention, by means of tables of their *logarithms*.

The early trigonometers used a radius consisting of sixty parts, but we now regard the radius of the circle as unit, and divide it decimally—that is, into ten, one hundred, one thousand equal parts, and so on; the values of the sines, tangents, secants, being expressed in decimal fractions of the radius. Thus, (fig. 1), AOB being an angle at the centre of the circle described with the radius OA, the arc AB is homologous to it, so that if the whole circumference be divided into any number of degrees, say 360, the arc AB contains as many of those divisions as the angle AOB contains of 360th parts of the entire revolution. Having let fall from B the line BC perpendicular to OA, BC is the *sine* of the arc AB, or of the angle AOB; also, having drawn AD to touch the circle at A, and to meet the continuation of OB in D, AD is the tangent, OD the secant, and AC the versed sine of the same arc: these also, by an extension of the meaning of the words, are said to be the tangent, secant, and versed sine of the angle AOB to the radius OA; and if OA be taken as unit, we write, indifferently,

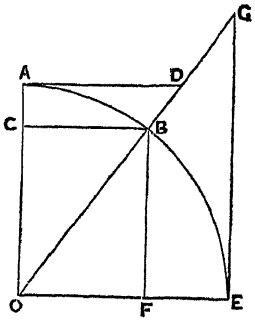


Fig. 1.

CB = sin AB;	CB = sin AOB;
AD = tan AB;	AD = tan AOB;
OD = sec AB;	OD = sec AOB;
AC = ver AB;	AC = ver AOB.

The defect of an acute angle from a right angle, or of its homologous arc from a quadrant, is called the *complement* of that angle or of that arc, and, for shortness sake, the sine, tangent, and secant of the complement are called the *cosine, cotangent, cosecant* of the angle or arc. If, then, OE be drawn perpendicular to OA, the angle BOE is the complement of AOB, the arc BE the complement of AB; while FB, EG, OG, EF, which are the sine, tangent, secant, versed sine of BE, are called the *cosine, cotangent, cosecant, coversed* sine of AB; and, conversely, CB, AD, OD, AC are the cosine, cotangent, cosecant, coversed sine EB.

Trigonometry.

Among these lines there are several very obvious relations; thus, putting a for the arc AB,

$$OC^2+CB^2 = OB^2 \text{ or } \cos a^2+\sin a^2 = 1,$$
$$OD^2-DA^2 = OA^2 \text{ or } \sec a^2-\tan a^2 = 1,$$
$$OG^2-GE^2 = OE^2 \text{ or } \operatorname{cse} a^2-\cot a^2 = 1;$$

$$OC : OB :: OA : OD \text{ or } \cos a \,.\, \sec a = 1,$$
$$CB : BO :: OE : OG \text{ or } \sin a \,.\, \operatorname{cse} a = 1,$$
$$DA : AO :: OE : EG \text{ or } \tan a \,.\, \cot a = 1;$$

$$OC : CB :: OA : AD \text{ or } \cos a \,.\, \tan a = \sin a,$$
$$BC : CO :: OE : EG \text{ or } \sin a \,.\, \cot a = \cos a.$$

If one of the functions of an angle be given, we can, by help of these propositions, easily compute the values of the others. Thus, if a be an angle such that its sine is $\frac{5}{13}$ths of the radius, we have $\sin a^2 = \frac{25}{169}$, whence $\cos a^2 = \frac{144}{169}$; $\cos a = \frac{12}{13}$; $\tan a = \frac{\sin a}{\cos a} = \frac{5}{12}$; $\cot a = \frac{1}{\tan a} = \frac{12}{5}$; $\sec a = \frac{1}{\cos a} = \frac{13}{12}$ and $\operatorname{cse} a = \frac{1}{\sin a} = \frac{13}{5}$; $\operatorname{ver} a = \frac{1}{13}$, $\operatorname{cov} a = \frac{8}{13}$.

But the real problems which lie at the root of all trigonometrical researches are these: having given the sine, or any other of these functions of an angle, to compute of how many degrees that angle consists; and conversely, having given, numerically, the value of an angle to find the values of its various functions. The practical solution of these problems is to construct a trigonometrical canon in which the values of the sines, tangents, and secants are set down for every minute, second, or other small portion of the circumference.

If the sines and cosines of two arcs be known, we can readily obtain those of their sum and of their difference. Thus, let AB, BC (fig. 2), be two arcs, of which the sines BD, CE, and consequently the cosines OD, OE, are known; we may obtain the sine CF of their sum AC, or C'F' of their difference AC' by the following process.

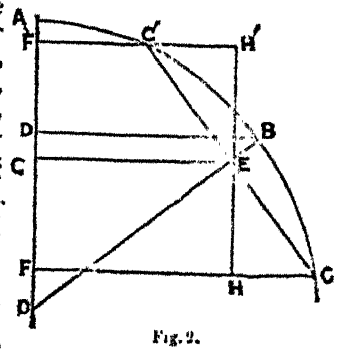


Fig. 2.

Through E draw EG parallel to BD and HEH' perpendicular to it; then, since the trigons ODB, OGE, CHE are similar, we have

OB : OE :: BD : EG :: OD : OG, or, putting a for the arc AB, and b for BC or BC'

Again, $1 : \cos b :: \sin a : EG :: \cos a : OG$;

whence, $EG = \sin a \,.\, \cos b$; $OG = \cos a \,.\, \cos b$.

$OB : EC :: OD : CH :: DB : EH$;

or, $1 : \sin b :: \cos a : CH :: \sin a : EH$;

whence, $CH = \cos a \,.\, \sin b$; $EH = \sin a \,.\, \sin b$.

Now, $FC = GE + CH$; $F'C' = GE - CH$; $OF = OG - EH$; $OF' = OG + EH$; wherefore,

Trigonometry.

$$\sin(a+b) = \sin a \cdot \cos b + \cos a \cdot \sin b; \quad (1)$$
$$\sin(a-b) = \sin a \cdot \cos b - \cos a \cdot \sin b; \quad (2)$$
$$\cos(a+b) = \cos a \cdot \cos b - \sin a \cdot \sin b; \quad (3)$$
$$\cos(a-b) = \cos a \cdot \cos b + \sin a \cdot \sin b. \quad (4)$$

If we can by any means obtain the sine of one degree, equations (1) and (3) enable us, by putting $b = 1°$, and a successively equal to 1, 2, 3, &c., degrees, to obtain the sines and cosines of every degree in the half quadrant; and so for any other division: the essential matter, then, is to obtain the sine of the smallest sub-division which we intend to use.

On putting $b = a$, equations (1) and (3) become

$$\sin 2a = 2 \sin a \cdot \cos a \quad (5)$$
$$\cos 2a = \cos a^2 - \sin a^2 \quad (6)$$

and, observing that $\sin a^2 + \cos a^2 = 1$, the latter of these may be put under the forms

$$\cos 2a = 2 \cos a^2 - 1 \quad (7)$$
$$\cos 2a = 1 - 2 \sin a^2 \quad (8)$$

whence $\cos a = \sqrt{\left\{\frac{1}{2} + \frac{1}{2}\cos 2a\right\}}$ (9)

$$\sin a = \sqrt{\left\{\frac{1}{2} - \frac{1}{2}\cos 2a\right\}} \quad (10)$$

by help of which we can compute the sine and cosine of an arc when the cosine of its double is known.

Again, on putting $b = 2a$, equations (1) and (3) become, after transformations,

$$\sin 3a = 3 \sin a - 4 \sin a^3 \quad (11)$$
$$\cos 3a = 4 \cos a^3 - 3 \cos a \quad (12)$$

by means of which the sine and cosine of the third part of an arc may be computed.

Similarly, on putting $3a$ for a, $2a$ for b, in the fundamental equations we obtain

$$\sin 5a = 5 \sin a - 20 \sin a^3 + 16 \sin a^5; \quad (13)$$
$$\cos 5a = 16 \cos a^5 - 20 \cos a^3 + 5 \cos a; \quad (14)$$

which enable us to compute the sine and cosine of the fifth part of an arc.

In the ancient system of graduation, still very generally adhered to, the quadrant is divided into 90 degrees, the degree into 60 *minuti primi* or minutes; the minute again into 60 *minuti secundi* or seconds; while, in the modern or centesimal system the quadrant is divided into 100 degrees, the degree into 100 minutes, the minute into 100 seconds. The former graduation is accomplished by means of the prime divisors 2, 3, 5, while the modern requires only the use of 2 and 5, so that the above equations contain all that is needed for the formation of the canon of sines according to either of the systems.

The tri-section of an angle implies the solution of an equation of the third degree irreducible by Cardan's rule. The quinquisection requires the solution of an equation of the fifth degree. As no practicable method for reducing such equations was then known, the computers of the actual tables of sines were forced to use only repeated bisections; these bisections they carried on until they arrived at arcs so small as to be proportional to their sines without sensible error, and thence, by a common proportion, they found the sine of one minute. This process, besides being indirect, is attended with a serious practical inconvenience when the arc to be bisected is small. The cosine of a small angle is nearly equal to unity, so that the quantity $\frac{1}{2} - \frac{1}{2}\cos 2a$ comes to have few effective figures, and can only give the sine of the angle a true to a small number of places. This circumstance compels us to carry the primary computations to a great number of decimal places. By employing the higher equations we avoid these inconveniences, as is seen from the following computation of the sine of one degree of the ancient division. Trigonometry.

Since the chord of 60° is just equal to the radius, the sine of 30° must be $\frac{1}{2}$, whence

$$\cos 30° = \sqrt{.75}$$
$$= .86602\ 54037\ 84439.$$

Observing that, according to equations (9) (10)—

$$\cos 15° = \sqrt{\left\{\frac{1}{2} + \frac{1}{2}\cos 30°\right\}}; \quad \sin 15° = \sqrt{\left\{\frac{1}{2} - \frac{1}{2}\cos 30°\right\}}$$

we obtain

$$\cos 15° = .96592\ 58262\ 89068$$
$$\sin 15° = .25881\ 90451\ 02521.$$

By putting x for sin 5° in equation (11), we have

$$4x^3 - 3x + \sin 15° = 0$$

whence the following computation:—

24	$24x$	$12x^2 - 3$	$4x^3 - 3x + \sin 15°$	sin 5°
24	2·088 + 3 720	−2·909 172 + 323 640 + 288	·000 453 057 − 450 921 + 25	·087 ·000 155
24	2·091 720 + 17 808	−2·908 848 072 + 1 552	·000 002 161 − 2 158	·087 155 + 742
24	2·091 737 808	−2·908 846 520	·000 000 003	·087 155 742

which gives sin 5° = .087 155 742.

Similarly from equation (12) we have, putting y for cos 5°,

$$4y^3 - 3y - \cos 15° = 0$$

whence

24	$24y$	$12y^2 - 3$	$4y^3 - 3y - \cos 15$	cos 5°
24	24· −·072	9· −·072 +· 108	·034 074 174 − 27 + 108 − 108	1· −·003
24	23·928 −·019 320	8·928 108 −·019 262 040 +· 7 776	·007 182 066 − 7 187 127 + 7 753 − 2	·997 − 805
24	23·908 680	8·908 853 736	·000 002 690 − 2 690	·996 195 − 302
				·996 194 698

which gives cos 5° = .996 194 698.

The sine and cosine of one degree are now to be found by help of equations (13) (14). Putting x for sine 1°, equation (13) becomes

$$16x^5 - 20x^3 + 5x - \sin 5° = 0$$

whence the following very rapid computation:—

1920	$1920x$	$960x^2 - 120$	$320x^3 - 120x$	$80x^4 - 60x^2 + 5$	$16x^5$ &c.	sin 1°
1920	0· + 33·408	− 120· + ·290 65	0· − 2·088 + 1 686	+ 5· − ·018 165 6 + 7 3	− ·087 155 742 + ·087 0 − 105 360 + 25	·0 ·0 174
1920	+ 33·408 + 101	− 119·709 35 + 1 75	− 2·086 314 − 6 273	+ 4·981 841 7 − 109 3 − 2	− ·000 261 077 + 261 049 − 3	·0 174 + 0 524
1920	+ 33·509	− 119·707 6	− 2·092 587	+ 4·981 732 2	− ·000 000 031 + 30	·017 452 4 + 006
						·017 452 406

And again, putting y for cos 1° in equation (14)

$$16y^5 - 20y^3 + 5y - \cos 5° = 0.$$

1920	$1920y$	$960y^2 - 120$	$320y^3 - 120y$	$80y^4 - 60y^2 + 5$	$16y^5$, &c.	cos 1°
1920	1920·00 − ·29	840·000 0 − ·291 8	200·000 00 − ·127 68 + 2	25·000 000 − ·030 400 + 9 − 1	·003 805 302 − 3 800 + 2 310	1· − ·000 152
1920	1919·71	839·708 2	199·872 34	24·969 608	·000 007 612 − 7 616	·999 848 − 305
						·999 847 695

So that sin 1° = ·017 452 406
cos 1° = ·999 847 695

If we now, in order to compute the sine and cosine of one minute, proceed by bisection, we have

$$\sin 30' = \sqrt{\{·000\ 076\ 153\}};$$
$$\cos 30' = \sqrt{\{·999\ 923\ 847\}}.$$

The first of these equations is clearly unfit for giving a result with great precision, for which reason, if our intention had been to compute the sine of one minute, it would have been better to have gone on with the bisection of 15°; and then of 7° 30′, so as to obtain the sine and cosine of 3° 45′; thence by two trisections to reach 25′; and, lastly, by two quinquisections to have obtained the sine and cosine of one minute.

The construction of the canon of sines is greatly facilitated by employing the method of differences. Thus, if we take three equi-different arcs, $a - b$, a, $a + b$, their sines with the first and second differences stand thus,

	First Difference.	Second Difference.
$\sin(a-b)$		
$\sin a$	$\sin a - \sin(a-b)$	$\sin(a+b) - 2\sin a + \sin(a-b)$
$\sin(a+b)$	$\sin(a+b) - \sin a$	

and this second difference may, by help of equations (1) and (2), be put under the form $-2\sin a\,(1-\cos b) = -2\sin a\,.\,\text{ver}\,b$. Now, since b is necessarily a small angle, its versed sine, that is, the defect of its cosine from radius, must also be very small, so that the multiplication by it is attended with little labour. Again, if $a-2b$, $a-b$, a, $a+b$, $a+2b$, be five equidifferent arcs, the fourth difference of their sines is

$$\sin(a+2b) - 4\sin(a+b) + 6\sin a - 4\sin(a-b) + \sin(a-2b)$$

which may be put under the forms

$$2\sin a\{\cos 2b - 4\cos b + 3\};\ \text{or,}$$
$$4\sin a\{\cos b - 1\}^2 = +4\sin a\,.\,\text{ver}\,b^2.$$

And, further, if we take seven equidifferent arcs from $a-3b$ to $a+3b$, the sixth difference of their sines is

$$-8\sin a\,.\,\text{ver}\,b^3,$$

and this law of formation extends to all differences of an even order.

But in applying the method of successive differences, the minute errors unavoidable in the last placed figures would go on accumulating, wherefore we must provide periodical tests of the accuracy of the work. Now, we have already obtained the sines of 15°, 30°, 60°, 75°, wherefore the sine of 45° only is wanted to complete the series of arcs differing by 15°. But of 45° the sine is, necessarily, equal to the cosine, and therefore

$$\sin 45° = \sqrt{\tfrac{1}{2}} = ·707\ 106\ 781$$

so that our first table of sines is this;

sin 0° = ·000 000 000
sin 15° = ·258 819 045
sin 30° = ·500 000 000
sin 45° = ·707 106 781
sin 60° = ·866 025 404
sin 75° = ·965 925 826
sin 90° = 1·000 000 000

The equation $\sin 2a = 2\sin a\,.\,\cos a$ may be put in the form $\sin 2a = 2\sin a - \sin a\,.\,2\,\text{ver}\,a$, which, especially when a is a small arc, is more convenient for computation. Putting $a = 5°$, this equation becomes

$$\sin 10° = 2\sin 5° - \sin 5°\,.\,2\,\text{ver}\,5°$$
Now, 2 ver 5° = ·007 610 604; and
(2 ver 5°)² = ·000 057 921;

whence the following table is readily constructed:

Arc.	Sine.	First Diff.	Second Diff.	Third Diff.	Fourth Diff.
0°	·000 000 000	87 155 743	−	−	+
5	·087 155 743	86 492 435	663 308	658 260	10 059
10	·173 648 178	85 170 867	1 321 568	648 201	14 991
15	·258 819 045	83 201 098	1 969 769	633 210	19 808
20	·342 020 143	80 598 119	2 602 979	613 402	24 481
25	·422 618 262	77 381 738	3 216 381	588 921	28 961
30	·500 000 000	73 576 436	3 805 302	559 960	33 219
35	·573 576 436	69 211 174	4 365 262	526 741	37 235
40	·642 787 610	64 319 171	4 892 003	489 506	40 954
45	·707 106 781	58 937 662	5 381 509	448 552	44 372
50	·766 044 443	53 107 601	5 830 061	404 180	47 444
55	·819 152 044	46 873 360	6 234 241	356 736	50 164
60	·866 025 404	40 282 383	6 590 977	306 572	52 492
65	·906 307 787	33 384 834	6 897 549	254 080	54 431
70	·939 692 621	26 233 205	7 151 629	199 649	55 945
75	·965 925 826	18 881 927	7 351 278	143 704	57 043
80	·984 807 753	11 386 945	7 494 982	86 661	
85	·996 194 698	3 805 302	7 581 643		
90	·000 000 000				

Having written the sines of 0° and of 5°, we get the first differences; and the first of the second differences is obtained by taking the product of sin 5° by − 2 ver 5°, from which the second of the first differences and the sine of 10° are had. The first of the third differences, viz., 658 260 is the product of the second of the first differences, viz., + 86 492 435 by the same multiplier − 2 ver. 5°; from it we get the next second difference, the next first difference, and the sine of 15°, the coincidence of which with the previously determined value shows the work to have been accurately done. The first of the fourth differences, 10 059, is the product of − 1321 568 by the same multiplier, or, as is preferable, of sin 10° by (2 ver 5°)². Each successive fourth difference is the product of the same multiplier (2 ver 5°)² by the sine of the next arc; now this multiplier ·000 057 921 has few effective figures, and thus the labour of the calculation is much reduced.

The same process may be extended to the sixth order of differences, which are obtained by multiplying the columns of sines by $(-2\,\text{ver}\,5°)^3$ = ·000 000 441, which has still fewer effective figures; but the advantage obtained by pushing the differences to a high order is counteracted by

the circumstance, that the minute errors, unavoidable in the last place figures, accumulate to cause inconvenience.

When the subdivision is more minute, this method is still more rapid; thus, in constructing the table of the sines of arcs differing by one degree, we use the multipliers

$$2 \text{ ver } 1^\circ = \cdot 000\ 304\ 610$$
$$(2 \text{ ver } 1^\circ)^2 = \cdot 000\ 000\ 093.$$

Arc.	Sine.	1st Diff.	2d Diff.	3d Diff.	4th Diff.
0°	·000 000 000	17 452 406	—	—	+
1	·017 452 406	17 447 091	05 315	5 317	
2	·034 899 497	17 436 459	10 632	5 309	8
3	·052 335 956	17 420 518	15 941	5 308	1
4	·069 756 474	17 399 269	21 249		
5	·087 155 743				

It is always necessary to carry the computation of the differences to two or three places beyond what is intended to be used. This is well seen in the above example, in which the values of the sines are given true to the nearest figure in the ninth decimal place: the fourth differences found by help of these correct values, are 8, 1; whereas, by computation from the sines of 2° and 3°, they ought to have been 3·25 and 4·86, if the work had been carried two places farther.

This illustration is sufficient to exemplify the manner in which trigonometrical tables are constructed. Various contrivances are employed for diminishing the labour of making tables of secants, tangents, and logarithmic sines. A complete account of these would extend this article to an unreasonable length; we shall, therefore, at once address ourselves to the method of using those tables which have been already constructed.

Hitherto we have only considered the sines, tangents, and secants of arcs within the quadrant; and must now examine the cases of arcs extending to the whole circumference, or even beyond it.

Let a point start from A, and move round the circumference of the circle described from the centre O with the radius OA (fig. 3); when the moving point has passed over the arc AB, the sine has grown from zero to CB; as the arc continues to increase, the sine also increases, until the arc becomes a complete quadrant AD, at which time the sine is the radius OD. After the arc has passed into the second quadrant, the sine FE shortens to become zero, when the arc is the semicircumference AG; and it is obvious that the sine of the arc AE, which is greater than the quadrant, is also the sine of its supplement GE, which is as much less than the quadrant.

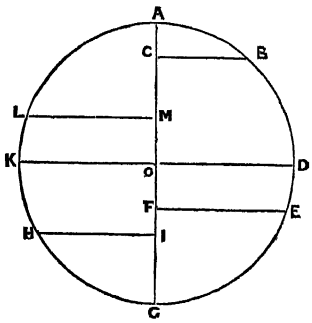


Fig. 3.

When the arc, as AH, exceeds the semicircumference, its sine IH appears on the other side of the diameter AOG, and this position is represented by the sign −. The sine of AK (three quadrants) is the radius OK, and is therefore represented by − 1; and when the arc, as AL, exceeds three quadrants, its sine ML, actually decreasing, is, in algebraic language, said to be increasing, that is, becoming less subtractive. The sine of the whole circumference AA is again zero; and if the moving point be supposed to continue its progress, the same changes in the value of the sine are repeated in each succeeding revolution. The cosine of the arc undergoes corresponding changes; it is positive in the first quadrant, negative in the second and third, and again positive in the fourth quadrant.

Resolution of Right-angled Triangles.

In a right-angled triangle ABC, besides the right angle at C, we have one angle and three sides to consider: of these, any two being given, the other two may be computed thus:—

CASE 1.—An angle and the hypotenuse being given.

If the hypotenuse AB were made the radius, BC would be the

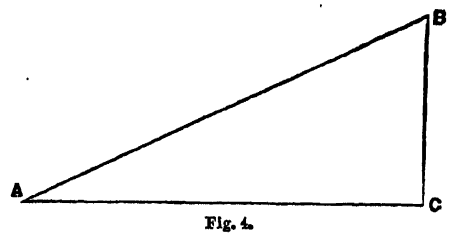


Fig. 4.

sine, and AC the cosine of the angle A; hence BC = AB . sin A, AC = AB . cos A (fig 4).

Let A be 27° 53′; AB 572·8; we obtain BC and AC thus;

Log sin 27° 53′	= 9·669 9420
Log 572·8	= 2·758 0030
Log cos 27 53	= 9·946 4040
BC = 267·883	2·427 9450
AC = 506·299	2·704 4070

CASE 2.—An angle and the adjacent side being given.

If the given side, say AC, were made the radius, CB would be the tangent, and AB the secant of the adjacent angle A; hence CB = AC . tan A, AB = AC . sec A.

Example.—Let A = 57° 41′, AC = 897·7

Log tan 57° 41′	= 0·198 8839
Log 897·7	= 2·953 1312
Log sec 57 41	= 0·271 9725
CB = 1419·107	3·152 0151
AB = 1679·205	3·225 1037

CASE 3.—An angle and the side opposite to it being given.

If BC were made the radius, CA would be the cotangent, AB the cosecant of the opposite angle A; whence CA = BC . cot A, AB = BC . cse A.

Thus, let BC = 419·72; A = 15° 31′, and the calculation may be arranged as under:

Log cot 15° 31′	= 0·556 5214
Log 419·72	= 2·622 9597
Log cse 15 31	= 0·572 6459
AC = 1511·754	3·179 4811
AB = 1568·937	3·195 6056

In these three examples the logarithm of the given side is placed in the middle, so as to be conveniently added to the logarithm above for the one result, to the logarithm below for the other.

CASE 4.—The hypotenuse and one side being given.

Example.—Let AB = 894·37; BC = 514·63; then when the angle as well as the other side is wanted, the computation may be arranged thus:—

Log cos 35° 07′ 42″ 2	= 9·912 6815
Log 894·37	= 2·951 5172
Log 514·63	= 2·711 4951
Log sin 35° 07′ 42″ 2	= 9·759 9779
Log AC = log 731·474	= 2·864 1987

Here, from the logarithm of BC we subtract that of AC, in order to obtain the logarithmic sine of the angle A, and thence the angle A itself. Then, taking the logarithmic cosine of that angle, we write it above or adjacent to the logarithm of AB, the space having been purposely left open for it, these added together give the logarithm of AC.

When the side AC alone is wanted, this process is somewhat long; it is preferable to proceed as under—

Trigonometry.

AB =	894·37	
BC =	514·63	
Sum =	1409·00 log =	3·148 9110
Difference =	379·74 log =	2·579 4863
	2	5·728 3973
AC =	731·474	2·864 1987

This operation is founded on the fact, that the difference between the squares of two lines is equivalent to the rectangle under the sum and the difference of those lines.

CASE 5.—When the two sides are given.

If AC = 980·91, CB = 762·43, the angle A and the hypotenuse AB may be found thus :—

Log sec 37° 51′ 24″ 4	= 0·102 6219
Log 980·91	= 2·991 6292
Log 762·43	= 2·882 2000
Log tan 37° 51′ 24″ 4	= 9·890 5708
Log AB = log 1242·37	= 3·094 2511

Resolution of Oblique-Angled Triangles.

In general we have to consider two angles and the three sides of a triangle : of these, any three being given, the remaining two may be computed.

CASE 6.—Two angles and a side being given.

The third angle is found by subtracting the sum of the two given ones from 180°.

Having described a circle round the triangle ABC (fig. 5), join the centre O with each of the corners, and let fall the perpendiculars OD, OE, OF; then the angles BOD, COE, AOF are, respectively, equal to BAC, CBA, ACB. Now, BD is the sine of the angle BOD to the radius OB; so is CE of COE, and AF of AOF, so that the three lines BD, CE, AF, or their doubles BC, CA, AB, are proportional to the sines of the opposite angles BAC, CBA, ACB.

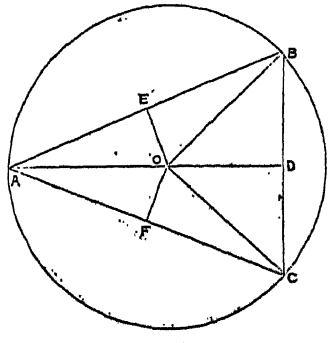


Fig. 5.

When both of the other sides are wanted, the computation can be arranged neatly, so as to avoid unnecessary figuring, by observing that the cosecant of an angle ist he inverse of its sine.

Example.—Let AB = 1378·7; BAC = 47° 53′; ABC = 65° 19′, and consequently ACB = 66° 44′.

Log sin 47° 53′	= 9·870 2756
Log cse 66 48	= 0·036 6205
Log 1378·7	= 3·139 4698
Log sin 65 19	= 9·958 3869
BC = 1112·669	3·046 3659
AC = 1362·941	3·134 4772

The logarithms of the results are here obtained by adding together the three upper and the three under logarithms.

CASE 7.—Two sides and an angle opposite to one of them being given.

As, in certain circumstances, this case admits of a double solution, it can only be safely used when there are the means of discriminating between the two results. Thus if, in the measurement of some triangle, we had found CAB = 37° 27′, AB = 3881, BC = 2360, it would have been difficult to determine which of the two results should be taken. For in finding the angle C by means of the proportion BC : AB :: sin A : sin C, we obtain for the log sine of C the value 9·999 9844, which is the log sine of 89° 30′, and somewhere between 48″ and 55″, and is also the log sine of the supplement, viz., 90° 29′, and between 5″ and 12″; the angle C may thus be either 89° 30′ 50″, or 90° 29′ 10″, and each of these values with an uncertainty of several seconds.

Colog 2360	= 6·627 0880
Log 3881	= 3·588 9436
Log sin 37° 27′	= 9·783 9528
	9·999 9844

If we take the former value, we obtain 53° 02′ 10″ for the remaining angle B, and thence get the length of the third side AC, as follows,— Trigonometry.

Log cse 37° 27′	= 0·216 0472
Log sin 53 02 10	= 9·902 5547
Log 2360	= 3·372 9120
AC = 3101·09	= 3·491 5139

But if we take the latter value, we have C = 52° 03′ 50″, giving the following calculation for AC—

Log cse 37° 27′	= 0·216 0472
Log sin 52 03 50	= 9·896 9101
Log 2360	= 3·372 9120
AC = 3061·04	= 3·485 8693

Thus, it seems that this mode of measuring a triangle is to be avoided whenever the angle opposite to the other given side is nearly a right angle; both on account of the difficulty of discriminating between the two results, and of the inexactitude with which each of these is obtained.

When the side opposite the measured angle is the greater of the two, there can be no ambiguity.

CASE 8.—Two sides and the angle contained by them being given.

When the sides BA, BC, and their contained angle ABC, are known, the other angles and the third side may be computed by drawing a perpendicular from B to AC, and by resolving the right-angled triangles thus formed. The following process is, however, generally preferred :—

Having produced one side CB, lay off BD, BE, each equal to BA, join DA, EA, and through C draw CF parallel to EA. Then ABD, the supplement of ABC, is equal to the sum of the two angles BAC, BCA, wherefore BEA is half the sum of A and C, while EAC or ACF is half their difference. Also, EAD is a right angle, so that FD is the tangent of DCF, FA the tangent of FCA to the radius CF; but FD : FA :: CD : CE; wherefore,

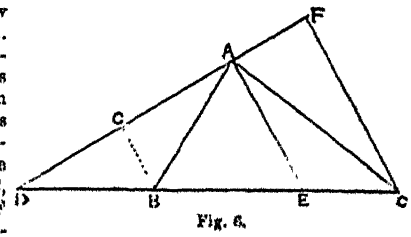


Fig. 6.

$$BC + AB : BC - AB :: \tan\frac{A+C}{2} : \tan\frac{A-C}{2}.$$

By help of this proportion we can find the half difference of the two angles, and thence the angles A and B themselves. Afterwards the third side is usually computed by help of the law stated in Case 6; but the following process, which is believed to be new, enables us to avoid the seeking out of logarithms, and the opening of the trigonometrical canon at so many places.

In the triangle AEC we have sin CAE : sin AEC :: EC : CA; that is,

$$\sin\frac{A-C}{2} : \sin\frac{A+C}{2} :: CB - BA : CA.$$

Or, in the triangle ADC, sin DAC : sin ADC :: DC : CA; that is,

$$\cos\frac{A-C}{2} : \cos\frac{A+C}{2} :: CB + BA : CA.$$

By means of either of these proportions we can find the third side CA.

Example.—Let AB = 738·6; BC = 1079·3; ABC = 67° 42′; whence A + C = 112° 18′.

AB = 738·6	
BC = 1079·3	
1817·9 colog	= 6·740 4300
340·7 log	= 2·532 3721
Log tan 56° 09′	= 0·173 4677
Log tan 15 36 42·7	= 9·446 2698
A = 71° 45′ 42·7″	
B = 40 32 17·3	
Log 340·7	= 2·532 3721
Log sin 56° 09′ 00″	= 9·919 3390
Log cse 15 36 42·7	= 0·570 0553
AC = 1051·396	3·021 7664

Trigonometry.

When, as often happens, the third side only is wanted, the following process is perhaps the most expeditious:—

Through B draw BG parallel to CF, and, of course, bisecting DA.

Then $DC^2 - CA^2 = DF^2 - FA^2 = 4\,DG \cdot GF$, but $DG = AB \cdot \cos\frac{B}{2}$, $GF = BC \cdot \cos\frac{B}{2}$; wherefore $AC^2 = DC^2 - 4\,AB \cdot BC \left(\cos\frac{B}{2}\right)^2$. Hence, if we find M a mean proportional between DG and GF, we must have

$M = \cos\frac{B}{2} \cdot \sqrt{(AB \cdot BC)}$, and $AC = \sqrt{\{(AB + BC + 2M) \cdot (AB + BC - 2M)\}}$; whence the following computation:—

½ log	738·6	= 1·434 2046
½ log	1079·3	= 1·516 5711
Log cos	33° 51′	= 9·919 3390
.M	= 741·506	2·870 1147
AB + BC	= 1817·9	
2 M	= 1483·012	
AB + BC + 2 M	= 3300·912	log = 3·518 6340
AB + BC − 2 M	= 334·888	log = 2·524 8996
		2 | 6·043 5336
AC	= 1051·397.	3·021 7668

CASE 9.—The three sides being given.

Bisect the angles BAC, BCA, and BCR the supplement of BCA, by the lines AOQ, CO, and CQ (fig. 7); draw also the perpendiculars OP, QR; then it is easy to show that O is the centre and OP the radius of the inscribed circle, that Q is the centre and QR the radius of one of the circles of external contact; also, that AR is the semiperimeter of the triangle, and AP, PC, CR, the excesses of that semiperimeter above the sides CB, BA, AC respectively.

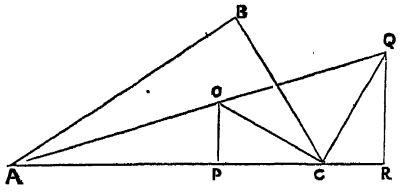


Fig. 7.

The triangle QCR is similar to COP, wherefore OP : PC :: CR : RQ, and $OP \cdot RQ = PC \cdot CR$. Again, AR : AP :: RQ : OP :: $OP \cdot RQ : OP^2$, wherefore AR : AP :: $PC \cdot CR : OP^2$, or $OP = \sqrt{\left\{\frac{AP \cdot PC \cdot CR}{AR}\right\}}$. But AP : PO :: R : tan ½ A, wherefore $\tan\frac{1}{2}A = \frac{PO}{AP}$; and similarly, $\tan\frac{1}{2}C = \frac{PO}{PC}$, $\tan\frac{1}{2}B = \frac{PO}{CR}$. Also, the area of the triangle is equivalent to the rectangle under AR and OP, or $ABC = \sqrt{\{AP \cdot PC \cdot CR \cdot RA\}}$. Hence, the three angles and the area can be found by a very concise operation.

Example.—Let CB = 517·7; BA = 789·5; AC = 904·6.

CB	= 517·7	AP	= 588·2	log	= 2·769 5250
BA	= 789·5	PC	= 316·4	log	= 2·500 2365
AC	= 904·6	CR	= 201·3	log	= 2·303 8438
Sum	= 2211·8	RA	= 1105·9	col	= 6·956 2841
					2 | 4·529 8894
				Log OP	= 2·264 9447
½ A	= 17° 22′ 31·6″			log tan	= 9·495 4197
½ C	= 30 11 13·5			log tan	= 9·764 7082
½ B	= 42 26 14·9			log tan	= 9·961 1009
Area	= 203 545·1			log	= 5·308 6606

the last four logarithms being obtained by subtracting each of the first four from the logarithm of the inscribing radius.

SPHERICAL TRIGONOMETRY.

A spherical triangle is a portion of the surface of a sphere inclosed by three arcs of great circles, and represents the *corner* or solid angle formed by the meeting of three planes at the centre of the sphere. The sides of the triangle measure the angles, and the angles of the triangle measure the edges of the corner. Since the sum of the three angles of a spherical triangle exceeds half a revolution by a quantity proportional to the surface of the triangle, we have to consider the three angles and the three sides, any three of which being given, the other three may have to be calculated; and therefore the cases are more numerous than in plane trigonometry. But the number of investigations is reduced one-half by the consideration of what is called the supplemental or polar triangle.

Trigonometry.

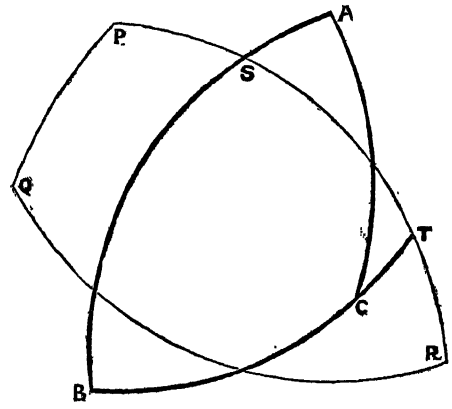


Fig. 8.

From each of the corners A, B, C, of the spherical triangle ABC, as a pole describe a great circle, so as to form a new triangle PQR, then the corners of PQR are necessarily the poles of the sides of ABC.

Let the sides BA, BC, produced if necessary, meet PR in S and T, then the arc ST is homologous with the angle ABC; now PT and SR are quadrants, wherefore PR is the supplement of ST; wherefore each side of PQR is supplementary to an angle of ABC, and conversely. Hence, if one spherical triangle have its sides supplementary to the angles of another, its angles also are supplementary to the sides of that other.

Right-angled Spherical Triangles.

Let ABC represent a spherical triangle having a right angle at C; join A, B, C with O, the centre of the sphere,

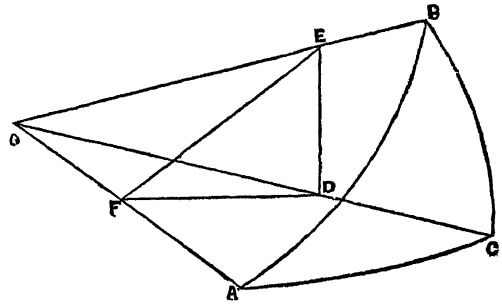


Fig. 9.

so as to trace a corner bounded by the three planes AOB, BOC, COA, the two last being perpendicular to each other.

In OC take any point D, thence draw DF perpendicular to OA, at F in the plane AOB raise FE also perpendicular to OA, and join DE; DE is evidently normal to the plane AOC, and the angle DFE measures the inclination of the two planes COA, BOA, and is thus equal to the angle A.

If we suppose OE to be the tabular radius, OD is the cosine of BC, DE its sine; OF the cosine of BA, EF its sine; but OD : OF :: R : cos AC, wherefore R : cos AC :: cos BC : cos AB (1); and again, FE : ED :: R : sin CAB, wherefore R : sin A :: sin AB : sin BC (2).

If we suppose OD to be the tabular radius, DE becomes the tangent of BC, DF the sine of CA; but FD : DE :: R : tan DFE, wherefore R : tan A :: sin AC : tan BC (3)

Trigonometry.

Lastly, if OF be made the tabular radius, FE becomes the tangent of AB, FD that of AC; now EF : FD :: R : cos EFD, whence R : cos A :: tan AB : tan AC (4).

As an analogous construction may be made for the angle B, we have similarly R : sin B :: sin AB : sin AC (5); R : tan B :: sin BC : tan AC (6); and R : cos B :: tan AB : BC (7).

By inverting the 7th proportion, and combining it with the second, we obtain cos B : sin A :: cos AB : cos BC, wherefore 1 : cos AC :: sin A : cos B (8); and similarly, 1 : cos BC :: sin B : cos A (9); also, by combining the 1st, 3d, and 6th proportions, we have 1 : cot A :: cot B : cos AB (10). From these ten proportions we have the following solutions of the various cases :—

CASE 1.—Given A and B.

$$\sec BC = \sec A \,.\, \sin B;\ \sec AC = \sin A \,.\, \sec B;$$
$$\sec AB = \tan A \,.\, \tan B.$$

CASE 2.—Given A and AB.

$$\sin BC = \sin AB \,.\, \sin A;\ \tan AC = \tan AB \,.\, \cos A;$$
$$\tan B = \sec AB \,.\, \cot A.$$

CASE 3.—Given A and AC.

$$\tan BC = \sin AC \,.\, \tan A;\ \tan AB = \tan AC \,.\, \sec A;$$
$$\sec B = \sec AC \,.\, \operatorname{cse} A.$$

CASE 4.—Given A and BC.

$$\sin AC = \tan BC \,.\, \cot A;\ \sin AB = \sin BC \,.\, \operatorname{cse} A;$$
$$\sin B = \sec BC \,.\, \cos A.$$

CASE 5.—Given AB and BC.

$$\sec AC = \sec AB \,.\, \cos BC;\ \sec B = \tan AB \,.\, \cot BC;$$
$$\sin A = \operatorname{cse} AB \,.\, \sin BC.$$

CASE 6.—Given AC and BC.

$$\sec AB = \sec BC \,.\, \sec AC;\ \tan A = \tan BC \,.\, \operatorname{cse} AC;$$
$$\tan B = \operatorname{cse} BC \,.\, \tan AC.$$

Quadrantal Spherical Triangles.

When one side of a spherical triangle is a quadrant, it may be revolved by considering its conjugate. Thus, if ABC be a triangle, having AB = 90°, we may form another triangle A'B'C', the angles of which are the supplements of the sides of ABC, and therefore having C' = 90°. In this way, we obtain the ten following equations which contain the solution of every possible case.

$\cos C = -\cos B \,.\, \cos A$;	$\cos C = -\cot BC \,.\, \cot AC$;
$\sin A = +\sin C \,.\, \sin BC$;	$\sin B = +\sin C \,.\, \sin AC$;
$\tan B = -\tan C \,.\, \cos BC$;	$\tan A = -\tan C \,.\, \cos AC$;
$\tan B = +\sin A \,.\, \tan AC$;	$\tan A = +\sin B \,.\, \tan BC$;
$\cos AC = +\cos B \,.\, \sin BC$;	$\cos BC = +\cos A \,.\, \sin AC$.

Spherical Triangles in General.

CASE 1. Given the three sides.

Having made a construction analogous to that given in Case 9 of Plane Trigonometry, O is the pole of a small circle which touches

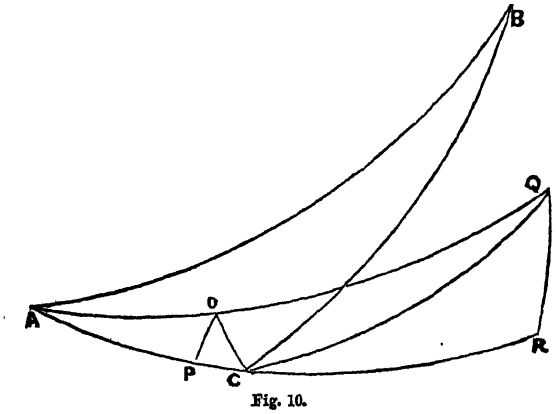


Fig. 10.

the three sides internally, and Q that of another small circle which touches the same three sides externally.

Trigonometry.

In the right-angled triangle OPC, we have R : tan OCP :: sin CP : tan PO; and similarly in QRC, R : tan QCR :: sin CR : tan RQ; but QCR is the complement of OCP, wherefore tan OCP : R :: R : tan QCR, wherefore tan PO : sin CP :: sin CR : sin RQ, or tan PO . tan RQ = sin PC . sin CR. Again, in the triangles APO, ARQ, R : tan QAR :: sin AR : tan RQ :: sin AP : tan PO, wherefore sin AR : sin AP :: tan RQ : tan PO :: tan PO . tan RQ : tan PO^2, or sin AR : sin AP :: sin PC . sin CR : tan PO^2, whence

$$\tan PO = \sqrt{\left\{\frac{\sin AP \,.\, \sin PC \,.\, \sin CR}{\sin AR}\right\}}.$$

The tangent of PO being thus found, we readily obtain the tangent of the half angles by observing that $\tan \frac{A}{2} = \frac{\tan PO}{\sin AP}$, $\tan \frac{C}{2} = \frac{\tan PO}{\sin PC}$, and $\tan \frac{B}{2} = \frac{\tan PO}{\sin CR}$. Hence a form of procedure quite similar to that for the analogous case of plane triangles.

Example.—Let BC = 84° 27′ 48″; AB = 95° 44 51″ CA = 53° 14′ 17″.

BC = 84° 27′ 48″	AP = 32° 15′ 40″	log sin	= 9·727 3611
AB = 95 44 51	PC = 20 58 37	log sin	= 9·553 8736
CA = 53 14 17	CR = 63 29 11	log sin	= 9·951 7397
233 26 56	RA = 116 43 28	log cse	= 0 049 0612
			2|9·282 0356
		Log tan PO	= 9·641 0178

A = 78° 41′ 46·0″	½A = 39° 20′ 29·7″	log tan	= 9·913 6567
C = 101 25 13·5	½C = 50 42 36·7	log tan	= 0·087 1442
B = 52 06 50·3	½B = 26 03 25·3	log tan	= 9·689 2781

If only one of the angles had been wanted, say that at A, we should have used the formula

$$\tan \frac{A}{2} = \sqrt{\left\{\frac{\sin PC \,.\, \sin CR}{\sin AP \,.\, \sin AR}\right\}}.$$

CASE 2. The three angles being given.

A, B, C, being the three given angles; let us construct a triangle A'B'C', having B'C' = 180° − A; C'A' = 180° − B; A'B' = 180° − C; then shall we have A'R' = 270 − ½(A + B + C); A'P' = 90° − ½(−A + B + C); P'C' = 90° − ½(A + B − C); C'R' = 90° − ½(A − B + C); wherefore $\tan \frac{A'}{2} = \sqrt{\left\{\frac{\cos (S - C) \,.\, \cos (S - B)}{-\cos (S - A) \,.\, \cos S}\right\}}$ in which S is put for ½(A + B + C). But A' = 180° − BC, wherefore $\cot \frac{BC}{2} = \sqrt{\left\{\frac{\cos (S - C) \,.\, \cos (S - B)}{-\cos (S - A) \,.\, \cos S}\right\}}$, by help of which formula any one of the sides may readily be found. When all the three sides are wanted, an arrangement similar to the last may be used.

Example.—A = 89° 58′ 43″; B = 76° 47′ 19″; C = 69° 19′ 48″.

89° 58′ 43″	28° 04′ 12″	log cos	= 9·945 6524
76 47 19	41 15 36	log cos	= 9·876 0588
69 19 48	48 43 07	log cos	= 9·819 3844
236 05 50	118 02 55	log (− sec)	= 0·327 6984
			2|9·968 7940
			9·984 3970

BC = 84° 53′ 42·9″	42° 26′ 51·4″	log cot = 0·038 7446
CA = 75 51 11·1	37 55 35·5	log cot = 0·108 3382
AB = 68 44 09·0	34 22 04·5	log cot = 0·165 0126

CASE 3. Two sides and the contained angle being given.

Let AB, BC, be the given sides, ABC the given angle. From A draw the arc AD of a great circle perpendicular to the side BC, then we have tan BA . cos B = tan BD, whence BD, and then DC can be found. Now, R : tan B :: sin BD : tan DA and tan C : R :: tan DA : sin DC, wherefore, compounding sin DC : sin BD :: tan B : tan C, which gives us C; and, again, R : cos AD :: cos

Trigonometry.

BD : cos AB; R : cos AD :: cos CD : cos AC, whence cos BD : cos DC :: cos AB : cos AC.

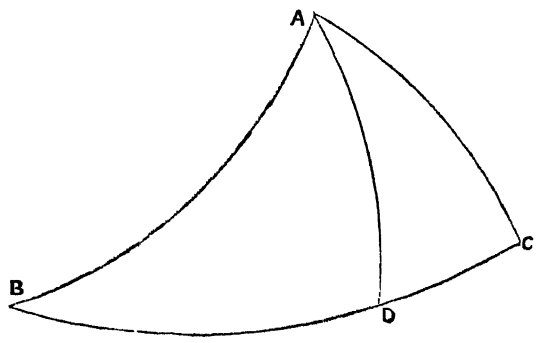


Fig. 11.

In order to find the angle A, we observe that cot ABD . sec BA = tan BAD; and also, that, since tan BD = sin AD . tan BAD and tan DC = sin AD, tan DAC, tan BD : tan DC :: tan BAD : tan DAC.

Example.—Let AB = 61° 44′ 14″; BC = 98° 22′ 45″; ABC = 76° 40′ 20″.

B = 76° 40′ 20″	log cos = 9·362 7115
AB = 61 44 14	log tan = 0·269 5352
BD = 23 12 33·4	log tan = 9·632 2467
BC = 98 22 45	
DC = 75 10 11·6	log cos = 9·408 1616
	log sec DB = 0·036 6507
	log cos AB = 9·675 3348
AC = 82° 25′ 20·3″	log cos = 9·120 1471
	log cse DC = 0·014 7133
	log sin BD = 9·595 5963
	log tan B = 0·625 4314
C = 59° 50′ 19·2″	log tan = 0·235 7410
B	log cot = 9·374 5686
BA	log sec = 0·324 6652
BAD = 26° 34′ 44·3″	log tan = 9·699 2338
DC	log tan = 0·577 1252
BD	log cot = 0·367 7531
DAC = 77 12 52·3	log tan = 0·644 1121
A = 103 47 36·6	

This process is convenient when only the third side, or only one of the angles, is wanted; for the complete solution, the following investigation is to be preferred.

AB and BC being the given sides, bisect the third side AC in D, and make DF perpendicular to AC, continuing it to meet AB produced in F, join CF, thus forming an isosceles spherical triangle AFC. Bisect the angle BCF by CG, and let fall the three perpendiculars GK, GL, GM; these three are evidently equal to each other, and also BK to BM, wherefore the arc BG must bisect the angle FBC. Also, since MF = FL, AM = CL = CK, so that CK is half the sum, KB half the difference of AB and BC, while ACG is half the sum, GCK half the difference of the angles A and C: moreover, since the whole revolution at G is made up of 2 FGL, 2 LGC, and 2 BGK; the half revolution is composed of FGL, LGC, BGK, therefore CGD is equal to BGK; at the same time, it may be observed, that KBG is the complement of the half of the angle ABC.

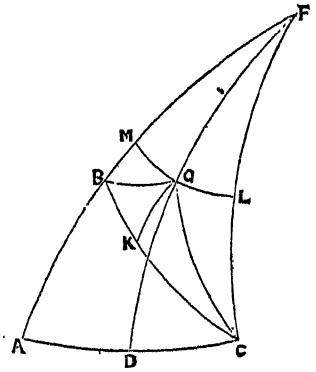


Fig. 12.

Since BKG is a right angle tan KG = sin BK . tan KBG; and also tan KG = sin CK . tan KCG, wherefore sin BK : sin KC :: tan KCG : tan KBG, that is

$$\sin\frac{CB+BA}{2} : \sin\frac{CB-BA}{2} :: \cot\frac{B}{2} : \tan\frac{A-C}{2} \quad . \quad . \quad (1)$$

Also, since GDC is a right angle, cos CG = cot DGC . cot GCD, while cos BG = cot BGK . cot GBK; wherefore since DGC = BGK, cos CG : cos BG :: cot GCD : cot GBK :: tan GBK : tan GCD; but cos CG : cos BG :: cos CK : cos BK, wherefore cos CK : cos BK :: tan GBK : tan GCD, that is

$$\cos\frac{CB+BA}{2} : \cos\frac{CB-BA}{2} :: \cot\frac{B}{2} : \tan\frac{A+C}{2} \quad . \quad . \quad (2)$$

Again, in the right-angled triangle GKC, tan GC . cos GCK = tan KC; and in GDC, tan GC . cos GCD = tan CD; wherefore cos GCK : cos GCD :: tan KC : tan CD, that is

$$\cos\frac{A-C}{2} : \cos\frac{A+C}{2} :: \tan\frac{CB+BA}{2} : \tan\frac{AC}{2} \quad . \quad . \quad (3)$$

Lastly sin GK = sin GC . sin GCK; sin GD = sin GC . sin GCD; sin GK . tan BGK = tan BK and sin GD . tan DGC = tan DC; wherefore, since BGK = DGC; sin GCK : sin GCD :: tan BK : tan DC, that is

$$\sin\frac{A-C}{2} : \sin\frac{A+C}{2} :: \tan\frac{CB-BA}{2} : \tan\frac{AC}{2}; \quad . \quad . \quad (4)$$

These four proportions are known under the name of *Nepair's Analogies*, in honour of their illustrious discoverer. By help of the first two we obtain half the difference and half the sum of the unknown angles, whence those angles themselves can be found: and then by help of either the third or the fourth we compute the half of the third side.

Taking the preceding example, we have

AB = 61° 44′ 14″	
BC = 98 22 45	
CB+BA = 160 06 59	
CB−BA = 36 38 31	
½ (CB+BA) = 80 03 29·5	sec = 0·762 8389
½ (CB−BA) = 18 19 15·5	cos = 9·977 4083
½ B = 38 20 10	cot = 0·101 9464
½ (CB−BA)	sin = 9·497 3996
½ (CB+BA)	cse = 0·006 5710
½ (A+C) = 81 48 57·9	tan = 0·842 1936
½ (A−C) = 21 58 38·8	tan = 9·605 9170
A = 103 47 36·7	
B = 59 50 19·1	
½ (A−C)	sec = 0·032 7651
½ (A+C)	cos = 9·153 3608
½ (CB+BA)	tan = 0·756 2679
½ AC = 41 12 40·1	tan = 9·942 3938

Or, thus

½ (A−C)	cse = 0·426 8480
½ (A+C)	sin = 9·995 5546
½ (CB−BA)	tan = 9·519 9913
½ AC = 41 12 40·1	tan = 9·942 3939
AC = 82 25 20·2	

AC in this example is the angular distance of the star α Andromedæ from β Orionis (1850).

CASE 4.—Two angles and the intermediate side being given.

The solution of this case is quite analogous to that of the preceding; thus, if the two angles at A and C and the interjacent side AC be known, we may let fall from A a perpendicular AD upon the opposite side, so as to form two right-angled triangles.

Then cos AC . tan C = cot CAD, whence CAD and, by subtraction, DAB can be found. Now in the right-angled triangle ADB, tan AD = tan AB . cos DAB, while in ADC, tan AD = tan AC . cos CAD, therefore cos DAB : cos CAD :: tan AC : tan AB from which AB is obtained. Again, cos B = cos AD . sin DAB and cos C = cos AD . sin DAC, wherefore sin CAD : sin DAB :: cos C : cos B which gives the angle B. Lastly, to find BC we have tan AC . cos C = tan DC, tan DC . tan DAB . cot CAD = tan DB.

Trigonometry.

Example.—Let A = 107° 23′ 46″; C = 75° 49′ 28″; AC = 67° 29′ 32″.

AC = 67° 29′ 32″		log cos = 9·582 9820
C = 75 49 28		log tan = 0·597 5924
CAD = 33 25 03·5		log cot = 0·180 5744
A = 107 23 46		
DAB = 73 58 42·5		log sec = 0·559 0933
CAD		log cos = 9·921 5191
AC		log tan = 0·382 6090
AB = 82 11 52·8		log tan = 0·863 2214
CAD		log cse = 0·259 0552
DAB		log sin = 9·982 7948
C		log cos = 9·388 9777
B = 64 41 51·9		log cos = 9·630 8277
C		log cos = 9·388 9777
AC		log tan = 0·382 6090
DC = 30 34 59·0		log tan = 9·771 5867
CAD		log cot = 0·180 5744
DAB		log tan = 0·541 8880
AD = 72 13 28·7		log tan = 0·494 0491
AC = 102 48 27·7		

Or the solution may be accomplished by help of Nepair's analogies thus;

A = 107° 23′ 46″		
C = 75 49 28		
A+C = 183 13 14		
A−C = 31 34 18		
½(A+C) = 91 36 37		log sec = 1·551 2790 (−)
½(A−C) = 15 47 09		log cos = 9·983 3038
½ AC = 33 44 46		log tan = 9·824 8288
½(A−C) = ...		log sin = 9·434 6365
½(A+C) = ...		log cse = 0·000 1715
½(CB+BA) = 92 30 10·3		log tan = 1·359 4116 (−)
½(CB−BA) = 10 18 17·4		log tan = 9·259 6368
CB = 102 48 27·7		
BA = 82 11 52·9		
½(CB−BA)		log cse = 0·747 4256
½(CB+BA)		log sin = 9·999 5855
½(A−C)		log tan = 9·451 3326
½ B = 32 20 55·95		log cot = 0·198 3437

Or thus for B:

½(CB−BA)		log sec = 0·007 0623
½(CB+BA)		log cos = 8·640 1739 (−)
½(A+C)		log tan = 1·551 1075 (−)
½ B = 32 20 55·95		log cot = 0·198 3437
B = 64 41 51·9		

CASE 5.—Two sides and an angle opposite one of them being given.

This, like the corresponding case in plane trigonometry, admits of two solutions, and we can only discriminate between these by a knowledge of the circumstances with which the work is connected.

We have, in relation to the figure for case 3, R : sin B :: sin BA : sin AD and R : sin C :: sin CA : sin AD; wherefore sin B : sin C :: sin AC : sin AB, and in general sin A : sin BC :: sin B : sin CA :: sin C : sin AB.

By help of this proportion we can compute the sine of the other opposite angle, and thence obtain the two supplementary angles of which it is the sine. Having ascertained which of the two angles is to be taken, we have now two sides and the two angles opposite to them, and can readily obtain the third side and the third angle by help of Nepair's analogies.

CASE 6.—Two angles and a side opposite one of them being given.

The very same remarks apply to this as as to the preceding case, the modes of solution being so closely related that it is not worth while to give the details of both.

Example.—A = 78° 21′ 40″; C = 59° 47′ 30″; AB = 48° 13′ 20″; BC obtuse.

C = 59° 47′ 30″		log cse = 0·063 3849
A = 78 21 40		log sin = 9·990 9772
AB = 48 13 20		log sin = 9·872 5842
BC = { 57 41 26·2 / 122 18 33·8 }		log sin = 9·926 9463
½(A−C) = 9° 17′ 05″		log cse = 0·792 2561
½(A+C) = 69 04 35		log sin = 9·970 3736
½(CB−BA) = 37 02 36·9		log tan = 9·877 8016
½ AC = 77 06 33·6		log tan = 0·640 4313
AC = 154 13 07·2		
½(CB−BA)		log cse = 0·220 0989
½(CB+BA) = 85 15 56·9		log sin = 9·998 5158
½(A−C)		log tan = 9·213 4713
½ B = 74 51 59·15		log cot = 9·432 0860
B = 149 43 58·3		

Or thus for AC, and B:

½(A−C) = ...		log sec = 0·005 7274
½(A+C)		log cos = 9·552 8178
½(CB+BA)		log tan = 1·081 8866
½ AC = 77 06 33·6		log tan = 0·640 4318
½(CB−BA)		log sec = 0·097 9007
½(CB+BA)		log cos = 8·916 6292
½(A+C)		log tan = 0·417 5558
½ B = 74 51 59·2		log cot = 9·432 0857

In this account of trigonometrical calculations, the leading cases and the most convenient modes of operating have alone been given. For fuller information on special cases, and the formulæ applicable to them, the reader is referred to any of the thousand and one treatises on the subject.

FIELD OPERATIONS.

The operations of the surveyor may be treated under three heads: the measurement of lines; the measurement of angles; and the determination of direction.

Graduated rods, tapes, and chains are used for the measurement of distance, the mode of operating depending on the degree of precision which is desired; for ordinary field-work, chains of 100 links are used, some being 100, some 66, and, for lightness, some only 50 feet long. The chain of 66 feet was contrived by Gunter in order to obtain the advantage of decimal calculation, for ten squares of such a chain make one acre, and thus the acre consists of 100,000 square links: 80 of Gunter's chains make one mile.

When the tape is used, care must be taken to stretch it always to the same tension; it is not to be depended on for nice work; its lightness is its great recommendation.

For the measurement of base-lines, where the utmost attainable degree of precision is needed, rods of wood or metal are employed, and means are provided for ascertaining their temperature in order that their expansions and contractions may be allowed for; the readings also are made by help of elaborate micrometric apparatus.

The measurement of angles proper is accomplished by means of the sextant, reflecting circle, repeating circle, and analogous instruments. The repeating circle consists, essentially, of two telescopes, AB, CD, turning on either side of a graduated circle, and having the planes in which they move brought as closely as possible together. Each of these telescopes can be secured and adjusted to any part of the limb by means of a clamp and tangent screw; and one of them, at least, as AB, carries a reader R, to indicate its position. The whole instrument is so supported on a stand as that the plane of the circle can be brought into the plane of the angle which is to be measured. Having secured the telescope AB so that the reader attached to it may indicate zero, we bring both telescopes to point to one of the signals, and secure CD to the limb. Releasing AB, we now bring it to point to the second signal, taking care that CD still point to the former; the reader now indicates the angular distance between the two signals. AB being now secured to the limb, and CD released, we again bring both telescopes to the first object, secure CD in that position, release AB, and bring it once more to the second object, while CD points to the first; the reader now indicates the double of the angle.

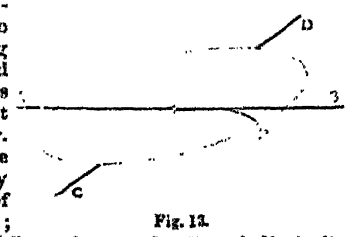


Fig. 13.

By continuing this process, we can repeat the angle as often as we choose; then, dividing the ultimate reading by the number of the operations, we obtain the value of the angle with more precision than if we had made only one measurement, for the minute

Trigonometry.

errors unavoidable in the graduation of the limb are subdivided. But no number of repetitions can give results true to a quantity less than that which is appreciable by the telescopes, or than what the stability of the instrument would warrant on a single observation, because each observation is accompanied by its own error, so that the sum of all the readings—that is, the ultimate reading of the instrument, includes as many of such errors as there are observations, so that the quotient must still be affected by the average error to which the instrument is liable.

The measurement of angles is most conveniently made by help of the sextant, or the reflecting circle. The construction of the sextant, and its use in astronomy, are given in the article NAVIGATION. The objects observed are there supposed to be remote, and the instrumental parallax has not been noticed: when the objects are near, this parallax becomes considerable, and we must therefore examine its source and the manner of correcting for it.

The inclination OCI of the two mirrors is double of SHP the angle which the two objects subtend, not at C the centre of the instrument, but at a variable point H, so that, if OP be joined, CPH is the parallax or the difference between the true and the apparent angle, when the object P is close at hand.

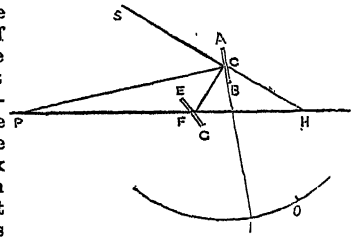


Fig. 14.

If the index I be brought back a little behind the zero point O, until the mirror AB be equally inclined to the lines FC, CP, the image of P will be seen in the same direction with P; wherefore, if we first bring the direct and reflected images of *that one of the signals which is to be looked at directly* to agree, as when taking the index error of the instrument, and correct for that error in the usual way, we shall obtain the angle CPS freed at once of parallax and of index error.

The sextant and octant, like all other fragmental instruments, are liable to this objection, that there are no means for ascertaining whether the actual axis of motion coincide with the centre of the graduation, or for correcting the error of centering; the observer has to rely entirely on the accuracy of the workmanship. By using an entire circle we obviate this inconvenience, and obtain also the advantage of repetition when great precision is required. The management of the reflecting circle does not differ, in any essential particular, from that of the sextant. There is in it this great advantage, that the left or the right hand object may be viewed directly.

Almost all the operations of the surveyor have reference to the positions which objects have on the surface of the earth; and hence, he is far oftener occupied in determining the *directions* of lines than in measuring their angles. These directions are, in general, indicated by referring them to the direction of the plummet, and to that of the meridian line; the first being obtained by processes purely mechanical, the second by the study of the motions of the stars. Frequently, indeed, the magnetic instead of the true north is used; but this is by no means a satisfactory practice, since the direction of the magnetised bar is subject to hourly, monthly, and secular variations, and is liable to great changes by change of position, so that the north shown by the compass at one station often differs by several degrees from that shown at another.

The simple plummet—that is, a fine thread with a small piece of lead attached so it—affords the most obvious, and, for many purposes, a sufficient indication of the direction of gravity; but it is superseded almost for ordinary work, and altogether for accurate purposes, by the spirit-level, which is a glass tube nearly filled with alcohol. When this tube is laid almost horizontally, the bubble or empty space comes to the higher end, and its position thus indicates that end which may be the higher. The upper inside surface of the tube is made slightly concave in the direction of its length, the curvature, in fine levels, being given by grinding; but, in those for ordinary use, the bend which the glass takes while being drawn out is held sufficient. The air-bubble sweeping along the upper surface of the tube is thus the counterpart of the plummet bob; the one rests exactly under, the other exactly above, the centre of curvature. If the tube be ground to a curve of 28 feet 6 inches radius, an inclination of one minute causes the air-bubble to move through one-tenth part of an inch: such a level, which can be easily carried in the pocket, has as much precision as a plummet of 28 feet.

The tube is usually protected by a case, of which the under side is made accurately parallel to the surface at the middle, and divisions are marked along the glass to show the deviation from horizontality. In order, by help of such an instrument, to render a surface horizontal, or the normal to that surface vertical, it is necessary to examine the level when placed in two directions inclined to each other; hence, in many cases, two cross levels are used.

Trigonometry.

The spherical spirit-level which indicates horizontality at once, consists of a circular disc of glass, having its under side ground concave; this disc is tightly fitted as the cover of a flat metal box, which is nearly filled with alcohol. The lower surface of the box, or the plane passing through the extremities of its three supports, is adjusted to be parallel to the spherical surface at the middle, and the air-bubble coming always to the highest point of the sphere, shows the deviation from horizontality, if there be any.

The directions of lines, in general, are ascertained by means of altitude-and-azimuth circles or theodolites. The essential parts of these instruments are as follows:—(1*st*), The telescope AB (fig. 15), having cross wires in its field-bar, and turning in a vertical plane upon (2*d*) the horizontal axis CD. This horizontal axis carries (3*d*) a graduated vertical circle E, which shows the inclination of the telescope to the horizon, its angular distance from the zenith, or its nadir distance, according to the taste of the observer; the nadir distance is the most convenient. In the older theodolites, the telescope could only be raised or depressed 40 or 60 degrees; but in all good instruments the telescope may be turned completely round. The horizontal axis rests upon (4*th*) two pillars

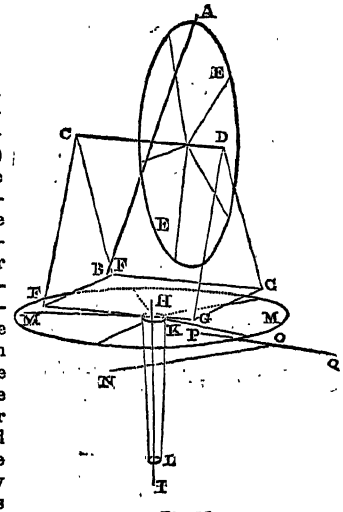


Fig. 15.

CF, DE, which are fitted with adjustments for rendering the axis truly horizontal. These again stand upon (5*th*) a plate or cross-bar FHG, fixed securely on the top of (6*th*) the vertical axis HI. This axis HI works in a hollow axis KL (7*th*), which ought to be perfectly concentric with it. By this arrangement the telescope BA is free to be pointed in any required direction. There is attached to the outer axis KL, a horizontal or azimuth circle M (8*th*), the divisions on which are read by verniers or micrometers attached to the cross-bar FHG; these show the *bearing* or *azimuth* of the telescope.

For the comfortable use of the instrument there are some secondary arrangements. The axis KL is made to work into a frame provided with screws for rendering the axis truly vertical, there being a pair of cross-levels, or else a spherical spirit-level, fixed to the plate FHG for assisting in this operation. By means of a strong clamp and tangent-screw the horizontal circle can be turned into and held in any required position. Since the reading of the horizontal angles would be vitiated by any displacement of the circle M, the better class of surveying circles carry a *settler*, that is, a telescope, PQ, fixed on the end of an axis NO, which turns in a frame that can be secured firmly in any required position on the axis KL. This settler, which ought to be quite as powerful as the principal telescope AB, is directed to any well-defined object, and then clamped firmly in its place; so that, if the circle M be deranged, its position can be again put right by bringing the settler back to its signal by means of the lower tangent-screw. We have not room to detail the various adjustments of this useful instrument, and may only remark, that by reversing the position of the telescope, and taking the mean of the two sets of readings, the effect of any minute error in the horizontality of CD, or in the collimation of the telescope AB, is neutralised.

It is usual to reckon the *bearings* of objects from the north line, the degrees being numbered from north towards the east, so that a signal due east is said to *bear* 90°, one due south 180°, and one due west 270°; and therefore it is properly the first business of the surveyor to determine the true north.

For this purpose the most convenient proceeding is to establish a station for the theodolite near to head-quarters, and commanding a view of the district to be surveyed. At some distance from this a signal is to be set up in such a position that it may be illuminated by a lamp at night. Having then roughly estimated the bearing of that signal, we set the vernier to read that assumed bearing on the horizontal circle M, turn the whole instrument round until the telescope BA point to the signal, secure the outer axis KL in its place, and then bring the settler PQ to the same, or to some other well-defined signal capable of being illuminated at night. The instrument is now in position for showing bearings as from the assumed meridian.

Trigonometry.

The latitude of the plane has now to be ascertained by observing the least or greatest zenith distance of a star (see ASTRONOMY, PRACTICAL, prob. ix. art 2, and NAVIGATION, chap. iii. sect. 1), preferring those stars which pass near to the zenith, and using observations with the face of the instrument alternately east and west. This done, the readiest process for obtaining the error of the assumed meridian is to take the extreme east or west bearing of some star which passes between the pole and the zenith, those which are near the pole being preferred; the true bearing of the star when in this position is easily computed, and the difference between this and the assumed bearing gives the required error.

Thus, in latitude 56° 23′ north, the assumed bearing of a signal being 283° 30′, the greatest easting of the star β Cephei was observed to be 24° 41′ on March 11, 1860. On consulting the *Nautical Almanac*, we find that the north declination of the star at that date was 69° 56′ 39″, whence

Log cos decl. star	= 9·535 2127
Log sec lat. plane	= 0·256 7774
Log sin 38° 16′ 28″	= 9·791 9901
24 41	= assumed bearing of star.
13 35 28	= error of assumed meridian.
283 30	= assumed bearing of signal.
297 05 28	= true bearing of signal.

Having now obtained the true bearing of the signal, the position of the theodolite can be corrected, and the bearings of those station-points which are within sight determined.

In surveys of limited extent, embracing, say, only a few square miles, we may regard the surface of the earth as flat, and the meridian lines passing through the different points as all parallel to each other. In this case it is easy to transfer the theodolite to another station; for, if the bearing of B from A be 297° 05′, that of A from B must be 117° 05′, the difference being 180°. Hence, if the theodolite be carried to B, and so placed as that the bearing of A be 117° 05′, its zero, or north line, will be parallel to what it was at A; in this way the instrument may be carried from station to station, until the directions of all the principal lines of the survey be ascertained.

When the ground is uneven, it is necessary to notice the inclinations of the lines: this is conveniently done by painting the signal-staves alternately black and white at each link or foot, and by directing the telescope to the division corresponding to the height of the instrument. On the common theodolite, the zero on the vertical circle shows the telescope to be horizontal, and we must distinguish elevation (+) from depression (−).

The conductor of the survey, after having obtained a general idea of the configuration of the district, proceeds to arrange the stations, choosing these so that the lines joining them may pass near to the boundaries of the fields, at the same time having regard to their being conspicuous. He then ascertains, in the manner above described, the directions of these as seen from each other, entering the observations in his *Theodolite-Book*: and afterwards he proceeds to measure such of their distances as may be required, and the *offsets* or deviations of the actual boundaries from the measured lines, recording these measurements in his *Chain-Book*.

The theodolite-book is conveniently divided into five columns, the first for the name or number of the station at which the instrument is planted; the second for the actual readings on the horizontal limb; the third for the readings on the vertical arc; the fourth for the measured distances (to be extracted from the chain-book); and the fifth for the name or number of the signal. The following extract will sufficiently exemplify this matter:—

Station.	Bearing.	Inclination.	Distance.	Signal.
F	299° 31′	...	...	A
	17 02	...	...	B
	65 16	...	...	C
	99 30	+2° 54′	633	E
	256 30	−4 20	529	G
A	119 31	...	...	F
	73 50	+1 18	708	B
	177 50	−2 19	422	G
C	245 16	...	...	F
	275 00	−1 55	780	B
	171 00	+7 43	515	D
	209 49	...	...	E
E	279 30	−2 54	...	F
	29 49	...	...	C
	85 50	+8 15	390	D

Trigonometry.

The page of the chain-book is divided into three columns, the middle one to receive the distances measured along the traverse lines, and those to the right and left for offsets to either side. The beginning of each page is at the bottom, and the writing proceeds upwards, so as to imitate the progress on the field; and at the commencement of each line its bearing, as extracted from the theodolite-book, is given. The following is the chain-work for the field ABCDEFG.

	Corner 15	527			Corner 10	429	
	15	515	Station D.			422	Station A.
Wall.	14	500			0	404	0
	12	400				370	11
	8	300		Thorn Hedge.		334	22
	9	200				300	30
	9	100				260	39
	Corner 13	−14				200	44
	From C ...	171° 00′				180	42
						18	22
						−14	25 Corner.
					From G ...	357° 50′	
	Corner 17	789				529	Station G.
	4	780	Station C.		Corner 19	507	
	0	739	0		15	460	
		700	9		9	400	
		600	28		6	350	
		500	45	Water Edge.	4	300	
		400	65		3	200	
		365	73		4	150	
		348	71		5	100	
Young Hedge.		334	66		12	40	
		300	53		18	8	
		200	23		From F ...	256° 30′	
	0	75	0				
	Last point 10	0	...				
	From B.....	95° 00′					
					20	633	Station F.
	9	712			15	600	
		708	Station B.		6	500	
	36	666		Water Edge.	2	400	
	75	592			2	300	
	89	545			5	200	
Young Hedge.	92	510			8	100	
	52	393			15	−10	
	28	120			From E ...	279° 30′	
	13	27					
	Corner 9.....	−8				390	Station E.
	From A.....	73° 50′			17	384	
				Edge of Water.	25	300	
					24	200	
					20	100	
					Corner 11	−16	
					From D ...	265° 50′	

9th March 1859.

In making the plan, many surveyors use the protractor, and imitate on paper the operations which have been performed in the field; this plan, again, they re-measure for the area. This proceeding is liable to the very serious objection that the errors on paper far exceed those to which the field operations are liable. It is easier and preferable to compute the co-ordinates of the stations, and by help of these to lay down the plan and compute the areas. If the ordinates x be directed northwards, the y's eastwards, and the z's towards the zenith, the difference between the ordinates of one station, as A, and those of another station, as B, are given by the equations,—

$$z_B - z_A = \text{sine elevation} \times \text{oblique distance AB},$$
$$\text{hor. distance AB} = \text{cosine elevation} \times \text{oblique distance AB},$$
$$y_B - y_A = \text{sine bearing} \times \text{horizontal distance AB},$$
$$x_B - x_A = \text{cosine bearing} \times \text{horizontal distance AB}.$$

When the co-ordinates of any one of the stations are either known or assumed, those of each of the other stations can be easily deduced by means of these formula, using either the ordinary trigonometrical tables or the *traverse tables*. Thus, if we assume for the station A, $x_A = 500$, $y_A = 100$, $z_A = 150$, we have,

Station.	x or Lat.	y or Long.	z or Alt.
A	500·0	100·0	150·0
	+197·1	+ 679 8	16·1

Station.	x or Lat.	y or Long.	z or Alt.
B	+697·1 − 67·9	779·8 + 776·5	166·1 + 26·1
C	629·2 −504·1	1556·3 + 79·8	192·2 + 69·2
D	125·1 − 28·0	1636·1 − 384·9	261·4 − 56·0
E	97·1 +104·3	1251·2 − 623·5	205·4 − 32·0
F	201·4 −123·2	627·7 − 512·9	173·4 − 40·0
G	78·2 +421·4	114·8 − 15·9	133·4 + 17·1
A	499·6	98·9	150·5

Having proceeded from A successively to B, C, D, E, F, and G, we return from G to A. If all the operations have been absolutely exact, the co-ordinates of A thus obtained should have agreed exactly with those from which we first set out. Actually there are small errors—viz., −·4 in the direction x, −1·1 in the direction y, and +·5 in the direction z. These may naturally be attributed to the unavoidable minute errors in the measurements; and the close coincidence shows that no serious error has been committed. The positions of the several points may be taken as under, rejecting the fractional parts of a link:—

Point.	x or Lat.	y or Lon.	z or Alt.
A	500	100	150
B	697	780	166
C	629	1557	192
D	125	1637	261
E	97	1252	205
F	202	629	173
G	79	116	133

From these results, it is easy to mark on the plane the positions of the stations, and then to lay down the contour of the figure from the chain-book.

The area of the polygon is readily computed from the formula—

$$2\ \text{Area} = x_A(y_B - y_G) + x_B(y_C - y_A) + \text{etc.}$$

This formula is easily kept in mind: we proceed round the polygon from corner to corner, and multiply the x or *latitude* of the point at which we are by the y or *longitude* of the point before us *minus* the y of the point behind us. The aggregate of these products, attention being paid to the algebraic signs, is the double of the area.

The computation for the preceding example stands thus:—

$$\begin{aligned}
500 \times + \ 664 &= + \ 332\,000\\
697 \times + 1457 &= + 1015\,529\\
629 \times + \ 857 &= + \ 539\,053\\
125 \times - \ 305 &= - \ \ 38\,125\\
97 \times - 1008 &= - \ \ 97\,776\\
202 \times - 1136 &= - \ 229\,472\\
79 \times - \ 529 &= - \ \ 41\,791\\
2 &\ \overline{|1479\,418}\\
\text{Area of polygon} &= \ 739\,709
\end{aligned}$$

The areas included between the traverse lines and the actual boundaries of the field have now to be computed and added to or subtracted from the area of the polygon according to their positions; the subjoined computations of the offsets from A to B and from G to A exemplify sufficiently well the manner of carrying on the work. Strictly, the results have to be multiplied by the cosines of the inclinations of the respective traverse lines, in order to give the areas of the projections on a horizontal plane.

A to B.

$$\begin{aligned}
-\ 8\,(+\ 0 + \ 9) &= - \ \ \ 72\\
35\,(+\ 9 + 13) &= + \ \ 770\\
93\,(+ 13 + 28) &= + \ 3\,813\\
273\,(+ 28 + 52) &= + 21\,840\\
117\,(+ 52 + 92) &= + 16\,848\\
35\,(+ 92 + 89) &= + \ 6\,335\\
47\,(+ 89 + 75) &= + \ 7\,708\\
74\,(+ 75 + 36) &= + \ 8\,214\\
46\,(+ 36 + \ 9) &= + \ 2\,070\\
-\ 4\,(+\ 9 + \ 0) &= - \ \ \ 36\\
2 &\ \overline{|67\,490}\\
&+ \ 33\,745
\end{aligned}$$

$$\begin{aligned}
\text{Log } 33745 &= 4{\cdot}52821\\
\text{Log cos } 1^\circ\,18' &= 9{\cdot}99989\\
\text{Log } 33736 &= 4{\cdot}52810
\end{aligned}$$

G to A.

$$\begin{aligned}
-\ 14\,(-\ 0 - 25) &= + \ \ \ 350\\
32\,(-\ 25 - 22) &= - \ \ 1\,504\\
162\,(-\ 22 - 42) &= - \ 10\,368\\
20\,(-\ 42 - 44) &= - \ \ 1\,720\\
60\,(-\ 44 - 39) &= - \ \ 4\,980\\
40\,(-\ 39 - 30) &= - \ \ 2\,760\\
34\,(-\ 30 - 22) &= - \ \ 1\,768\\
36\,(-\ 22 - 11) &= - \ \ 1\,188\\
34\,(-\ 11 - \ 0) &= - \ \ \ 374\\
25\,(-\ 0 + 10) = \\
-\ 7\,(+ 10 + \ 0) = \} &+ \ \ 180\\
&\ \overline{|24\,132}\\
&- \ 12\,066
\end{aligned}$$

$$\begin{aligned}
\text{Log cos } 2^\circ\,19' &= 9{\cdot}99964\\
\text{Log } 12066 &= 4{\cdot}08157\\
\text{Log } 12056 &= 4{\cdot}08121
\end{aligned}$$

The exact area of the figure is thus:—

$$\begin{aligned}
\text{Area of polygon} &\quad 739\,709\\
\text{Offsets from A to B} + &\ \ 33\,736\\
\text{B to C} - &\ \ 22\,546\\
\text{C to D} + &\ \ \ 5\,499\\
\text{D to E} + &\ \ \ 8\,090\\
\text{E to F} + &\ \ \ 4\,412\\
\text{F to G} + &\ \ \ 4\,153\\
\text{G to A} - &\ \ 12\,056\\
&\ 760\,997
\end{aligned}$$

or 7·610 acres.

When a surveyor has carried his operations with the theodolite over a considerable distance, he is naturally led to inquire whether the instrument now show a north line exactly parallel to what it did at the outset. In order to avoid uncertainty in this respect, he seeks to reduce as far as possible the number of transferences, or even uses a more powerful instrument for connecting the bearings of the distant stations. He can readily obtain a verification of his work by appealing again to the astronomical method; but here he meets with this difficulty, that the true meridians of two places are not parallel to each other, the north lines converging on the north side and diverging on the south side of the equator.

In order to compute the convergence of two meridian lines, we may observe that these would meet each other on the prolongation of the earth's axis; hence the easting or westing divided by the cotangent of the terrestrial latitude must measure the convergence: now, one minute of longitude on the earth's equator measures 6086 feet or 9221 links; hence, if we divide the difference between the y's of two stations by 6086 or by 9221, according as our measurements are in feet or in links, and multiply the quotient by the tangent of the latitude, we obtain the convergence of the meridians in minutes. Thus, in our example of a very small survey made in north latitude 56°, the convergence of the meridians at the extreme east and west stations is computed as under:—

$$\begin{aligned}
y_A &= \ 100\\
y_B &= 1636\\
&\ \overline{1536} \qquad \log = 3{\cdot}18639\\
&\ \ 9221 \qquad \text{col} = 6{\cdot}03522\\
&\ \ \ 56^\circ \qquad \tan = 0{\cdot}17101\\
&\ 0'{\cdot}2469 \qquad \log = \overline{9{\cdot}39262}
\end{aligned}$$

which gives 0′·2468 or 14″·8, about a quarter of a minute.

When the survey extends over many square miles, we can no longer neglect the curvature of the earth in any one of the operations; and even the oblateness must be taken into account. (E. S.)

Trikhala || Trincomalie.

TRIKHALA, or TRICALA (anc. *Tricca*), a town of European Turkey, Thessaly, 37 miles W.N.W. of Larissa. It covers a large space of ground, and contains seven mosques, ten Greek churches, two synagogues, and large bazaars. Blankets, coarse woollen and cotton cloth, are made; and there are dye-works for Turkish yarn. A considerable transit trade is carried on. Pop. 12,000.

TRIM, a town of Ireland, capital of the county of Meath, on the left bank of the Boyne, 25 miles N.W. of Dublin. It is an ancient town; and had formerly walls, parts of which still remain. There are also the ruins of a large and strong castle, and of an old abbey. It has a parish church, Roman Catholic chapel, schools, court-house, jail, workhouse, &c. Trim has some trade in rural produce. Pop. 1905.

TRINCOMALIE, a town in Ceylon, with a harbour the most capacious and secure in the Indian seas. It is situated in the north-east portion of the island, Lat. 8. 35. 38. N., and Long. 81. 16. 37. E., distant by the road 182 miles from Colombo, 130 from Jaffna, and about 113 from Kandy, the central capital. The coast in the immediate vicinity is bold and rocky, rising into wooded acclivities, with forests of valuable timber-trees, amongst which satin-wood and ebony are abundant. The shore near the villages, wherever sand has been heaped up by the currents and rivers, is planted with palms, chiefly the cocoa-nut and palmyra (*Borassus flabelliformis*).

The entrance to the Bay of Trincomalie is by a passage from four to five miles wide; but such is the force of the current that sets to the southward during the N.E. monsoon, that sailing vessels are frequently carried past it. On freeing the channel the inlet expands, headlands and islands dividing the inner harbour to the north from Great Bay to the south. The latter receives the waters of the Mahawelli-ganga, the Kottiar, and two other rivers; it is about 5 miles in width, with a similar length, and its depth in some places is upwards of 70 fathoms. To the west of Great Bay, and communicating with it by a passage navigable only by boats, is the lagoon of Tamblegam, a shallow lake about 20 miles in circumference, which, according to a native tradition, was at no remote period a broad expanse of rice lands, irrigated by a canal from the enormous tank at Kandelay, 24 miles to the westward. The tank having partially fallen to ruin; and the waters issuing in a torrent, converted their ordinary outlet into an impetuous river, which, overflowing the plain below, burst open an entrance for the sea, that, once admitted, has ever since continued to hold possession. An examination of the locality confirms to some extent the possible truth of this tradition. The remains of the great tank are still in fine preservation, and could be readily restored; but the waters escaping from the broken bund, although partially applied to cultivation, are to some extent lost in the lagoon of Tamblegam. The lake abounds in fish, and produces in perfection the thin transparent oyster (*Placuna placenta*), whose clear white shells are used in China and elsewhere as a substitute for window-glass. They are collected annually for the sake of the pearls they produce. These pearls are exported to the coast of India, there to be burned into a species of lime, which the more luxurious princes affect to chew with their betel. So prolific are the mollusca of the *placuna*, that the number of shells taken by the licensed renter in the three years prior to 1858 could not have been less than 18,000,000.

The inner harbour of Trincomalie is land-locked in every direction, with safe anchorage and deep water close to the principal wharves. It is protected on the east side by a rocky peninsula between 3 and 4 miles long, whose southern extremity rises into two elevated ridges, one of which, above Ostenberg Point, sustains a fort for the defence of the inner bay. The entrance to the latter is little more than a quarter of a mile wide. These cliffs, and the basalt of which they are partially composed, exhibit traces of a volcanic origin, a conjecture which is sustained by the existence of a hot spring at Kannea, a few miles to the north-west. Some shoals and sunken rocks, well known to the local pilots, render the passage somewhat hazardous without their assistance. Within the area of the great harbour it covers a space upwards of 3 miles in length from north to south, with a breadth somewhat greater, irrespective of the coves and indentures which diversify its outline. It contains several wooded islands, and it is surrounded by hills covered with forests to their summits.

On the east side of the peninsula, which protects the inner harbour, the outline of the coast forms another port, fronting the Bay of Bengal, known as Back Bay, which affords safe holding ground and deep water close to the beach. This is resorted to by shipping during the S.W. monsoon, when the wind is off the shore. On a promontory at its southern extremity, which is surmounted by Fort Frederick, a light is displayed at a height of 206 feet above the sea, and serves to guide vessels clear of the rocks off Pigeon Island to the north, as well as of the shoals off Foul Point, at the south side of the passage leading to the bay. From the 25th October, when the N.E. monsoon begins to blow, till the middle of March, the anchorage in Back Bay is unsafe, owing to the heavy swell which it occasions. Trincomalie.

Fort Frederick is commanded from the adjacent heights; and being situated 3 miles to the northward of the dockyard and the mouth of the inner harbour, it protects only the outer anchorage, and is available solely as a *point d'appui*. Notwithstanding their extent, the military works of Trincomalie are utterly incommensurate with the importance of the position, and would be found ineffectual for its protection in the event of attack. The town is built across the neck of the promontory above referred to, and extends to the sea on either side. It had formerly a bad reputation from fever and other ailments incidental to damp and malaria, but the clearance of the jungle close to the suburbs, and the draining of the adjacent lands previously submerged by the decay of works for irrigation, have contributed to remove this reproach, and Trincomalie, at the present day, is no less healthy than any other portion of the maritime provinces. Its climate resembles that of the Indian peninsula south of Madras. With moist winds and plentiful dew light showers are frequent, and the rain throughout the year does not exceed 40 inches. The temperature of this part of Ceylon follows the course of the sun, and ranges from a minimum of 70° in December and January to a maximum of 94° in May and June; but the heat is rendered tolerable at all seasons by the steadiness of the land and sea breezes. The mean is about 81·4. A meteorological record for the year 1854 exhibits the following results:—

1854.	Mean Maximum Temperature.	Mean Minimum Temperature.	Extreme Range for the Month.	Highest Temperature noted.	Days of Rain.
January	81·3°	74·7°	14°	83°	10
February	83·8	75·8	14	86	7
March	85·9	76·1	16	88	3
April	89·6	78·9	16	92	3
May	89·1	79·3	19	93	3
June	90·0	79·5	19	94	3
July	87·7	77·7	16	90	5
August	87·9	77·4	16	91	4
September	89·3	77·3	18	93	2
October	85·2	75·8	15	89	14
November	81·0	74·9	11	83	15
December	80·1	74·3	11	82	13

Trincomalie, which is still called by the Tamils, who form the preponderating body of the population, *Tiru-konatha-malie*, "the sacred hill of Konatha," appears to have been one of the earliest settlements of the Malabar race in Ceylon, who, at a period which has escaped historic record, erected on the cliff, now crowned by Fort Frederick, a temple dedicated to Konatha or Konasir. This edifice was still in existence on the arrival of the Portuguese, in the early part of the sixteenth century. They desecrated and destroyed it in 1622, using the materials for the construction of the fort; but the pagoda is remembered as the "Temple of a Thousand Columns," and near its site is a cliff still designated the *Sawmy Rock*, a term expressive of its sanctity. Twice a week a procession, attended by devotees, who bring offerings of fruits and flowers, repairs at sunset to the spot where the rock projects above the ocean; a series of ceremonies are performed, including the mysterious breaking of a cocoa-nut against the cliff; and the officiating Brahman concludes his invocation by elevating a brazen censer above his head, filled with inflammable materials, the light of which, as they burn, is reflected far over the sea.

The Portuguese attached no importance to the possession of Trincomalie, which lay remote from their trading settlements on the opposite side of Ceylon; and their attention was only directed towards it by their alarm for its falling into the hands of Holland. Their imperfect fortifications did not avert this catastrophe; the Dutch took possession of it in 1639, and under their authority it remained till temporarily occupied by the English under Sir Hector Munro in 1782. The fort was, however, surprised by Admiral Suffrein and a French fleet immediately afterwards, and restored to Holland in the following year. At length, in 1795, an expedition fitted out from Madras arrived, and, after a siege of three weeks, reduced the fort and the town. Trincomalie, with all other

Trincomalie.

Dutch possessions in Ceylon, was finally ceded to Great Britain, by the Treaty of Amiens, in 1802.

The modern town is meanly built, its only recommendation being the breadth and airiness of its streets and esplanade. The temples are gloomy and impoverished; the bazaars poor, and supplied with little beyond the absolute necessaries of life; and the only edifices worthy of notice are the public offices and barracks, and the residences of the civil and naval authorities. The official house of the admiral commanding in chief in the Indian Seas is situated in a park close to the naval arsenal and dockyards. Being the chief town of the eastern province of Ceylon, Trincomalie is the residence of the principal revenue and judicial officers. The revenue jurisdiction extends over an area of 4573 square miles, the population of which, exclusive of the British troops, is but 75,798 persons. Of these, only 344 are whites. The inhabitants of the town itself and its immediate suburbs are under 20,000. There is an English church, served by a chaplain of the establishment; two Roman Catholic chapels; a meeting-house of the Wesleyan Methodists; and several Mohammedan mosques belonging to the enterprising race known by the local designation of Moors, who, in all the seaports of Ceylon, are the most energetic of the native mercantile bodies. There is a public library, the property of the civil community; and schools, supported by the government or the missionaries. The great road leading inland to Kandy, a distance of 113 miles, was commenced many years back; but, owing to the numerous rivers to be bridged, it has not yet been completed. For the last 17 miles into Kandy it is practicable for wheel-carriages, but the rest of the journey can only be performed on horseback.

As regards its trade and foreign relations, Trincomalie has not hitherto been a place of commercial importance. The cultivation of cinnamon, as well as the export of gems and pearls, having at all times been confined to the south and west of the island, the northern and eastern portions were uninterested in trading operations; and even at the present day, the customs receipts of Trincomalie are under L.3000 per annum. The total value of imports in 1859 was L.19,587; and the exports, consisting of salt, ebony, satin-wood, and the products of the cocoa-nut palm, L.6276, 1s. 2d. It is more than probable, however, in the present transitional state of the colony, and with the growing importance of Ceylon as the point of arrival and departure for almost every line of steamer that traverses the Indian and Pacific Oceans, that advantage may ere long be taken of the matchless Bay of Trincomalie, to make it the rendezvous of all the packets and vessels now resorting to Colombo and Galle. The peculiar superiority of its harbour over every other in India consists in its perfect accessibility to all descriptions of craft in every variation of weather. It can be entered with equal facility and safety in the N.E. as in the S.W. monsoon, and the water within is so deep that vessels can lie close to the beach, and discharge or receive cargo without the intervention of boats. Its geographical position has already caused its adoption as the most favourable point for a great naval station and dockyard, whence instructions and intelligence can be most rapidly communicated to the various forces in the eastern seas. Regarding Ceylon, at the present moment, as the centre of all operations for postal communications with Madras and Calcutta, the Straits settlements, China and Australia, as well as with the French, Dutch, and Spanish possessions in the East, the insufficiency and defects of the harbour of Point de Galle are so evident, as to render it idle to institute a comparative inquiry into the manifest advantages offered by that of Trincomalie. The unrivalled position of the latter for commerce, fronting the Bay of Bengal, and presenting a natural point of conveyance for all vessels trading to India and the East, marks it out as having been destined for a great emporium, to which shipping of all nations will yet find it their interest to resort.

Closely connected with this important measure, will be the restoration of its navigable character to the great river, the Maha-welli-ganga, which was formerly traversible by light craft from Trincomalie to the foot of the Kandyan Mountains, now the principal seat of coffee cultivation in Ceylon. About 40 miles before it enters the sea, the Maha-welli-ganga now separates into two branches—one the Kooroogal-ganga, which continues a northerly course till it falls into the Bay of Bengal, W. of Kottiar; the other, the Vergel-aar, which, diverging almost at right angles at a point called Koorangemone, reaches the coast by several mouths N. and S. of Arnetivor. The tradition of the Singhalese is, that at no very remote period, the Vergel-aar was but a narrow watercourse, cut by the natives for the irrigation of their paddy-fields; but that the soil being light and yielding, it hollowed out, and deepened its own bed with such rapidity as almost to drain the original channel of the river below the point of junction. The Vergel thus became what it now is, one of the most tumultuous and dangerous torrents on the eastern side of Ceylon; and by the same operation, the original channel of the Maha-welli-ganga was rendered so shallow as to be at all times unnavigable, and even dry in many places, except during the freshes after the rains, when it resumes its original depth and importance. By preventing the abstraction of the water, now diverted into the Vergel, and by removing some sand-banks and minor obstructions below the present junction, the Maha-welli-ganga might be easily rendered navigable for 80 miles, from the Bay of Trincomalie to Calinga—an important locality in the centre of one of the most fertile and productive districts of Ceylon—where, however, in consequence of the absence of roads or any other means of intercommunication, the soil is almost uncultivated, except in the immediate vicinity of the Moorish villages scattered over the district of Tamankadua. For 30 miles above Calinga, the removal of the rocks and impediments would be difficult; but even here a communication might be established for a moderate expenditure, and inland navigation rendered possible from the eastern coast almost to the coffee plantations in the mountain zone; where is also situated Kandy, the inland capital. To the coffee-planters, the conveyance of rice and stores from the low country would be a signal benefit; and the transport of coffee to a shipping port, at a reasonable charge, would reduce one of the most formidable difficulties against which the planters have to struggle in their competition with other producing countries; and to the Kandyan peasantry, the realisation of such a project would be productive of simultaneous advantage by opening up a market for the agricultural productions of the interior, as well as an outlet for its mineral wealth; and by affording an easy carriage to the sea for the ebony, satin-wood, and other valuable timber, which now grow in neglected luxuriance and in almost exhaustless profusion throughout the forests intersected by the Maha-welli-ganga. Trincomalie, if thus converted into a place of export for the products of Ceylon, and a rendezvous for the foreign shipping frequenting those seas, would speedily become, that for which nature has adapted its unrivalled harbour, the most secure and commodious emporium of India. (Percival's *Account of Ceylon*; Cordiner's *Description of Ceylon*; Davy's *Account of the Interior of Ceylon*; Forbes' *Eleven Years in Ceylon*; Sir J. Emerson Tennent's *Ceylon*, &c.) (J. E. T.)

Trinidad.

TRINIDAD, one of the West India Islands, belonging to Great Britain, lying off the coast of Venezuela, between N. Lat. 10. 5. and 10. 50.; W. Long. 61. and 62. It is of an oblong form, with three projecting capes at the N.E., N.W., and S.W.; its length is about 50 miles; its breadth from 30 to 35; and its area is estimated at 2020 square miles. Between the island and the mainland lies the Gulf of Paria, into which fall the northern mouths of the Orinoco. The northern entrance to this gulf, called the Dragon's Mouth, lies west of the N.W. promontory of the island; and the opposite entrance, the Serpent's Mouth, lies between the mainland and the S.W. promontory. The northern, eastern, and southern coasts of Trinidad are steep and lofty, and are indented with few creeks or harbours; but the Gulf of Paria on the west forms one vast harbour, and has several smaller creeks running into the land from it. The coast is here low, and the ground gradually rises towards the interior, presenting a beautiful expanse of green plains, hills, and valleys in all directions. Three chains of hills traverse the island from east to west, thus forming two wide plains. The most rugged and lofty of these is quite close to the northern shore; it is interrupted by many valleys and passes, and reaches in some places the height of 3000 feet. The central chain, about the middle of the island, consists of rounded hills or knolls from 600 to 1000 feet high; and the third chain is nearly of the same height extending along the southern shore and close to it. All these chains may be regarded as continuations of similar ranges in Venezuela, from which the island seems to have been detached by some volcanic or aqueous convulsion. The surface between the ridges of hills is occupied by plains and undulating tracts; and along the west coast lies a low sandy region, partly interrupted by marshes. The northern of the two plains is watered by two principal rivers, both navigable, the Caroni flowing into the Gulf of Paria, and the Oropuche into the Atlantic. Further south the Atlantic receives the waters of the Lebranche, Nariva, and Hortoire; while the Gulf of Paria receives the Guaracaro; and several smaller streams flow into the sea on the north and south of the island. The

Trinidad.

geological structure of Trinidad consists chiefly of clay slate and mica slate. Extensive tracts are occupied with limestone rocks covered with thin layers of soil; and gneiss, quartz, gypsum, and other deposits are found in the island. The most abundant mineral is asphalt, of which there is a remarkable lake near the west coast, occupying an area of 150 acres. Towards the outside the mineral is cold and hard, but further in it rises up from below in a heated and liquid state. The depth of the lake has never been ascertained, nor have its contents been made use of to any profit, except in the making of roads. In the neighbourhood of this lake the sea throws up bitumen; and various other traces of volcanic action are to be seen in the island, among the rest an active volcano, near the S.W. promontory, and several submarine ones around the coasts. Arsenic, alum, sulphate of copper, plumbago, and sulphur, are the chief other minerals in the island. The soil is very various; but in general it is fertile, especially in the plains and valleys. The hills are covered with dense forests and brushwood, which in some places stretch down to the very edge of the water. The climate is more healthy than that of most other parts of the West Indies. Though the heat is great, the temperature ranging usually from 70° to 85°, and sometimes higher, the island is free from excessive droughts; and the winds are frequent and regular. The rainy and dry seasons are well marked, the former beginning in June and continuing till the middle of November, while the latter occupies the remainder of the year. About 60,000 acres are in cultivation in the island, which is but a small proportion of the whole extent. Sugar, coffee, and cocoa are the most important productions; and cotton, tobacco, and indigo are also raised. The timber of the forests is useful for shipbuilding and for ornamental purposes; and in them red cedar and palms are the most remarkable trees. Various spices have been introduced into the island; and vines from France and Spain grow well here. Various wild animals exist in Trinidad; and the shores abound in fish of different kinds. The principal articles exported are cocoa, raw cotton, sugar, molasses, rum, and hides; and the total value of the exports in 1856 was L.574,767. The imports for the same year consisted of cotton, linen and woollen cloth, flour, rice, hardware, leather, meat, fish, cattle, horses and mules, butter, silk, coals, and many other articles; and amounted in value to L.666,474. The imports and exports were distributed among different countries as follows:—

	Imports.	Exports.
United Kingdom	L.305,688	L.430,702
British Colonies	122,074	27,190
United States	158,038	92,191
France	43,536	15,250
Other countries	37,138	9,434
Total	666,474	574,767

The number and tonnage of the vessels that entered and cleared at the ports of Trinidad, in the same year, to and from different countries was as follows:—

Countries.	Entered.		Cleared.	
	No.	Tonnage.	No.	Tonnage.
United Kingdom	62	20,273	71	23,774
British Colonies	311	17,384	317	14,584
United States	89	15,748	44	8,951
Other countries	179	8,677	220	18,563
Total	641	62,082	652	65,872

Of these, 620 vessels, with 59,824 tons, entered, and 627, with 62,091 tons, cleared at Port of Spain; while 21 vessels, with 2258 tons, entered, and 25, with 3781 tons, cleared, at San Fernando. These are the principal places in the island; the former, which is the capital, standing on the north-west coast, and the latter about 20 miles further south. About this region lie most of the settled portions of the island, divided into eight counties. The colony is administered by a governor, an executive council of three, and a legislative council of thirteen members, all appointed by the crown. The public revenue, derived chiefly from the customs, amounted in 1856 to L.93,213, and the public expenditure to L.80,304. The laws are partly Spanish and partly English, and are administered by a chief-justice and a puisne judge. The Church of England has eleven clergymen, and the Church of Rome, which has a majority of the population, eighteen in the colony, besides whom there are several belonging to other sects. There were in 1856 thirty schools, attended by 2175 pupils. Trinidad was discovered by Columbus in 1498; and first colonised in 1588 by the Spaniards. In 1676 the French possessed it for a short time, but it was speedily restored to Spain; and in 1797 it was captured by the British, who have retained it ever since. Pop. (1851) 68,600, of whom 39,913 were natives of the island; 10,800 British West Indian colonies; 3993 East Indies (coolies); 8010 Africans; and 727 British.

Trino. || Tripoli.

TRINO, a town of Sardinia, Piedmont province, and eleven miles S.W. of the town of Vercelli. It stands on a low marshy plain near the Po; and is chiefly celebrated for its trade in cattle and pigs. The hams of Trino are famous throughout Upper Italy. Pop. 8217.

TRIO, or TERZETTO, in Music, a composition for three voices or for three instruments. The term is also applied to a movement in $\frac{3}{4}$ time, which often follows the minuet in a piece of instrumental music.

TRIPOLI, the most easterly of the Barbary States, nominally a province of the Ottoman empire, but virtually independent, lies along the south coast of the Mediterranean, between N. Lat. 28. and 33. 30.; E. Long. 10. 30 and 20.; bounded on the N. by the sea; E. by Barca; S. by Fezzan and the Libyan desert; and W. by Tunis. These are the limits of Tripoli proper; but the name is sometimes used in a more extended sense, including Barca and Fezzan, which are governed by chiefs subject to the pasha of Tripoli. But as these are described under their proper heads, it is only necessary here to give an account of Tripoli proper. Its length is about 700 miles, its breadth from 100 to 200, and its area estimated at 105,000 square miles. The coast line, which has a length of about 800 miles, is indented with the large bay of Sidra, the ancient Syrtis, but is broken with very few smaller creeks; and has only one good harbour, that of Tripoli the capital. The whole of the coast is low and sandy; the western portion, as far east as Cape Mesurata where the Gulf of Sidra begins, is in many places very fertile, covered with palm-groves or rich luxuriant gardens; but the shores of the Gulf of Sidra, which extend from Cape Mesurata on the west to Cape Teiones on the east, are very bare and sterile, lined with sandy dunes and chains of salt marshes, so that this whole region has got the name of *Sert*, or the desert. Still further east lies the plateau of Barca, where steep and rugged cliffs come down to the sea, and alter entirely the character of the coast. In the western part of the country the land continues level towards the interior as far as the northern foot of the plateau *Dhar-el-Jebel*, which extends in a direction parallel to the coast, and from 40 to 50 miles distant from it. Its northern declivity is pretty steep, so that it has the appearance of a range of mountains when viewed from the north, and it is known in different parts by different names. Towards the west it is called *Jebel Jefran*; to the south of Tripoli, *Gharian*; and further east, where it branches out nearly to the sea, *Tarhoona*. The first of these parts has an average height of 2600 feet; the second of 1500; and the third of about 1000. At the point where the coast-line

Tripoli. bends towards the south and the Bay of Sidra begins, the plateau ceases altogether. South of Gharian it rises to a greater height, in some places to 2800 feet, and here bears the name of *Hamada*. It extends to the S.W. as far as Ghadames, and to the S. as far as the north border of the oasis of Fezzan, thus occupying nearly the whole of western Tripoli. The surface is for the most part level, and broken only by valleys descending in terraces to the depth of 400 or 500 feet. It is partly fertile; Gharian is cultivated to a large extent, and Tarhoona is richly covered with fig and olive trees, but the southern portion is very dry and barren, except where the valleys are occupied with palms, fig-trees, and olives. There are no important rivers in Tripoli, and very few permanent streams of any kind; although there are many that are filled during the winter by the rains, but entirely dried up in summer. The want of rivers is supplied to some extent in the low country along the coast by underground streams, which are reached by wells a few feet deep. There are no fresh-water lakes of any size, but only a few of salt water along the coast. The country round the Gulf of Sidra is of the most desolate character. At a little distance from the sea there rises a chain of hills 400 or 500 feet high, but the nature of the country beyond them is little known. The prevalent geological formations in Tripoli are chalk, sandstone, and marl. Chalk and marl are the chief deposits about the capital, and along the whole of the coast plain; while the interior plateau is composed chiefly of sandstone, which, from the action of the atmosphere, and the large amount of iron it contains, in many places assumes the aspect of basalt. True basalt occurs in some places, but hardly any other igneous rock exists in the country. Of useful minerals, Tripoli has none of any importance, with the exception of sea-salt, obtained along the coast, and sulphur, which exists in abundance at three places, Brega, Linouf, and Mouktar, along the shore of the Gulf of Sidra. With the exception of some marshy spots close to the sea, the climate of Tripoli is very healthy. The heat in summer is intense, especially when the hot south wind blows from the Sahara, when the thermometer sometimes rises above 90°. During the summer hardly any rain falls, but the cool and moist breezes which blow regularly from the sea cause an abundant dew, on which the vegetation almost entirely depends. In the winter, from November to March, rain falls in abundance, and the temperature is sometimes reduced as low as 40° or even 32° at night, while during the day it usually stands at 70°. In the interior the winter is still more severe; it is introduced by violent thunderstorms and rains; on Gharian snow sometimes lies; and on some of the higher peaks it remains for a considerable length of time. The soil in many parts of Tripoli is very fertile, and, as it is carefully cultivated, produces abundant crops. Tripoli. The best portion is a tract called *Mesheea*, extending along the shore in the west for a length of about 15 miles by 5 in breadth. This land yields abundant crops of wheat, barley, millet, and maize, and has also plantations of palm and orange trees, vineyards, orchards, and gardens, which yield oranges, lemons, pomegranates, and many other fruits. In the more hilly regions there are extensive and luxuriant natural pastures, on which large numbers of cattle are fed. The cattle and sheep are small, but very strong and hardy. Of wild beasts there are not many. Lions have been almost exterminated, but jackals, hyænas, and other smaller beasts of prey are numerous. Ostriches wander about the more desert parts of the country, and bustards, cranes, plovers, quails, and flamingoes are among the birds of Tripoli. Among insects, the scorpion is one of the most destructive, and is found here in immense swarms; locusts frequently devastate the country. The land is on the whole but thinly peopled, as the whole population, which is steadily decreasing by emigration to Tunis and Egypt on account of the oppressive system of government in Tripoli, does not exceed 600,000 in Tripoli proper; and including Barca and Fezzan is only from 1,500,000 to 2,000,000. The prevailing character of the population is Arab, though on the western borders there dwell many Berbers, who speak their own language, and the general character of the town population is Moorish. In the coast towns there are many Jews; and Turks, generally military or other officials, live at the capital and other chief places. Mohammedanism is the religion of the whole people, with the exception of the Jews and a few Christians. The manufactures of Tripoli are inconsiderable, and not to be compared to those of Tunis; as here trade, agriculture, and pastoral pursuits are almost the only occupations of the inhabitants. Woollen cloth, carpets, red sashes, and gold wire, are almost the only articles made in the country. The trade is very considerable. As Tripoli is the nearest place on the seacoast to Bornu in the interior, large caravans proceed from that place by Moorzook and Ghadames to Tripoli, bringing, among other articles, negro slaves, ostrich feathers, morocco leather, gold, and ivory, in exchange for European and oriental wares. From Moorzook many date and senna leaves, as well as trona from the natron lakes of Fezzan, are brought down to the coast. Of its own products Tripoli exports gums, wool, hides, madder, dates, saffron, and corn. The caravans come to Tripoli in winter, and return to the interior on the approach of spring. The only seaport for maritime trade in Tripoli proper is the capital, but Barca has an important port, Bengazi. The shipping of the former for the years 1852–57 was as follows:—

Year.	Entered.				Cleared.			
	Ships.	Tons.	Crews.	Cargoes.	Ships.	Tons.	Crews.	Cargoes.
1852	267	26,657	2271	L.120,340	252	25,636	2174	L.122,450
1853	251	30,455	2197	123,884	257	30,867	2278	177,470
1854	309	29,745	2690	114,370	295	28,742	2565	183,310
1855	225	22,519	1991	141,990	225	22,494	1933	101,360
1856	207	25,743	2009	301,910	209	25,918	2025	157,490
1857	151	16,007	1346	110,800	139	14,980	1230	68,070

The government is an unlimited despotism exercised by a pasha, who pays a tribute to the Porte, and is supported by a regular Turkish force of 5000 men. The amount of the tribute is not exactly known; it is derived from import and export duties, taxes on various articles, a toll on slaves and gold dust brought into Fezzan, and a tribute from Ghadames. The ancient history of Tripoli is given in the article CYRENAICA. In medieval and modern times it has passed through a number of vicissitudes. In the twelfth century it was possessed for a short time by Roger II. of Sicily, but was soon regained by the Saracens, who retained it till its conquest by the Spaniards in 1510. Charles V. gave Tripoli along with Malta to the knights of St John in 1530, but in 1551 Simon Basha conquered it for the sultan Soliman, and then first it became a Turkish pashalic. Its history since that time presents no events of importance.

TRIPOLI (the ancient *Œa*), the capital of the above state, stands on a low rocky promontory stretching out

Tripoli ‖ Tripolitza.

into the Mediterranean,—Lat. (of castle) 32. 53. 56. N.; Long. 13. 10. 58. E. The town is surrounded by high walls strengthened by several bastions, and is entered by two gates, to the east and south. It is of a very irregular shape, and is about 1360 yards in extreme length, and about 1000 yards in greatest width. As seen from the sea it has a semicircular appearance; and the extreme whiteness of its square flat buildings, covered with lime, which in this climate encounters the sun's fiercest rays, is very striking. Internally the streets are narrow and irregular, the houses generally mean, and many of the buildings have a very dilapidated appearance, while here and there immense heaps of rubbish are to be met with. The town, however, has a character for cleanliness; and the police are said to be in so efficient a state, that acts of violence are never committed in the streets. The castle or royal palace in which the pasha resides is at the east end of the town, within the walls. From the numerous buildings which have at various times been added to it to receive the junior branches of the royal family, it has lost all symmetry, and has now the appearance of a little irregular town. The caravanserais, mosques, and some of the principal houses, are usually built of stone, and regularly white-washed twice a year; the dwellings of the lower orders are of earth, small stones, and mortar. Tripoli contains twelve mosques, six of which are of the first order,—the principal or grand mosque is a very handsome and stately building. The roof is composed of numerous small cupolas, and supported by sixteen Doric marble columns. The mosques are in general surrounded by plantations of Indian figs and date trees. The Jews have three synagogues, and the Christians have two or three places of worship. The bazaars are large, and one of them is devoted to traffic in slaves brought from the interior of Africa. The baths add considerably to the picturesque appearance of the town from their clusters of cupolas which occur in different parts. Near the sea-gate of the town stands a magnificent triumphal arch, erected in 164 to the emperors M. Aurelius Antoninus and L. Aurelius Verus. It is built of huge blocks without cement, and though half sunk in sand, its upper part is still in good preservation. East of the town is the site of the ancient cemetery, where various remains of antiquity have been discovered. The harbour is safe and commodious for vessels whose draught of water does not exceed 18 feet. It is formed by a long reef of rocks running out to the north-east, and by other reefs at some distance to the east. For the trade of the port see previous article. Pop. about 15,000.

TRIPOLI, or *Tarablus*, a seaport town of Syria and capital of a pashalic of the same name, stands on a small plain at the foot of Mount Lebanon, a short distance from the Mediterranean, and 46 miles N.E. of Beyrout,—Lat. 34. 26. 22. N.; Long. 35. 51. 32. E. It has a very neat and picturesque appearance, being surrounded by orchards of orange, lemon, apricot, and apple trees, while the houses are generally large substantial stone edifices. It, however, contains no public buildings of mark. On the heights behind the town is an old castle, built by Count Raymond of Toulouse during the crusades. The river Kadisha flows through the town. The port of Tripoli el-Mîna is about a mile and a half from the town, but the harbour is small and insecure, and the trade is being rapidly absorbed by Beyrout. Pop. about 10,000 Moslems and 3000 Greek Christians.

TRIPOLITZA, or TRIPOLIZZA, a town of Greece, capital of the nomarchy of Arcadia, is situated in a plain 3000 feet above the level of the sea, and 22 miles south-west of Argos. Before the revolution Tripolitza was the capital of the Morea and the seat of a pasha, and contained about 20,000 inhabitants; but in 1821 it was taken and sacked by the insurgents; and in 1825 its ruin was completed by Ibrahim Pasha, who razed it with the ground. The town has since been rebuilt, and at present contains about 8000 inhabitants.

Triumph ‖ Trogus Pompeius.

TRIUMPH, a public and solemn honour conferred by the ancient Romans on a victorious general, by allowing him a magnificent entry into the city. The greater triumph, called also *curulis*, or simply the triumph, was decreed by the senate to a general upon the conquering of a province, or gaining a signal victory. The day appointed for the ceremony being arrived, scaffolds were erected in the forum and circus, and all the other parts of the city where they could best behold the pomp. The senate went to meet the conqueror without the gate called *Capena* or *Triumphalis*, and marched back in order to the Capitol; the ways being cleared and cleansed by a number of officers and tipstaffs, who drove away such as thronged the passage or straggled up and down. The general was clad in a rich purple robe, interwoven with figures of gold, setting forth his great exploits; his buskins were set with pearl; and he wore a crown, which at first was only laurel, but afterwards gold; in one hand he bore a branch of laurel, and in the other a truncheon. He was carried in a magnificent chariot, adorned with ivory and plates of gold, drawn usually by two white horses; though sometimes by other animals, as that of Pompey when he triumphed over Africa, by elephants, that of Mark Antony by lions, that of Heliogabalus by tigers, that of Aurelian by deer. His children were at his feet, and sometimes on the chariot horses. The procession was led by the musicians, who played triumphal pieces in praise of the general. These were followed by young men, who led the victims to the sacrifice, with their horns gilded, and their heads adorned with ribbands and garlands. Next came the carts and waggons, loaded with all the spoils taken from the enemy, together with their horses, chariots, &c. These were followed by the kings, princes, and generals who had been taken captives, loaded with chains. Next appeared the triumphal chariot, before which, as it passed, they all along strewed flowers, and the people with loud acclamations called out, *Io triumphe!* The chariot was followed by the senate clad in white robes, and the senate by such citizens as had been set at liberty or ransomed; and the procession was closed by the priests and their officers and utensils, with a white ox led along for the chief victim. In this order they proceeded through the triumphal gate, along the Via Sacra, to the Capitol, where the victims were slain. In the meantime all the temples were open, and all the altars loaded with offerings and incense; games and combats were celebrated in the public places, and the city became a scene of general festivity. The less splendid form of a triumph was called an *Ovation;* a term supposed to have been derived from *ovis*, because on such an occasion sheep and not oxen were usually sacrificed. The procession commonly began at the Albanian Mount, from whence the general with his retinue made his entry into the city. He walked on foot, wearing a garland of myrtle, and was attended by a band of music.

TROAS, the kingdom of which Troy was the capital. (See TROY.)

TROGUS POMPEIUS, a Roman historian, of whom little is known beyond some general statements furnished by Justinus. He seems to have lived about the time of Augustus, and was descended from a Gallic family of the Vocontii; his father and grandfather having been soldiers, the one in the army of Cn. Pompeius, the other in that of Julius Cæsar. All that is known of Trogus Pompeius beyond these vague accounts is, that he was called "a man of antique eloquence, and a most grave author." His *Historiæ Philippicæ*, consisting of forty-four books, and including a view of the Macedonian empire, is now lost, but an abridgment of it by Justinus is still extant. All that is known respecting both Trogus and Justin, and their

Tromp ‖ Troppau.

several works, will be found copiously set down in the *Commentationes de Trogi Pompeii ejusque epitomatoris Justini fontibus et auctoritate*, by Heeren.

TROMP, MARTEN HARPERTZOON VAN, a celebrated Dutch admiral, was born at the Briel, in Holland, in 1597. He raised himself by his own merit, having distinguished himself on many occasions, especially at the famous engagement near Gibraltar in 1607. He passed for one of the greatest seamen who till that time had appeared in the world; and was declared admiral of Holland, even by the advice of the Prince of Orange. In that character he defeated a large Spanish fleet in 1630, and gained thirty-two other victories at sea; but was killed when under deck, in an engagement with the English, in 1653.

TRON, or TROND, ST., a town of Belgium, province of Limburg, 11 miles S.W. of Hasselt, on the branch line connecting the latter town with the Liege-Mechlin railway. Manufactures of firearms, cutlery, and lace, are principally carried on. St Tron is celebrated for a battle fought here in 1793, between the French and Austrians, in which the latter were defeated. Pop. 9000.

TRONDHJEM, or DRONTHEIM, a fortified seaport town of Norway, capital of the stift or province of the same name, is pleasantly situated on the southern shore of the Trondhjems-fiord, at the mouth of the Nid-elf, in Lat. 63. 26. N., Long. 10. 23. E. The houses, though almost all of wood, are substantial, cheerful, with numerous windows, and scrupulously clean; the streets are wide, regular, and well kept. "When we thus," says Professor J. D. Forbes, in describing the approach to this town, "unexpectedly look down upon its orderly streets, clean dwellings, tall warehouses projecting into the bay—upon the neat villas amidst trees and fields of the brightest green, country and town churches, and especially upon its once majestic and still venerable cathedral—it is difficult to believe that we are entering one of the most northern capitals, and one of the least visited towns of Europe which yet possesses evidences of comfort, independence, and self-respect amongst the lower classes, and of intelligence, hospitality, and refinement amongst the upper, which many cities of more pretension might well be proud of." The town is commanded by a series of heights, and is thus incapable of defence on the land side; but seawards it is strongly fortified, having especially the fortress of Munkholm on a small island in the fiord. The principal object of interest in Trondhjem is the cathedral, part of which dates as far back as 1180. It is partly Saxon and partly Gothic, and is 346 feet in length by 84 in width, except at the west end, where, having a chapel at each corner, the width is increased to 140 feet. Having frequently suffered from fires, it has often been restored with little regard to architectural beauty or uniformity; but it still ranks as the finest ecclesiastical edifice in the kingdom, and is the place of coronation of the Norwegian sovereigns. Trondhjem, founded by Olaf in 997, became the capital of Norway, and continued so down to the union of that country with Denmark. The old palace is now converted into an arsenal. There are also three other churches, an hospital, workhouse, deaf-mute asylum, grammar-school, museum, bank, theatre, and public library. Trondhjem carries on an active export trade in dried fish, deals, tar, and copper. Pop. about 13,000.

TROON. See AYRSHIRE.

TROPPAU, the capital of Austrian Silesia, and of a principality and circle of its own name, stands on the Oppa, a tributary of the Oder, 36 miles N.E. of Olmütz. It is pleasantly situated, and well built; is surrounded by walls, and entered by four gates. It is the seat of several courts; and among its public buildings are a castle, three churches, four chapels, a town-hall, gymnasium with museum attached, and theatre. Manufactures of linen and woollen stuffs, soap, leather, &c., are actively carried on. In 1820, the diplomatic congress, which afterwards removed to Laybach, sat for a month here. Pop. of town, including the suburbs, of which there are several, 9496.

Trosachs ‖ Trowbridge.

TROSACHS, *i.e. Bristled Territory*, a singularly romantic and picturesque glen of Scotland, Perthshire, between Lochs Katrine and Achray. This rugged and narrow defile is about a mile and a half in length, and was first rendered popular by Sir Walter Scott, in his *Lady of the Lake*. It consists of a wild confusion of abrupt crags, of the most extraordinary and fantastic forms, which, in some convulsion of nature, have been separated from the neighbouring mountains of Ben Venu and Ben Au. A rich and varied vegetation adds to the beauty of the scene.

> "Crags, knolls, and mounds, confus'dly hurled,
> The fragments of an earlier world.
> . . . . . .
> So wondrous wild, the whole might seem
> The scenery of a fairy dream."

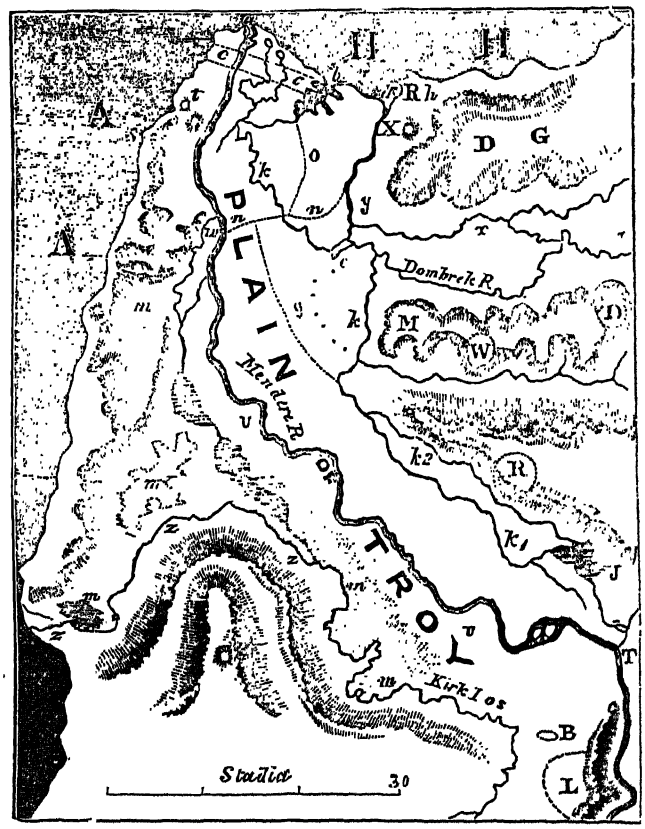
TROUBADOURS. See POETRY.

TROWBRIDGE, a market town of England, Wiltshire, stands on the declivity of a rocky eminence on the right bank of the Were, a tributary of the Avon, and here crossed by a stone bridge, 21 miles N.W. of Salisbury. The main street, of which the town principally consists, is winding and irregularly built. The houses generally are old and mean, though some of them are large and handsome. The parish church is a spacious edifice, with a nave, chancel, two side-aisles with chapels attached, and a large western tower and spire. Besides another church, recently erected, there are various dissenting places of worship, several schools, almshouses, and other charities. The woollen manufacture was established here at an early period, and cassimeres, kerseys, and tweeds are still its chief products. The Kennet and Avon Canal passes about 1 mile N. of the town. The poet Crabbe was rector of Trowbridge for eighteen years, and died here in 1832.

TROWBRIDGE, *Sir Thomas, Admiral*, was born in London, but at what precise date does not appear. He was made a lieutenant under Admiral Sir Edward Hughes, in the East Indies, in 1780, a commander and post-captain in 1782, and was shortly afterwards taken prisoner by the French as commander of the Castor frigate of thirty-two guns. They were again recaptured by Lord Howe, before they had reached France, on the 1st of June 1794. Trowbridge subsequently commanded the Culloden, seventy-four guns, at the victory of 14th February 1797, under Earl St Vincent. In 1798, he was despatched with eight ships of the line to support Nelson in the Mediterranean; and was only prevented from taking part in the great sea-fight of the Nile by his ship running aground. This accident "almost broke the heart of the gallant captain," says Brenton, but Nelson, who knew well the temper of his officer, said—"It was Trowbridge who saved the Culloden, when none that I know in the service would have attempted it." The effect of this eulogium passed upon the chief-officer of the Culloden was, that her crew were treated as if they had actually been engaged in the battle. After being employed in various exploits of minor note in the Mediterranean, Trowbridge was, on his return to England in 1801, made captain of the channel fleet under Earl St Vincent; and in 1804 he was made an admiral. In 1805, he was sent to the East Indies in command of the Blenheim, a ninety gun ship, reduced to seventy-four guns, with a convoy of ten merchant vessels. The admiral's ship ran aground in 1806 in the Straits of Malacca, and after a temporary repair he set out for the Cape of Good Hope. The Blenheim was perceived—separated from her convoy in a violent gale—off the island of Madagascar, on the 1st of February 1807, exhibiting signals of distress. As no assistance could be rendered to the foundering ship, she was seen

Troy. plunging heavily till dusk, after which she was never heard of more.

TROY, TROIA, or ILIUM, an ancient city in Asia Minor, on the south side of the Hellespont, and near the Ægean Sea. It was the capital of a small kingdom which flourished about 3000 years ago, and the fame of whose real or legendary history has been spread over the civilized world by the poems of Homer. A city bearing the name existed here in the times of Alexander the Great and the Roman emperors, the site of which is now as well ascertained as that of Athens or Rome. But doubts were raised by Demetrius of Skepsis, a learned native of the country, as to its identity with the poet's Ilium; and these doubts, which continue to the present day, have produced much controversy, and given birth to sundry theories, or explanations of the topography, intended to ascertain the position of the different objects and localities mentioned in the poems of Homer. An outline of these theories is all that can be offered here. To give the rationale of them, a volume would be necessary. The annexed topographical sketch includes what is usually termed the "Plain of Troy,"



consisting of the level land on the sides of two streams, now named the Menderé and the Dombrek, with the ridges of low hills enclosing them. It is copied from the carefully executed map published by the Admiralty in 1840.

A A.—The Ægean Sea.

H H.—The Hellespont at its south-west extremity, where it joins the Ægean Sea.

S.—The Sigæan promontory, 182 feet in height. It is the termination of a ridge of tertiary limestone facing the west, and about 6 miles in length.

Rh.—The Rhætean promontory; and DG the Rhætean ridge, which rises from the east side of the plain, and increases in height in its continuation eastward. At Ren Keui (which is beyond the limits of the map), it attains an elevation of 700 or 800 feet above the Hellespont.

M D.—The elevation of this ridge above the plain is about 100 feet at M, its west end; and it rises very gradually eastward.

The river *Menderé* is the only large river in the Troad. In the plain it is from 200 to 300 feet in breadth, and when full is from 8 to 12 feet in depth. The river has its head-spring near the summit of Mount Ida, about 40 miles south-east from its estuary *a*, in the Hellespont. The name is evidently the ancient name Skamander, slightly altered; and it was identified with the Homeric river so called, by all geographers ancient and modern, previous to the publication of Lechevalier's theory in 1791. Troy.

The *Dombrek*, the next river in importance, is comparatively very small, being about 12 miles in length, and from 20 to 30 feet in breadth in the lower part of its course. It was the Simois of the Greek and Roman geographers, and derives its modern name from the village of Dombrek, which stands in the higher part of the valley, and very probably occupies the site of the ancient Gergis or Gergithus.

x y.—An older channel of the Dombrek, still open in winter. The Dombrek and Menderé, or Simois and Skamander of the Greeks and Romans, probably united about *y*, in the time of Homer.

The *Kirk Ios*, or rivulet of Bunarbashi, the Skamander of Lechevalier, 10 miles in length, and, according to him, 12 feet broad and 3 deep. It rises from numerous springs; and hence its Turkish name, Kirk Ios, meaning "forty eyes." (The word "forty" expresses an indefinite number among the Turks and Arabs, and did so among the ancient Hebrews, being equivalent to the English word "many.") There are eight distinct springs near the village of Bunarbashi (B), and probably many smaller ones concealed by the marshes, which skirt its course down to its old junction with the Menderé by two mouths near *w*.

m m m.—Marshes formed by water which escapes from the channel of the Kirk Ios.

z z z.—A canal cut about the beginning of the last century, which conveys most of the water of the Kirk Ios to the Ægean Sea.

T.—The termination of the River Thymbrius, where it joins the Skamander.

t.—Two earthen tumuli, believed to be those erected in honour of Achilles and Patroclus.

X.—A stone monument, believed to occupy the site of the tomb of Ajax.

k. k. k 2. *k* 1.—"Asmaks," a Turkish name, applied to streams which are little rivers in winter, but in summer are chains of pools and mud.

b.—A large salt-water inlet, upon the coast, resembling an ancient estuary, supposed by Mr Maclaren to have been the estuary of the Menderé in the time of Strabo.

d.—A deep inlet called En Tepe Asmak, which conveys the water of the Dombrek to the Hellespont. It is supposed by Mr Maclaren to have been the joint estuary of the Menderé and Dombrek in the time of Homer.

n. n. d.—The supposed ancient course of the Menderé in the time of Homer, according to Mr Maclaren.

n. o. b.—Its supposed course in Strabo's time.

c. c.—The Greek camp, according to Mr Maclaren, about 10 stadia or a mile and a quarter in length. Lechevalier places the camp in the same position, but extends it eastward to the Asmak at X, giving it a length of 20 stadia.

w. v. v.—Lechevalier's plain of Skamander, the scene of the battles. The open space between the present channel of the Menderé on the west, and the eastern line of the Asmaks, *k*, *y*. X. *d*, is Mr Maclaren's Skamandrian Plain, or Homeric battle-field. The dotted line *g* marks what he thinks was the ancient course of the Asmaks, k 1, k 2, to the Menderé or Skamander.

J.—A lake or marsh, called Judan, fed by permanent springs, the water of which flows off north-westward by the two Asmaks, k 1, k 2. These uniting, pursue their course by *k. k*, and terminate in two small stagnant pools near the estuary of the Menderé.

The scale attached is in stadia, of which 8¼ are equal to an English mile. The stadium is nearly equal to the English furlong.

M.—The undisputed site of the Ilium or Troia, which was patronised by Alexander the Great and the Romans, and believed by them, and by nearly all the geographers of Greece and Rome, to be the Ilium of Homer. The most level part of the hill-top (which is covered with fragments of tile and pottery), is about 84 feet above the surface of the plain, but the south-west portion of it is 20 feet higher. The ancient city that stood here is the "New Ilium" of Demetrius and Strabo, the Homeric Ilium of Mr Maclaren, of Mr Grote the historian, and of Dr Smith in his *Dictionary of Ancient Geography*. The hill forms the west end of a ridge.

D.—The Homeric Ilium of Demetrius and Strabo. An "Ilican village" (so named), stood here in the time of the Romans, 30 stadia eastward from New Ilium, according to Strabo; and at the present day some stones and broken pottery, the usual vestiges of an ancient town or village, mark the site.

R.—The Homeric Ilium of Major Rennell. A grove of oaks with a cemetery, broken pottery, and some fragments of columns, exist at the locality. His reasons for placing the city here are explained in his *Observations on the Topography of the Plain of Troy*, Lond. 1814.

L.—The Homeric Ilium of Lechevalier, consisting of an uneven sloping surface, rising southward from the village of Bunarbashi, B, and bounded on the east by the ravine which forms the bed of the Menderé. Fragments of an ancient wall were found at the place, with some few remains of pottery, and three tumuli stand on the higher part of the ground, and overlook the ravine. His speculations on the topography were read before the Royal Society of Edinburgh in 1791, and printed in its *Transactions* in French. They were republished in Paris under the title of *Voyage de la Troade*; and the third and last edition, which bears the date of 1802, was in three volumes.

W.—The Homeric Ilium of Mr Barker Webb. This gentleman spent two or three weeks in the Troad in 1819. The fruits of his researches were originally published in an Italian journal, and afterwards republished in Paris, under the title of *Topographie de la Troade, Ancienne et Moderne* (1844). In the latter he embodied a large portion of Mr Maclaren's argument to show that Homer's Ilium was within a short distance of the sea. The position, W, assigned to it by Mr Webb, is a little eastward of a Turkish village named Chiblak.

These very different opinions respecting the site of the famous city have been developed in lengthy arguments or *theories*, grounded on a comparison of the present topography with the local details and allusions scattered through the *Iliad* and *Odyssey*, and supplemented by the comments of the ancient geographers, and the occasional statements of the historians. Only two of the theories, so far as we know, have found any supporters in recent times—the old Græco-Roman theory, revived by Mr Maclaren, and that of Lechevalier.

After the failure of Mr Wood's attempt to find the site of Troy in 1750, the inquiry seems to have been abandoned as hopeless, till M. Lechevalier, who was an attaché of the French embassy at Constantinople, visited the plain in 1785. Arriving at the village of Bunarbashi (B), in the end of September, he observed a group of springs, one of which had a cloud of smoke over it, while its water felt warm to the hand. A hot and a cold spring in juxtaposition are mentioned by Homer (*Iliad*, xxii. v. 147), as existing close to the walls of Ilium externally; but the former had disappeared two thousand years ago, as we learn from Strabo. It occurred to Lechevalier that the spring with the smoke over it might possibly be the *lost* hot spring of the poet. Adopting this idea as a basis, he sought amidst the topographical features of the plain for evidence in its support, and constructed a theory remarkable for originality and boldness. This theory, though completely at variance with the works of the Greek and Roman geographers, was well received by many distinguished scholars at first, and has still some able supporters, among others the esteemed British consul at the Dardanelles, Mr Calvert, who owns or farms a portion of Priam's territories.

Respecting the springs, then, the sole root of the theory, the poet's words, confronted with the physical facts, stand thus:—Homer's springs were "two" in number; "one hot with a cloud of smoke over it, as from a fire;" the other "cold as snow or ice in summer." The known springs at Bunarbashi are *eight* in number (as laid down in Mauduit's plan), *all cold*, and of exactly the same temperature, namely 63° of Fahr., which is the mean temperature of the 40th parallel (see Professor Leslie's article CLIMATE, in the sixth volume of this work, table, p. 769). They are of unequal magnitude, four of five of them are pretty copious, the water gushing out with force from openings in the conglomerate rock; they are scattered over a space 3000 feet in length; and their united water suffices to turn a mill.

The most easterly spring, which is the most copious, and will exhibit most smoke, was selected by Lechevalier for his "hot" spring. In lieu of the *one cold* spring, he adopted "six small rills gushing from the foot of the hills, and constantly preserving the same cold temperature" (such are his words); the simple truth being, that two or three of the small rills are copious springs, and that all of them, instead of "constantly maintaining a cold temperature," have exactly the same temperature with his hot spring! In all his three visits to the plain, he never carried a thermometer with him, but judged of the temperature by plunging his hand into the water; and a hot and a cold spring at Bunarbashi continued to be talked and written about as realities, for sixteen years, till the delusion was dispelled, in 1801, by the celebrated English traveller, Dr E. D. Clarke, who, testing each of the springs in succession with a thermometer, demonstrated that they were all of precisely the same temperature. It was then alleged that the inhabitants of the district *believed* one spring to be hotter than the others, and that this justified the poet's description. If such was the popular opinion at Bunarbashi fifty years ago, it is not so now. When the writer of this article was at the village in May 1847, and inquired, "which was the spring that smoked in winter?" the answer he received was, that "they all smoked in winter." Mauduit, a French architect, who visited the springs in November 1811, saw them all smoking ("toutes les bouches chaudes et même fumantes." *Decouvertes dans la Troade*, p. 62); and the circumstance must be familiarly known. Lechevalier saw one spring smoking, and was "told it was much warmer at mid-winter," and asked no further questions. Was it not odd, that being destitute of a thermometer, he did not avail himself of the means of information thus opened up, and ask "whether the other springs did not also smoke in winter?" If he had done so, he would assuredly have got the same reply in 1785 which we got half a century later, that all the springs smoked. Tried by this test they are all hot springs, while technically they are *cold* springs, since they have merely the mean temperature of the 40th parallel. The case then stands literally thus,—Homer describes two springs, one very hot and one very cold, and Lechevalier desires to persuade us, that they are identical with eight cold springs, all of one temperature! Assuming the springs at Bunarbashi to be the *head* springs of Skamander, he legitimately inferred, that the little stream of the Kirk Ios, flowing from them, is that renowned river. But Homer characterizes the Skamander as "great," "wide-flowing," "deep-flowing," and "abounding in whirlpools;" terms very inapplicable to the little Kirk Ios, which, by Lechevalier's own account, is only 12 feet broad and 3 feet deep; and, where we crossed it, merited the terms of "slow and sluggish," applied to it by the *Edinburgh Reviewer* (vol. vi. p. 272). Asserting without any authority, that the fighting in the river described in the twenty-first book, which the poet says, was "in the Skamander," was *below the junction* of the two streams, Lechevalier is forced to maintain, that the great river, the Menderé, 40 miles long, and nearly 300 feet broad, gave up its name to the little brook the Kirk Ios, 10 miles long and 12 feet broad. This is precisely such a change as would take place, if the Tweed for the last two miles of its course borrowed the name of the Whitadder, or the Clyde below Glasgow took the name of the Kelvin. Farther, to cover the inconsistency, he asserts that while the Kirk Ios is an unfailing stream, the Menderé is a mere occasional torrent, *dry all the year*, except at the melting of the snows in spring, and after accidental rains. The latter statement is utterly untrue, and is one of the gross misrepresentations employed to buttress his theory. The Menderé is never without a considerable body of water, and according to Professor Forchhammer of Kiel, an excellent authority, is a larger river than the Alpheus or Eurotas, the largest rivers in the Peloponnesus.

Converting the little Kirk Ios into Homer's great Skamander, Lechevalier is forced to maintain that Strabo, Pliny, and all the ancient geographers, including Demetrius, who lived in the district, mistook the names of the rivers! He admits that the Menderé was their Skamander, and his

Troy. followers now admit that the Dombrek was their Simois. Herodotus, Livy, Plutarch, he holds, were all equally in error; in short, the whole ancient world, two thousand years nearer to Homer than we are, was ignorant of the true names of the principal rivers in Priam's kingdom, till the ingenious Frenchman revealed them! One would have thought that no two rivers in the ancient world had such a guarantee for the preservation of their genuine names, as the poems of Homer afforded to the Skamander and Simois.

Since the poet's hot and cold springs were close to the walls, their site determines the site of the city. Lechevalier accordingly places Troy at L, on the sloping ground above Bunarbashi, nine miles from the south shore of the Hellespont *a*, *b*, *d*, on which the Greeks were encamped. The account of the first battle shows, that in one day, indeed less than an entire day, the Greeks passed four times over the space between the city and camp, fighting nearly all the time. Lechevalier therefore assumes that the Greeks performed a march of more than 30 miles in one day, amidst the toil of actual conflict, while Major Rennell shows that the march of an army *unopposed*, in ancient and modern times, does not exceed 15 miles in a day. It is obvious, therefore, that Lechevalier's Troy is at twice or thrice the distance from the sea required by the poet's narrative. Lechevalier pleads the poet's right to exaggerate, which Homer himself may be said to repudiate, for he is circumstantial and literal in a remarkable degree in relating facts. Major Leake felt the weight of the objection, and shortens the distance two miles, by assuming that a bay of the Hellespont extended as far south as the dotted line *n*, *n*, a physical change purely gratuitous, and resting on no other foundation than the *necessities* of an unsound theory.

Homer tells that Achilles chased Hector three times round the walls of Troy (*Iliad* xxii. 165). Lechevalier's Troy at L does not admit of a course round it, in consequence of its proximity to a deep ravine which forms the channel of the Menderé. Here again his theory is in conflict with the topography, and he seeks an exit from his difficulties by proposing that the words τρις περιδανηθητην, "they ran thrice round," should be translated "they ran thrice *before* or *near*" the city—a plain perversion of the poet's words. These are only a specimen of the inconsistencies which the theory involves.

THE GRÆCO-ROMAN THEORY.

For many centuries the city called New Ilium by Strabo was visited by the poets, historians, statesmen, and warriors of Greece and Rome, from motives of curiosity, and was always recognised as the Ilium of Homer. In all antiquity only three persons, as Mr Grote observes, seem to have opposed its title to this distinction—Demetrius of Skepsis and Hestiæa of Troas, both adjacent towns, and Strabo. The opposition of the first two may be accounted for by the jealousy which the gifts and honours bestowed upon New Ilium by the Romans could not fail to excite in the neighbouring towns; and as for Strabo, he admits having followed Demetrius implicitly, and does not seem to have made any original inquiries. Now Skepsis claimed the honour of being the royal seat of Æneas, and this claim had been treated with neglect or contempt by the Romans; for it is not recorded that Skepsis ever participated in the many benefits conferred on New Ilium. Troas having risen to importance by commercial industry, probably envied the immunity from taxation which New Ilium owed to its legendary titles. What was more natural than that the validity of these titles should be objected to in Skepsis and Troas, and that citizens of these towns should shape the objections into a theory? When only two such dissentients from the opinions of the Greek and Roman writers are upon record, may we not say that the pretensions of New Ilium to be the Ilium of Homer were acquiesced in by the ancient Greek and Roman world? Troy.

In Strabo's day, Ilium was 20 stadia from the mouth of the Skamander, which probably then joined the Hellespont through the lagoon at *b*. It was only 12 stadia from another opening, falsely called the Portus Achæorum, or "harbour of the Greeks," which has generally been identified with *d*, the estuary of the Dombrek, on which boats probably sailed up as far as X, or a little farther. The northern part of Ilium must then have been placed about *e* to bring it within the distances named—viz., 20 stadia from *b*, and 12 from X. But almost 400 years before Strabo's time, Ilium, according to the Periplus of Skylax, was 25 *stadia from the sea;* that is, the beach at *b* or *d*, to which trading-vessels resorted. How is this statement to be reconciled with Strabo's? Very easily. Skylax speaks of the "hill-crowning Ilium," ιλιας οφρυοεσσα (*Il.* xxii. 411), seated on the rock of Hissarlik, M; while Strabo speaks of the city after it had been enriched by the patronage of the Romans for a century and a half, the effect of which would be greatly to enlarge its boundaries, spreading the population over the plain, probably northwards as far as *e*, and westwards to *g*, as indicated by a dotted line. A change followed, exemplified in Athens and many other Greek towns; the hill-top M, which originally lodged the whole population, now became the citadel or acropolis. Such it was in Strabo's time, as he informs us. A comparison, therefore, of the distance of Ilium from the sea, as given by Strabo, and by Skylax at least 350 years earlier, clearly proves the extension of Ilium over the plain northward in the interval. The statement of Skylax as clearly disproves the existence of any deep bay of the Hellespont (reaching southward to *n n*), such as Major Leake *imagined*, in order to shorten the distance between Lechevalier's Troy (L) and the Greek camp. The disappearance of this imaginary bay annihilates a physical speculation of Demetrius; who argued that the portion of land between Ilium and the Hellespont was rapidly receiving accessions from the soil brought down by the Skamander (the Menderé), and hence that the so-called Portus Achæorum, then 12 stadia from the city, would be within 6 stadia of it at the time of the Trojan war. The words of Skylax demonstrate that this notion of Demetrius as to the growth of the land is baseless. The Skæan gate, or principal entrance to the Homeric city (M), must have been on the W. or S.W. side of the hill, the N. and N.W. sides being too steep to permit chariots to ascend. Now the distance of the Rhætean bay at *d* (or *Rh*), from the middle of the W. side of the hill M, is just 25 stadia at this day in the Admiralty map, the very distance named by Skylax at the date of the Peloponnesian war. Mr Maclaren admits that when the Skamander abandoned its estuary at *b* for that which it now occupies, the point of land at *a* would be a little extended, and he has on this ground placed the Greek camp *c. c*, 3 stadia S. from the present estuary; but in former times, as at this day, by far the greater part of the matter brought down by the Skamander must have been swept into the Ægean Sea by the rapid current of the Hellespont. The depositing agent was always held in check, less or more, by the denuding agent; when they balanced each other, the enlargement of the land would cease, and this point of rest may have been reached 2000 years ago.

The Greeks did not fortify their camp till after the defection of Achilles, in the tenth year of the war. Demetrius argues, that if Troy was so near the sea as the city then existing, it was exceedingly foolish in the Greeks to leave their camp so long unprotected, and very pusillanimous in the Trojans to abstain from attacking it. The argument is plausible, but loses its cogency if we place the ancient Troy nearly twice as far from the sea as the city Demetrius had before him. And if we seek a site for

Troy. the city so distant as to secure the camp against a surprise, neither Demetrius' site D, 6 miles from the camp, nor Lechevalier's L, 8 miles from it, nor any site within a distance which armed men could march over in one night, would satisfy the conditions of the problem. A leading object in the Epic narrative, as Colonel Mure observes, was to exalt the glory of Achilles. As long as he was in the field, the camp needed no other defence than his prowess and renown.

The art of besieging towns was not then understood, and the Greeks seem never to have attempted to invest Ilium; but with their camp only 3 miles from it, they subjected it to a species of loose blockade. Thus Hector asks Polydamas in the eighteenth book, if he was not tired of being "shut up within the walls," and seeing the city impoverished. Priam, in the twenty-fourth book, requests permission from Achilles to bring wood from Ida for Hector's funeral. The Trojan women, in peaceful times, washed their robes at the hot and cold fountains without the gates, but just under the city walls; and this practice was abandoned from the moment the Greeks took up their position at the shore. These incidents (and there are others of similar import) imply that the Trojans were closely exposed to observation, and very much straitened in their external communications. They are consistent with the position of an Ilium standing at M, 3 miles from the camp; but they cannot easily be reconciled with that of an Ilium at D, 6 miles, or at L, 8 miles from it.

Homer lays it down very distinctly that the Greeks, in marching to and from Troy, crossed the Skamander. It is necessary, therefore, to give that river a bend eastward in some such line as *n. n*, or *n. o*. But, apart from any inferences drawn from the text of the Iliad, there is good physical evidence to show that the Menderé did join the Hellespont at ancient periods through the openings at *b* and *d*. This evidence is furnished by the soundings given in the Admiralty map, which it is impossible to insert in our sketch.

It is as clearly laid down, that the "Skamandrian plain" of the poet, the field in which the battles were fought, was the level ground between Simois and Skamander. Now in Lechevalier's theory the Kirk Ios being the Skamander, and the Menderé the Simois, it follows that the narrow stripe of ground *w v v*, only half a mile in breadth in the Admiralty map, and hedged with deep marshes on its western side, is Homer's field of battle! And in this narrow space the reader is expected to believe that the two "wide armies" (*Iliad* iv. 209), of 50,000 men each (there are data for their strength), manœuvred in front of each other, and fought battles! After this, it does not astonish one to find, that in Lechevalier's map, even in his third edition, the breadth of the ground, *w v v*, is magnified threefold! The field of battle, in the estimation of all the Greek and Roman writers, except Demetrius and the Lady Hestiæa, was undoubtedly the whole plain between the present course of the Menderé and the eastern line of Asmaks *h*, *y*, X, *d*, which has a breadth of very nearly 2 miles.

Though many of Homer's local details may be held to be fictitious, we are justified in reasoning respecting them as facts on two grounds: first, that he had an intimate knowledge of the ground which was the scene of the war, so that all its leading features were present to his thoughts; and secondly, that he intended his narrative to pass for a true history, and would not ascribe to the Greeks or Trojans acts physically impossible. (C. M.)

TROY, a town of the United States of North America, capital of the Rensselaer county, New York, stands on both sides of the Hudson River, 6 miles above Albany, and 151 miles N. from New York. The principal portion of the town is on the E. bank of the river, and communication between the two parts is kept up by means of a bridge and ferry-boats. It extends for about 3 miles along the river, and is regularly laid out and well built. The streets are generally 60 feet wide, well paved, lighted with gas, and shaded with trees. Many of the public buildings are handsome, among which are the court-house, a fine marble building in the Doric style, and St Paul's Episcopal church, a costly Gothic edifice. There are about twenty other churches in the town, a lyceum with a valuable collection of natural history, the Rensselaer Institute affording a scientific and practical education to young men, the Troy female institute, and two substantial brick market-houses. The town is abundantly supplied with water by means of the Hudson, and two small streams which join that river within the town. Troy contains numerous flour and paper mills, cotton and woollen factories, tanneries, breweries, iron-foundries, machine-shops, rolling-mills, and forges. It is very favourably situated for commerce; four railways meet at this place, and steamers ply daily between it and New York. Pop. (1850) 36,349, of which West Troy contained 7564.

Troy Weight Troyes.

TROY *Weight*, one of the most ancient of the different weights used in Britain. The ounce of this weight was brought from Grand Cairo in Egypt, about the time of the Crusades, into Europe, and first adopted in *Troyes*, a city of Champagne; whence the name. The pound *English* Troy contains 12 ounces, or 5760 grains. It was formerly used for every purpose, and is still retained for weighing gold, silver, and jewels; for compounding medicines; for experiments in natural philosophy; and for comparing different weights with each other. *Scottish* Troy Weight was established in the year 1618 by James VI., who enacted that only one weight should be used in Scotland—viz., the French Troy stone of 16 pounds, and 16 ounces in the pound. The pound contains 7600 grains, and is equal to 17 oz. 6 dr. avoirdupois. The cwt., or 112 lb. avoirdupois, contains only 103 lb. 2½ oz. of this weight, though generally reckoned equal to 104 lb. This weight is nearly, if not exactly, the same as that of Paris and Amsterdam, and is generally known by the name of *Dutch weight*. Though prohibited by the Articles of Union, it continued to be used in weighing iron, hemp, flax, most Dutch and Baltic goods, meal, butcher-meat, unwrought pewter and lead, and some other articles. See WEIGHTS and MEASURES.

TROYES, a town of France, capital of the department of Aube, and of an arrondissement of its own name, is situated in an extensive plain on the left bank of the Seine, 112 miles S.E. from Paris by railway. It is surrounded by old walls, and has generally an antique appearance—most of the houses being old, many of them of wood—and the streets are commonly narrow and crooked. Many of the recent erections, however, are constructed with more regard to taste and regularity, and some of the suburbs, of which there are several, are well built. Among its public buildings are the cathedral, a fine Gothic edifice commenced in the thirteenth though not finished till the sixteenth century; the churches of St Urbain and Santa Madeleine, the town-hall, the library containing 60,000 volumes, and theatre. The manufactures of the town are important, and are fostered by the abundant supply of water obtained from the river, and distributed over the town by means of numerous canals. The chief manufactures are cotton and woollen yarn and fabrics, linens, paper, leather, &c. Dyeing and bleaching are also largely carried on Troyes is the seat of a bishop, and has tribunals of primary instance and commerce. Troyes occupies the site of the ancient *Augustobona*, the chief town of the Tricasses. It afterwards became the capital of the county of Champagne and a great centre of trade; the fairs of Troyes, where the products of Italy and the south of France were exchanged for those of Germany and Flanders, were celebrated throughout Europe. It suffered severely in the civil wars of the

Truman ‖ Trumpet, Articulate.

fifteenth century, and was taken by Joan of Arc in 1429. In the campaign of 1814 it was several times taken and retaken by the French and the allies. Pop. (1856) 30,966.

TRUMAN, JOSEPH, an English theological writer of considerable ingenuity, of whom very little is known, was born either at Gedling or Stoke, in Nottinghamshire, in April 1631. After completing his school education he entered Clare Hall, Cambridge, where he had the gentle and modest Tillotson for a fellow-student. On leaving college he was inducted to the living of Cromwell, but refusing to read the Book of Common Prayer, he was obliged to resign in 1662. He was the author of three uncouth, rugged little treatises, marked by great acuteness and a singular power of subtle analysis. They are entitled, *The Great Propitiation*, 1669; *An Endeavour to Correct some prevailing Opinions contrary to the Doctrine of the Church of England*, 1671; and his *Discourse of Natural and Moral Impotency*, in 1671. A new edition of his works was published in 1834, with a "Biographical Introduction" by Henry Rogers. Truman, who resided for some years at Mansfield, died at the house of a friend at Sutton, in Bedfordshire, on the 29th of July 1671.

TRUMPET (Gr. σπρόμβος, Lat. *turba*, a spiral shell, according to Ménage), a musical instrument, the most noble of all portable ones of the wind-kind; used chiefly in war, among the cavalry, to direct them in the service. As to the invention of the trumpet, some Greek historians ascribe it to the Tyrrhenians; but others, with greater probability, to the Egyptians, from whom it might have been transmitted to the Israelites. The trumpet was not in use among the Greeks at the time of the Trojan war, though it was in common use in the time of Homer. According to Potter (*Arch. Græc.*, vol. ii. cap. 9), before the invention of trumpets, the first signals of battles in the primitive wars were lighted torches; to these succeeded shells of fishes, which were sounded like trumpets.

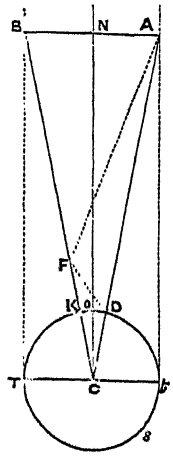
Speaking trumpet.

TRUMPET, *Articulate*, comprehends both the *speaking* and the *hearing* trumpet. The former appears to have been known to the ancient Greeks and natives of Peru as early as 1595, but does not seem to have been an object of scientific investigation until the middle of the seventeenth century, when it occupied the attention of Athenasius Kircher, and subsequently in 1670, when Sir Samuel Morland proposed as a question to the Royal Society of London, "What is the best form for a speaking-trumpet?"

The subject is an exceedingly difficult one; but the most important fact for our purpose is this: An echo from a small plane surface in the midst of an open field is not heard, unless we stand in such a position that the angle of *reflected* sound may be equal to that of *incidence*. According to the theory of undulations, this small surface should become the centre of a new undulation, which should spread in all directions; but it is a fact, that if we go a very small distance on either side of the line of deflection we shall hear nothing. Whatever, then, may be the nature of the elastic undulations, sounds are reflected from a small plane in the same manner as light; and we may avail ourselves of this fact, though we cannot explain it in a satisfactory manner. The following view of the subject is derived from *A Dissertation on Acoustic Instruments*, by Mr Lambert of Berlin. in the *Berlin Memoirs* for 1763.

Let the trumpet be a cone B C A, C N the axis, D K a line perpendicular to the axis at the mouth-piece, D F A the path of a reflected sound in the plane of the axis. Let α be the angle of the cone; $\theta_1\ \theta_2 \ldots \theta_n$ the angles of incidence at each of n reflections. Then, considering the angles of incidence and reflection to be equal, we have $\theta_n = \theta_{n-1} - \alpha$ $\theta_{n-1} = \theta_{n-2} - \alpha$, &c. $\theta_2 = \theta_1 - \alpha$; therefore by addition, $\theta_n = \theta_1 - n\alpha$; whence we see that as the length of the cone, and therefore as n increases, the last angle of reflection diminishes, and at some point, therefore, the direction of the reflected ray will be approximately parallel to the axis of the trumpet. Let A be this point; draw A B perpendicular to the axis C N Let the trumpet be assumed of such dimensions that A B is the diameter of the larger end, K D that of the mouth-piece, and T K t s the plane section of a sphere, whose centre is C, and diameter T t = A B. Draw the tangents T B, tA; these are parallel to C N. Then, following up the analogy of sound to light, we may assume that the effect upon an ear situated within the prolonged cylindrical surface A t T B will be the same as if lines of sound proceeded from every point of the surface of a sounding sphere T K D t; and also that the sound is magnified in the proportion of the surface T K D t to that of K O D. These considerations enable us to determine the dimensions and magnifying power of the trumpet. There are two conditions to be fulfilled—(1.) The diameter of the mouth-piece must be a fixed quantity, generally one inch and a half; (2.) The diameter of the larger end must be equal to that of the fictitious sonorous sphere.

Trumpet, Articulate.



Let m = diameter of the mouth-piece. y that of the larger end, x the required length of the trumpet. Then, Dimensions of trumpet

$$\frac{\frac{y}{2}}{x+\frac{y}{2}} = \sin\frac{\alpha}{2} = \frac{\frac{m}{2}}{\frac{y}{2}}$$

$$\therefore \frac{y}{2x+y} = \frac{m}{y} \quad \therefore x = \frac{y(y-m)}{2m}, \text{ and } y = \frac{m}{2} + \sqrt{2mx + \frac{m^2}{4}}.$$

In practice it is usual to find the diameter of the larger end of the trumpet from the second of these equations, corresponding to a proposed length of trumpet. Let M represent the magnifying power of the trumpet; then, as before observed, M : 1 = surface T K D t : surface K O D = (chord T O)² : (chord K O)² = $2 \times \frac{y^2}{4} : \left(2 \times \frac{y}{2}\sin\frac{\alpha}{4}\right)^2$; Magnifying power.

$$\therefore M = \frac{1}{2\sin^2\frac{\alpha}{4}},$$

$\frac{\alpha}{4}$ being a very small angle in practice, we may, without sensible error, write $\frac{\frac{m}{4}}{\frac{y}{2}}$ for $\sin\frac{\alpha}{4}$; in which case we have $M = \frac{2y^2}{m^2}$.

The extending power of the trumpet is the distance at which a person would hear the trumpet, compared with that at which he would hear the unassisted voice. Let D, d represent these distances, E the extending power of the trumpet, so that $E = \frac{D}{d}$. Now, if we suppose that the audibility of sounds varies inversely as the squares of the distances; and also that the magnifying power of the trumpet causes a voice to be heard as well at distance D as it would, if unassisted, be heard at distance d, we shall have $\frac{D^2}{d^2} = M = \frac{1}{2\sin^2\frac{\alpha}{4}}$; Extending power.

$$\therefore E = \frac{\sqrt{2}}{2\sin\frac{\alpha}{4}} = \sqrt{2}.\frac{y}{m} \text{ approximately.}$$

Trumpet, Articulate.

The following table gives examples of a variety of trumpets, x being expressed in feet, y in inches, $m=1{\cdot}5$ inches in all cases:—

Examples of trumpets.

x	y	M	E	α
1	6·8	42·6	6·5	24° 53′
3	11·2	112·4	10·6	15 18
5	14·2	180·4	13·4	12 4
7	16·6	247·7	15·7	10 18
9	18·8	314·6	17·7	9 8
11	20·7	380·9	19·5	8 18
15	24·	513·6	22·7	7 9
24	30·2	810·1	28·5	5 42

Parabolic trumpet.

Amongst other forms of trumpets which have been suggested, we may mention the parabolic and the hyperbolic. The former of these would be very advantageous if the mouth-piece were a point coinciding with the focus, for in that case all the reflected sounds would be parallel to the axis. But every point of an open mouth must be considered a centre of sound, and none of it must be kept out of the trumpet. Hence it will be found that the conical trumpet will disperse the reflected sounds less than the parabolic, and still less than the hyperbolic.

The elastic matter of the trumpet is thrown into tremors by the undulations from the mouth-piece. The agitations arising from these tremors tend greatly to hurt the distinctness of articulation; hence it is found advantageous to check all tremors of the trumpet by encasing it in woollen list.

Hearing trumpet.

By diminishing the aperture of the smaller end, the same instrument may be employed as a hearing trumpet. In this case the investigation is much simplified by the consideration that all the lines of sound may be supposed to enter the large end of the tubes in directions parallel to the axis. Now, employing the same figure as in the preceding investigation, let x = required length of the hearing trumpet, z that of the part cut off, x', x'', x''', &c., the distances from C of each successive point of reflection. Then, if we trace the progress of a line of sound from A to D, we perceive that the first angle of incidence and reflection is $\frac{\alpha}{2}$; and that each successive angle is greater than that which precedes it by the angle α. The greatest possible value of the angle of incidence is 90°, and we may assume this to be the angle at the smaller end DK. Now $\frac{x+z}{x'}=\frac{\sin\frac{3}{2}\alpha}{\sin\frac{\alpha}{2}}$, $\frac{x'}{x''}=\frac{\sin\frac{5}{2}\alpha}{\sin\frac{3}{2}\alpha}$ $\therefore x+z=x''.\frac{\sin\frac{5}{2}\alpha}{\sin\frac{\alpha}{2}}$. Similarly, we should find $x+z=x'''\frac{\sin\frac{7}{2}\alpha}{\sin\frac{\alpha}{2}}$; and so on till we arrived at $x+z=z\frac{\sin 90}{\sin\frac{\alpha}{2}}=\frac{z}{\sin\frac{\alpha}{2}}$.

Dimensions of hearing trumpet.

Approximating power.

Let A represent the approximating power of the trumpet; that is, the proportion in which a voice is brought apparently nearer. Then, if we consider sounds to be constipated in the ratio of the areas of the larger and smaller ends, that is, in the ratio of $(x+z)^2$ to z^2, we shall obtain $A=\frac{x+z}{z}=\frac{1}{\sin\frac{\alpha}{2}}$. But taking the usual diameter of the smaller end to be $\frac{1}{3}$ of an inch, we have $\sin\frac{\alpha}{2}=\frac{1}{6z}=\frac{A-1}{6x}$; hence $A=\frac{6x}{A-1}$ $\therefore x=\frac{A(A-1)}{6}$.

Truro ‖ Truxillo.

Example.

The above affords a simple rule for the construction of a hearing trumpet. Thus, suppose it be required to approximate the sound 12 times, making it 144 times stronger than the natural voice at the same distance; then in this case A = 12, and we have for the required length $\frac{12\times 11}{6}$ = 22 inches.

As in the case of speaking trumpets, all reverberation of the instrument should be avoided, by making it thick and of the least elastic materials, and by covering it externally with cloth.

The paraboloid is the best form for the hearing trumpet, because all the reflected sounds will pass through the focus. The necessary conditions for a trumpet of this form are, that it be cut off at the smaller end through the focus; that the parameter be $\frac{1}{8}$ of an inch, and the focus $\frac{1}{16}$ of an inch from the vertex,—the length being determined by the proposed approximating power, as before. (G. R. S.)

TRURO, a municipal and parliamentary borough and seaport town of England, Cornwall, situated at the point where the two streams Allen and Kenwin unite to form the creek or river Truro, which opens into Falmouth harbour, 8 miles N.N.E. of Falmouth. Truro is the largest and handsomest town of Cornwall; the houses are generally well built, the streets partially paved and lighted with gas. It is a principal stannary town, and situated in the centre of an important mining district, while the river admits of vessels of 100 tons coming up to it at high-water. The parish church of St Mary's is an elegant and handsome building, surmounted by a spire; besides which there are a chapel of ease and various dissenting places of worship; several schools, including a free grammar school, with two exhibitions at Oxford; county infirmary, jail, assembly rooms, elegant town-hall, custom-house, barracks, library, museum, &c. The exports are chiefly tin and copper; imports, iron, coal, and timber. The shipping registered at the port at 31st December 1858 was 70 vessels, of in all 6615 tons burden; there entered during that year 77 vessels, of 15,605 tons; and left, 33 vessels, of 8581 tons. Carpets, paper, and earthenware are manufactured to a small extent in the town. Truro is governed by a mayor, 6 aldermen, and 18 councillors, and returns two members to parliament. Pop. (1851) 10,733.

TRUXILLO, or TRUJILLO (a supposed corruption of *Turris Julia*, the ancient name), is a town of Spain, Estremadura, province and 23 miles E. of the town of Caceres. It stands on a granite hill, commanding an extensive view of the surrounding plain, and is divided into an upper and a lower town. The upper and old town is surrounded by a wall, and has a castle; but this, once the seat of a wealthy aristocracy, is now chiefly used as a cemetery. The modern town contains some handsome buildings, principally in the Plaza or Square, where are the church of San Martin, the town-hall, &c. The inhabitants are chiefly employed in agriculture. Pizarro, the conqueror of Peru, was born here, 1480. Pop. about 6000.

TRUXILLO, a town of Northern Peru, capital of the department of Libertad, is pleasantly situated in an extensive valley, about two miles from the sea, in Lat. 8.7. S., Long. 79. 4. W. It was founded by Pizarro in 1535, and named after his birthplace. The streets are wide and regular, and it contains several handsome buildings, the chief of which are the cathedral and town-hall. Pop. 6300.

TRUXILLO, a town of the Republic of Venezuela, capital of a province of the same name, 90 miles S.W. of Barquesimeto. It occupies a narrow valley between two ridges of high mountains, and consists chiefly of two parallel streets. Though now a poor mean place, it is said to have been,

Truxillo ‖ Tschirnhausen.

previously to 1678, when it was pillaged by the buccaneer Grammont, one of the finest and wealthiest cities in this part of America. Pop. 4700.

TRUXILLO, a seaport town of Central America, state of Honduras, and department of Yoro, on the Caribbean sea, in Lat. 15. 55. N., Long. 86. W. It stands on the western shore of a noble bay, and was formerly a place of some importance, both in a military and commercial point of view, though it now contains probably under 3000 inhabitants.

TRYPHIODORUS, a poet of some note in the declining ages of Greek literature, was a native of Egypt, and was born some time during the sixth century; but the rest of his history is very obscurely known. "All that can be determined in relation to our author's age," says Merrick, "is that he lived between the reigns of [Alexander] Severus and Anastasius, the former of whom died at the beginning of the third century, and the latter at the beginning of the sixth." His writings were numerous, and several of them are mentioned by Suidas. One of these is described as *Marathoniaca;* a poem which apparently related to the victory at Marathon. Another of his poems was founded on the story of Hippodamia; and a third, which is more frequently mentioned, was a lipogrammatic, or letter-dropping, Odyssey. The fantastic plan of this poem is well known to the English reader, from one of Addison's papers on false wit, *Spectator*, No. 59. All the works of Tryphiodorus have, however, perished, with the exception of his poem on the destruction of Troy, Ἰλίου Ἅλωσις, which consists of 681 hexameter verses.

The first edition of this poem was printed by Aldus, in an octavo volume which has no date, and which likewise includes the two poems of Quintus Calaber and Coluthus. That of Tryphiodorus was reprinted in several collections, usually with Latin versions and notes; among others, by Jamotius, Lutet., 1557, 8vo; by N. Frischlinus, Francof. 1588, 4to; by H. Rumpius, Hamb. 1617, 8vo; by James Merrick, Oxon. 8vo. He likewise translated the poem into English verse, and, besides adding copious notes, prefixed an elaborate *Dissertation on the Life and Writings of Tryphiodorus*, in 1741. The Greek text, with a Latin version, Salvini's translation into Italian verse, and select annotations, was edited by Bandini, Florent. 1765, 8vo; another edition, with a poetical translation into Italian verse by A. T. di Villa, Modena, 1774, 8vo; another edition by Thomas Northmore, Lond. 1791, 8vo; Lond. 1804, 8vo; a splendid edition, including a few emendations and critical notes, was more recently superintended by Schäfer, Lipsiæ, 1808, fol.; and the last and best critical edition is that of F. A. Wernicke, 8vo, Leipzig, 1819.

TSCHIRNHAUSEN, EHRENFRIED WALTER VON, an ingenious mathematician and natural philosopher, was descended from a noble family, and was born at Kieslingswalde, in Upper Lusatia, on the 13th of April 1651. After spending some years in study at the University of Leyden, in 1672 he entered the Dutch army, where he remained till the autumn of 1674. Several of the subsequent years of his life he spent in travelling in various parts of Europe, particularly England, France, and Italy; and during that time he was diligent in collecting everything of interest regarding natural philosophy. It was while sojourning abroad that he discovered the curves to which the reflected rays of light are tangents, and which have been called the "caustic curves of Tschirnhausen." In a paper which he read before the *Académie des Sciences* of Paris in 1682, he showed that the caustic formed by parallel rays when reflected from the concave surface of a hemisphere is an epicycloid; but it remained for MM. De la Hire and Bernoulli accurately to investigate the properties of this curve. On his return to his native place, he took to fashioning burning-glasses. (See BURNING-GLASSES.) He likewise discovered the principle of Chinese porcelain, from which he may well be regarded as the founder of the famous Dresden porcelain manufacture. The only works which he published separately were the *Medicina Corporis*, 1686, and the *Medicina Mentis*, 1687. Tschirnhausen died in October 1708, and King Augustus of Poland had him buried with great pomp.

Tuam ‖ Tucker.

TUAM, an episcopal town of Ireland, county of Galway, on the Harrow, a small affluent of the Clare, 19 miles N.N.E from Galway and 125 from Dublin. It consists chiefly of several streets diverging from a central market-place, and has of late been considerably improved. Tuam was the seat of a Protestant archbishop from the twelfth century down to the death of the last prelate in 1839, when the see was reduced to a bishopric suffragan to Armagh. It is, however, the seat of a Roman Catholic archbishop, whose cathedral is one of the finest ecclesiastical edifices in Ireland. The Protestant cathedral is a small plain building. The Roman Catholics have here a monastery, a nunnery, the college of St Jarlath, and other educational institutions. Tuam has also a market-house, court-house, barracks, workhouse, jail, and dispensary. The manufacture of canvass and coarse linen is carried on to some extent; and there are also an extensive brewery and several tanneries and flour-mills in the town. Pop. (1851) 7819, including 2881 in public institutions.

TUBINGEN, a walled town of Germany, kingdom of Würtemberg, circle of Schwarzwald on the Neckar, here joined by the Ammer, 18 miles S.S.W. of Stuttgart. The town is old and irregularly built, and is chiefly remarkable for its university founded in 1477, and which had among its professors Melancthon and Reuchlin. It has faculties of Protestant and Roman Catholic theology, law, medicine, political economy, and philosophy; 62 professors and teachers, and 669 students. It has also a library of about 200,000 volumes, museum of natural history, collection of mathematical and philosophical instruments, observatory, botanic garden, &c. There are besides a Protestant and Roman Catholic seminary, and various other educational establishments in the town. The church of St George, a handsome edifice of the fifteenth century, contains several monuments of the princes of the house of Würtemberg. The principal manufacture is that of woollen cloths, but there are also breweries, tanneries, and dye-works in the town. Pop. 9200.

TUCKER, ABRAHAM. See SECOND DISSERTATION.

TUCKER, *Josiah*, dean of Gloucester, and an able political writer, was born at Laugharne, in Caermarthenshire, in 1711. Having pursued his studies with ardour at Ruthin school in Denbighshire, he was subsequently enabled to obtain an exhibition to St John's College, Oxford. Having completed his course of study, he took orders, and obtained the curacy of All Saints, Bristol. Some time after he was appointed curate of St Stephen's, Bristol, and the rectory of St Stephen's was bestowed upon him in 1479 He completed his ecclesiastical preferment by obtaining in 1758 the office of dean of Gloucester. This amiable and pious man, after passing through a very stormy time, died on the 4th of November 1799, at the advanced age of eighty-eight. Dr Tucker's first political publication, entitled *A Brief Essay on Trade*, was published in 1748. He subsequently published numerous pamphlets and brochures, some of which obtained a wide circulation, and one of which, *War for the sake of Trade*, 1763, was translated into French with the high commendation of Turgot. The most remarkable of all the dean's tracts was a commercial one entitled *Reflections on the present Matters in Dispute between Great Britain and Ireland*, which appeared in 1785. Besides his *Treatise concerning Civil Government*, 1781, some other pamphlets and sermons, this closes Dr Tucker's labours. Smith's *Wealth of Nations* appeared in 1776,

which served to shed light on many a tangled question of political economy and of commercial enterprise; but it must not be forgotten that Tucker's *Essay on Trade* appeared in 1748, and the whole of the pamphlets which flowed from the dean's facile pen bore unquestionable traces of a near relationship to this his first work.

TUCUMAN. See PLATA, LA.

TUDELA (the ancient *Tutela*), a city of Spain, province of Navarre, on the Ebro, where it receives the Queyles, 50 miles N.W. of Zaragoza. The Ebro is here crossed by a noble and venerable stone bridge of 17 arches. The town is dull, the streets narrow, crooked, and dirty; the houses lofty and solid. Tudela was made the see of a bishop in 1783. The cathedral, formerly a collegiate church, is an ancient and interesting Gothic edifice with many curious monuments. There are numerous other churches and convents in the town, two hospitals, an orphan asylum, workhouse, prison, and several schools. Manufactures of coarse woollens, hair fabrics, soap, tiles, bricks, and earthenware, are carried on. Pop. 6790.

TULA, a government of European Russia, lying between 52. 53. and 54. 56. N. Lat., and 35. 54. and 38. 50. E. Long.; and bounded on the N. by the government of Moscow, E. by Riasan, S. by Tambov and Orlov, and W. by Orlov and Kaluga. It is about 130 miles in length by 85 in average breadth, and has an area of 11,774 square miles. The surface is an extensive undulating plain, here and there traversed by low hills, and having a general inclination to the N. and E. The principal rivers are the Oka and Don, the former of which forms its northern boundary, and the latter takes its rise in this government. There are numerous smaller rivers and streams. Tula is one of the most densely populated governments of the empire, and though the soil is not naturally fertile, yet from skilful cultivation it produces abundant crops. These are chiefly corn, beans, turnips, potatoes, flax, hemp, tobacco, and mustard. Sheep, cattle, and horses are also abundantly reared. About one-sixth of the surface is covered with forests. Iron is abundant, and there are various mines of it in the neighbourhood of the capital, but it is of inferior quality, and the supply for the manufactures of the capital is chiefly imported. Some coal of very inferior quality is also found. Except in the capital, almost the only manufactories of the government are distilleries, breweries, and tanneries. Pop. (1856) 1,125,517.

TULA, the capital of the above government, and an important manufacturing town, is situated on the Upa, an affluent of the Oka, 105 miles S. of Moscow. The imperial manufactory of arms, established here by Peter the Great in 1712, is the most extensive and important in the empire. It affords employment to about 8000 men, and turns out annually from 50,000 to 70,000 muskets, besides other articles. Cutlery and hardware, mathematical and physical instruments, jewellery, leather, candles, soap, woollen and linen fabrics, are among the other manufactures of the place. Tula carries on a great trade in these articles, and is the seat of two great annual fairs. The town contains about 28 churches, 2 convents, a gymnasium, theatre, foundling hospital, prison, house of correction, and an institution called the Alexandrium for the education of children of noble families. Tula has several times suffered from fire, especially in 1834, when a large portion of its inhabitants were reduced to beggary. Pop. (1856) 50,641.

TULLAMORE. See KING'S COUNTY.

TULLE, a town of France, capital of the department of Correze, and of an arrondissement of its own name, is situated on both sides of the river Correze, here crossed by several bridges, 45 miles S.E. of Limoges. It stands partly on the narrow plain, but chiefly on the steep acclivities on each side of the river. The principal portion of the town is on the right bank, but it is very irregularly built, and the houses are generally old and ugly. The portion on the opposite bank, however, is more modern, better laid out, and the houses generally are better built. Among the principal public buildings of Tulle are the cathedral, court-house, prison, and theatre. There is a pleasant promenade along the left bank of the river; and in the cemetery, which occupies an isolated hill commanding the town, is a lofty square tower said to have been built by the Romans. Tulle is the seat of a bishop, and has tribunals of primary instance and commerce, a communal college, normal school, and a public library with about 25,000 volumes. There is here an extensive manufactory of firearms, affording employment to about 600 men. Coarse woollen fabrics, paper, leather, and wax candles are also manufactured here. Pop. (1856) 10,263.

TULLUS HOSTILIUS. See ROMAN HISTORY, §§ 3, 4.

TUN, a large vessel or cask, of an oblong form, largest in the middle, and diminishing towards its two ends, girt about with hoops, and used for stowing several kinds of merchandise for convenience of carriage; as brandy, oil, sugar, skins, &c. Tun is also the name of a measure. A tun of wine is four hogsheads; of timber, a square of forty solid feet; and of coals, twenty hundredweight.

TUNBRIDGE, or TONBRIDGE, a market town of England, county of Kent, on the Medway, which here divides into several arms, and is crossed by five bridges (the principal of which was erected in 1775), 30 miles S. E. from London by road, and 41 by the London and South Eastern Railway. It consists chiefly of one long, wide, clean, and generally well built street. The principal buildings are the parish church, a large and elegant building; the free grammar school, founded in 1553 by Sir Andrew Judde, a native of the town, and recently rebuilt, having twenty-nine exhibitions at the universities; town-hall; and market-house. There are also several dissenting places of worship and schools, a mechanics' institute, a literary and scientific institution, a savings bank, and some almshouses. Fancy wooden wares, as toys, dressing-cases, snuff-boxes, &c., are made here, and hence called "Tunbridge ware." The town owes its origin to a castle built here in the eleventh century, of which the entrance-gate, with two round towers and part of the keep, still remain. Pop. (1851) 4539.

TUNBRIDGE, or *Tonbridge Wells*, a market-town and fashionable watering-place of England, chiefly in the county of Kent, but partly, also, in that of Sussex, 5 miles S. from Tunbridge, on the Hastings branch of the London and South-Eastern Railway, and 46 miles from London by railway. The spring to which the town owes its origin is said to have been discovered and brought into notice by Dudley, Lord North, in the reign of James I. It soon acquired celebrity, and was visited, among others, by Henrietta Maria, queen of Charles I., Catherine, queen of Charles II., and Queen Anne. It was a considerable time, however, before any houses were erected near the wells, the visitors generally residing at Tunbridge. At length, however, the present town began to be built, and latterly it has been rapidly increasing. It is very pleasantly situated in the midst of picturesque and beautiful scenery, and is noted for the salubrity of its atmosphere. The water is chalybeate, and nearly equal in strength to that of Spa in Germany. The town consists of four divisions—Mounts Ephraim, Pleasant, and Zion, and the Wells. It is much frequented during summer, and has all the requisites of a fashionable watering-place,—assembly-rooms, bowling-greens, baths, public walks, libraries, &c. The season extends from May to November. It has also several churches and chapels, numerous educational and literary institutions, an elegant town-hall, market-house, infirmary, &c. Tonbridge Wells, like Tunbridge, is famous for its toys and other small wooden articles. Among recent distinguished vist-

Tune ‖ Tunis.

tors at the Wells were her present Majesty and Prince Albert in 1849. Pop. (1851) 10,587.

TUNE, in *Music*, means either a short and popular melody, or correct intonation in singing or playing. See MUSIC, ORGAN, SONG, TEMPERAMENT, TONALITY.

TUNIS, one of the Barbary states in Northern Africa, forming a province of the Ottoman empire, but virtually independent, lying between N. Lat. 31. and 37., E. Long. 8. and 11., bounded on the N. and E. by the Mediterranean, S. by Tripoli and Beled-el-Jerid, and W. by Algeria. Its length is about 440 miles, its greatest breadth 160, and its area estimated at 72,000 square miles. The coast-line is very irregular, and is indented with three great bays, that of Tunis on the N., and those of Hanamamet and Cabes or the Lesser Syrtis. On the E. the principal headlands are on the N. coast, Cape Blanco the most northerly point of Africa, Cape Farina, and Cape Bon, where the coast turns sharply to the S.; Ras el Melha, el Mustafa, Monastir, and Kabudia, on the E. coast. Several islands lie off the coast, the principal being Pantellaria and Lampedusa belonging to Naples, Galita which is included in Algeria, Kerkina and Jerba in the E., near the Gulf of Cabes, both belonging to Tunis. The eastern coast is in general low, sandy, and sterile, interrupted by a few rocky promontories of no great height; but the northern coast is formed, to a large extent, by high and picturesque masses of rock, rising abruptly from the sea. This is especially the case, towards the west of the country; further east broad expanses of sand in many places separate the cliffs from the sea. In the interior, mountains occupy the northern and western portions, and some of their summits rise in rugged masses to a considerable height. These form parallel chains, with broad valleys between them, extending generally from N.E. to S.W. Of these mountain-chains the most northerly is a continuation of a similar chain in Algeria, and covers the N.W. part of Tunis from the coast as far as the valley of the Mejerda, terminating near the point where that river enters the sea. Beyond this valley, and that of the Millianah to the S. of it, rises another mountain range, connected with the southern Algerian chain, and extending N.E. till it terminates at Cape Bon. This range is known at different points by the names of Jebel Usselata, Jebel Sit, and Suk el Arbar; but one of the best known and most conspicuous of its summits is that called Zauan, 4270 feet high, to the S. of Tunis. The height of the range is in some places much greater, and even as much as 7000 feet. Towards the S. it is continued by a high plateau, on which the Jebel Truzza, Jebel Zihk, and Jebel Hamada el Kissera rise. In the S.W. of the country rises another mass of mountains, whose connection with the Jebel Auras in Algeria, and its Tunisian continuation, has not been ascertained; still less with the plateau of Tripoli, from which it is probably separated by a deep valley forming the northern boundary of the latter. South of this mountain mass lies the vast rocky plain of the Beled-el-Jered, or land of date palms, which occupies the extreme S. of Tunis. The mountainous regions in the N. of the country are watered by a number of rivers, which have their sources in the various peaks. Many of these, however, are lost in the sands, or after a short course fall into the sea; and none of them is navigable. The most important is the Mejerda, which rises in Algeria, and flows through Tunis in a direction at first N.N.E., and afterwards directly N., falling into the sea at Porto Farina. Parallel to it flows the Millianah, and the only other river of any importance is the Wed el Kebir, which flows northwards near the western boundary of the country. There are no freshwater lakes, but in the extreme S. lie two of salt-water, the Schott el Kebir, and the Schott el Gharsa, which at some seasons are united, and form one large sheet of water. There are also a few small salt lagoons along the shore. The mountains of Tunis are for the most part composed of chalk and sandstone, and the plains in the S. are covered with a reddish sand. In general the geological features of the country are similar to those of Algeria. Gypsum, marl, and salt exist in some places. Of minerals the chief are lead, which is found at various places, especially at Besha, and at Jebel Resas near Tunis; and quicksilver, which exists near the mouth of the Mejerda, but has never been worked. The climate is temperate and healthy, especially along the coasts, where even in the height of summer the air is cooled by the moist winds which blow regularly from the sea for a great part of the day. The winter here resembles a mild spring, and frost and snow are almost unknown. The mean annual temperature is 69° 2′; that of the winter 55° 9′; and that of the summer 83° 9′. Rain seldom falls in summer, but in winter the streams are frequent and copious. The soil is for the most part good, and produces a rich vegetation. Wheat, oats, maize, durrah, and pulse, are the crops most generally raised. Vines, olives, oranges, figs, pomegranates, and other fruits, are abundant; and cotton is grown in small quantities. The dates of Nefta are of the best quality, and the country about that place forms one vast forest of date palms. Many of these trees also grow in the south, where the cactus, too, flourishes. In the same quarter groves of cypresses, sumach, and other trees, often diversify the bare tracts of ground, which stretch to a vast extent. Agriculture is very much neglected, partly on account of the great natural fertility of the soil, and partly from the oppressions and extortions of the government. Tunis contains large numbers of cattle and of sheep with excellent wool. The horses are especially esteemed, and are used to a large extent for the French cavalry in Algeria. The dromedary is also among the animals of the country, and some of its varieties are remarkable for their speed, which exceeds that of the swiftest horses. Bees are abundant, and yield excellent honey; swans, partridges, and other birds are found, and there is a productive fishery along the coast. Coral is obtained at Tabarca and other points on the shore. The inhabitants of the rural districts of Tunis consist of various tribes of Arabs and Kabyles, who live, like the Bedouins of the east, in a wandering fashion, and are savage and inhospitable to strangers. In the towns the population has a different and very mixed character. Moors are the predominant race, but there are considerable numbers of Turks and Jews, and in the larger towns many European settlers. Although it is reckoned the most civilised of the Barbary states, yet when compared even with the least advanced countries in Europe, Tunis is in a very degraded condition. The government is an unmitigated despotism, hereditary in the family of the bey, who is only nominally subject to the Ottoman empire. The present monarch has, indeed, made some improvements by the abolition of slavery, and by an alliance with France; but very much remains to be done for the security of the country, the encouragement of agriculture and trade, and the removal of the many hindrances to the prosperity of the country, which are caused by arbitrary regulations of the government, and the oppressive conduct of its officials. The revenue is raised by taxes arbitrarily imposed, which have frequently to be collected by force. The standing army consists of 19,000 regular troops, besides a large number of irregular forces called out in time of war. The most important manufactures carried on here are those of the red caps, so much worn in the East, of coloured leather, of pottery, and of silk and woollen fabrics. Excellent woollen cloth is woven in the island of Jerba, and the potteries of Rabel are renowned. The trade of the country is considerable, and is chiefly concentrated in the towns of Tunis and Susa. The exports consist of wool, oil, wax, honey, hides, leather, red caps, dates, soap, coral, and corn;

Tunis.

Tunis.

and the imports of cotton, cloth, alum, iron, lead, manufactured articles from England, wine and brandy from Spain, sugar, coffee, glass, arms, &c. The caravans from the interior bring senna, ostrich feathers, gold dust, gum, and ivory; in exchange for cloth, muslin, silk, leather, arms, &c. The following table shows the number, tonnage, and value of cargoes of vessels that entered and cleared at the port of Goletta, or Tunis, in 1851, 1853, and 1854.

Year.	Entered.			Cleared.		
	No.	Tons.	Cargoes.	No.	Tons.	Cargoes.
			L.			L.
1851	413	40,224	441,997	405	39,682	334,052
1853	415	48,343	396,106	399	47,047	270,628
1854	547	63,398	326,463	546	63,273	360,738

The whole of the people, with the exception of the Jews and European settlers, profess the Mohammedan religion. Christianity, which once counted multitudes of flourishing churches here, is now unknown among the natives; and no religion has ever been more thoroughly extirpated from any part of the world than that of the cross from the country of Tertullian, Cyprian, and Augustine. The country was overrun by the armies of the Saracens in the seventh century A.D., wrested from the eastern empire, and soon after formed into an independent state; which, under various dynasties, lasted until, in 1574, the sultan Selim reduced it to subjection to the Ottoman Porte. It was governed at first by a pasha, but subsequently the people obtained permission to elect a bey. For a long time Tunis was notorious for piracy, but the efforts of the European powers to suppress this were at last successful in 1816. The population of Tunis is estimated to be from 2,500,000 to 3,000,000, of whom about 7000 are Turks, 9000 Christians, and 100,000 Jews.

TUNIS, a seaport of Africa, capital of the above state, at the mouth of the Medjerda, on the west side of an oval lagoon, communicating by a narrow opening with the sea, 400 miles E. by N. of Algiers,—N. Lat. 36. 48., E. Long. 10. 24. It is built on a sloping piece of ground, rising from the edge of the water to the heights on which stands the *kasbah* or citadel; and it is surrounded by two walls, the outermost of which, enclosing three suburbs, is about 5 miles in circuit. A strong fort commands the entrance of the lake, which is called Goletta, and various others protect the approach to the town in different directions. The outer wall is entered by four gates, and the inner, which is much loftier, by six. The commanding position of the town, and its long rows of white buildings, give it a very fine appearance from a distance; but on passing the gates it is found to consist of narrow, crooked, and dirty streets, lined with mean-looking houses of stone or brick. These are in many cases only one storey high, being built in the Moorish fashion, with a courtyard in the centre, and without windows to the outside. Most of the houses have a cistern for collecting the rain-water; and the town is also supplied with water by an aqueduct which conveys it from a neighbouring spring. The finest building is a mosque, which is very richly decorated with columns and other remains brought from ancient buildings in the interior. Of the many other mosques, not a few are handsome structures. The palace of the bey is a fine modern building in the Saracenic style, but badly situated in a narrow street. It has a large number of rooms paved with marble, and opening on marble courts adorned with fountains. Tunis contains a Moorish college, where law and theology are almost the only branches taught; and there are a few minor schools, where the children are instructed in reading, writing, and the koran. But toleration is extended to Jews and Christians, who have several synagogues and churches in the town; the latter belonging to the Roman Catholic and Greek churches. Tunis has also a Roman Catholic convent, an Italian theatre, several large and well-stocked bazaars, and six large barracks in different parts of the town, one of them a fine building of two storeys, capable of accommodating 4000 men. The principal manufactures of the town are linen and woollen cloth, embroidery, and red woollen caps. The trade is extensive, and has been already described under the state of Tunis. The harbour is not very good, on account of the shallowness of the lagoon, which does not allow large vessels to enter. Hence all drawing more than 6 or 7 feet of water must load and unload by means of lighters. But there is good anchorage in an inlet of the Gulf of Tunis, which has 10 or 12 fathoms, and is sheltered in every direction but the north-east. About 2 miles to the west of the town stands the *Bardo*, an extensive and fortified palace of the bey, and the usual residence of the court. It is said to contain more than 4000 inhabitants. About 3 miles to the north-east of Tunis lie the ruins of Carthage, which partly occupy the isthmus between the lagoon and the sea. Tunis itself is a very ancient city; and it is doubtful whether it was founded by the native Africans or, like Carthage, by the Phœnicians. Its history is identical with that of the state of which it is the capital. In point of population, Tunis is at present probably second only to Cairo among African towns, as it is estimated to contain from 100,000 to 180,000 inhabitants, of whom 30,000 are Jews.

Tunnel || Turgot.

TUNNEL. See RAILWAYS.

TURGOT, ANNE ROBERT JACQUES, Baron de l'Aulne, a celebrated philosopher and statesman, was born at Paris on the 10th of May 1727, of a very ancient Norman family. His father was a long time provost of the corporation of merchants, during which he was the object of general admiration on account of his prudent administration. Turgot was the youngest of three brothers, and was destined for the church. He had scarcely attained the age at which reflection commences, when he resolved to sacrifice all temporal advantages to liberty and conscience, and to pursue his ecclesiastical studies without declaring his repugnance to their proposed object. At the age of twenty-three years he took his degree, and in December 1749 was elected prior of the Sorbonne. The time when it was necessary for him to declare that he would not be an ecclesiastic was now arrived. He announced this resolution to his father by letter, showing the motives which induced him to decline the clerical profession. His father consented, and he was appointed master of requests. He prepared himself for this office by particular application to those branches of knowledge which are most connected with its functions and duties, viz., natural philosophy, agriculture, manufactures, commerce, &c. About this period he wrote some articles for the *Encyclopédie*, which attained great celebrity. Of these the principal are, Etymology, Existence, Expansibility, Fair, and Foundation. He had prepared several others, but the persecution against the *Encyclopédie* induced him to decline further contributions.

In 1761 Turgot was appointed intendant of Limoges, where he gave activity to the society of agriculture; opened a mode of public instruction for female professors of midwifery; procured for the people the attendance of able physicians during the raging of epidemic diseases; established houses of industry, supported by charity (the only species of alms-giving which does not encourage idleness); introduced the cultivation of potatoes into his province, &c., &c. While he proceeded with unremitting activity and zeal in promoting the good of the people over whom he was placed, he meditated projects of a more extensive nature, such as an equal distribution of the taxes, the construction of the

Turin. roads, the regulation of the militia, the prevention of a scarcity of provision, and the protection of commerce.

On the death of Louis XV. the public voice called Turgot to the first offices of government, as a man who united the experience resulting from habits of business to all the improvements which study can procure. After being only a short time at the head of the marine department, he was, August 24, 1774, appointed comptroller-general of the finances. During his discharge of this important office, the operations which he carried on are astonishing. He suppressed twenty-three kinds of duties on necessary occupations, useful contracts, or merited compensations. He abolished the corvée, or the labour required from the public for the highways, saving the nation thirty millions of livres annually. He set aside another kind of corvée, which respected the carriage of military stores and baggage. He abated the rigour in the administration of indirect impositions, to the great profit of the contributors, the king and the financiers; besides effecting many other essential improvements in political economy. At length, however, by the artifices of the courtiers, he was deprived of his offices; and in retirement he devoted himself to the studies which he had cultivated in his youth. He died on the 20th of March 1781. An edition of his works, in 9 vols. 8vo, was commenced in 1808 and completed in 1811. He composed, it is said, the celebrated Latin inscription intended for a picture of Dr Franklin,—

"Eripuit cœlo fulmen, mox sceptra tyrannis."

TURIN (It. *Torino*, anc. *Augusta Taurinorum*), the capital of the kingdom of Sardinia, and of a province of the same name, in Piedmont, near the Po, where it receives the Dora Ripaira, 79 miles W.S.W. of Milan. The natural advantages of its situation are very great, as it stands in a broad, fertile, and well-watered valley, enclosed by the offsets of the Cottian Alps on the north-west, and by the hills of Monferrato, which rise immediately above the right bank of the Po, on the south-east; while towards the north-east it opens out into the plain of Lombardy. The beauty of the environs is still further enhanced by the many fine edifices on the adjacent hills, and by the beautiful approach to the town from the west, by an avenue of noble trees, extending from the town of Rivoli, and thus being one of the longest in Europe. There are three bridges over the Po, and two over the Doria; one of the latter being a magnificent structure of a single arch. The form of the city is oblong, and it is about a mile and a quarter long by half a mile broad. Its size is rapidly increasing, and the former fortifications have been destroyed to make way for the construction of new houses and promenades. Turin is thus quite an open town, but it is defended by a regular citadel to the west, which is one of the strongest in Italy. Few European towns are more regularly laid out than this, at least in its modern portions, which form by far the greatest part of the city. The old part of the town, which lies towards the west, consists of narrow crooked streets and ill-built houses. In the new town, on the contrary, the streets are broad and straight, crossing each other at right angles. The houses are for the most part four or five storeys high, and many long ranges have a perfect uniformity of architecture. The monotony thus produced is somewhat relieved by the variety of sculptures and other decorations that adorn the fronts of the buildings, and by the glimpses every now and then obtained of the fine scenery in the environs. Turin possesses thirteen public squares, some of which are very fine. The *Piazza di Castello*, near the centre of the town, is spacious, and surrounded with handsome buildings. It derives its name from having in the centre the old palace of the dukes of Savoy, a castellated building surrounded by a moat. It has four fronts, one of which, in the Corinthian style, is considered the finest in Turin. The modern palace occupies the north side of the same square; it is a large building, with extensive gardens attached to it, and contains a fine collection of paintings. Turin. On the east side of the square stands the great theatre, one of the finest in Italy, erected from designs by Alfieri. From this square there stretches a street half a mile long to the Po, which is here crossed by a handsome bridge of five arches. This street, like several other streets and squares, is lined on each side with arcades, which gives it a very fine appearance. The largest and one of the finest squares in Turin is that of St Charles, which contains a statue by Marochetti of Emmanuel Philibert, duke of Savoy. Turin contains many private palaces, some of considerable size; but for the most part in bad taste, and not equal to those in many other Italian towns. Of public buildings there are few remarkable for antiquity or historical associations; but many of modern origin are very fine. The cathedral of St John Baptist, built in the sixteenth century, is small, and externally remarkable only for the arabesques which decorate its front. Its interior is richly adorned with frescoes, and has some fine paintings. Near the cathedral is the chapel called *Santo Sudario*, a small round building, encased with black marble, and considered a masterpiece of Guarini. Of the other churches, the most remarkable are *San Felippo Neri*, the largest and one of the finest in the town, though still unfinished; *Corpus Domini*, a tasteless building, but very profusely decorated; and *La Gran Madre de Dio*, a modern imitation of the Pantheon at Rome, erected to commemorate the restoration of the royal family in 1814. Turin has in all 110 churches and chapels, mostly Roman Catholic; but as Protestantism is tolerated here, a fine building, in the Lombard style, has been erected, in 1853, for the Waldensian church. There were formerly many monasteries and nunneries in the town; but, recently, these have all been abolished, except such as are actually engaged in works of charity, comparatively few in number. The University of Turin, founded in 1412, occupies a fine building, with a quadrangle surrounded by arcades, in which are placed a number of ancient sculptures and inscriptions. It has a library of 112,000 volumes, and 2000 MSS., a gallery of ancient statues, a very valuable collection of medals, and an Egyptian museum, inferior to few collections of the kind in Europe, besides museums of anatomy and natural history, and a good botanic garden. There are 5 faculties; theology, law, medicine, surgery, and arts; 84 professors, and, in 1858–59, 1376 students. The Royal Academy of Sciences, founded in 1783, consists of 40 members; and possesses valuable collections of zoology, mineralogy, and antiquities. Besides the university, there are various subordinate educational institutions, such as the episcopal seminary, royal military academy, several colleges and elementary schools, institutions for the deaf and dumb, and for the blind. The charitable institutions of the town are numerous, and well managed; and among them are the general hospital, the *Spedale de San Luigi*, the lunatic asylum, and others. There are also various government offices in the town. The senate holds its meetings in the ancient ducal palace, and the chamber of deputies in the Carignan palace, formerly the residence of the royal princes. Other important buildings are the court-houses, register-office, custom-house, and town-hall, the last adorned with a lofty but unfinished tower. Besides the large theatre already mentioned, there are several of smaller size, and various other places of amusement. Turin is the see of an archbishop, the seat of the court, government, and legislature of Sardinia, of a supreme law-court for the kingdom, an inferior tribunal, and chambers of agriculture and commerce. The manufactures of the town consist chiefly of woollen, linen, cotton, and silk cloth, hosiery, leather, paper, glass, china, ironmongery, musical and philosophical instruments, carriages, arms, &c. There are also distilleries and dyeworks in the place. The principal article of trade

Turkestan || Chinese Turkestan.

is silk, from which the wealth of the town is chiefly derived; but there is also some commerce in corn, wine, fruit, and other produce of the surrounding country. The city is connected by railways with Genoa, Alessandria, Novara, Cuneo, Pignerol, and Susa; and to the towns not on these lines diligences and mail-coaches regularly ply. In the vicinity of the capital there are several royal residences, a hunting-palace and park, and a royal riding-school, with a stud and veterinary college. The language of the common people in Turin is the Piedmontese dialect; but Italian is used in all official transactions, and it and French are spoken by the upper classes. Of the origin of Turin little is known; but its foundation is ascribed to a people called the Taurini or Taurisci. After the second Punic war it became a Roman colony; and, subsequently, in honour of Augustus, received the name of Augusta Taurinorum. It was taken and sacked by the Goths, and afterwards by the Lombards; and during the contests between the emperors and the popes it was of some importance, being for a time independent under its bishops. At length, however, the dukes of Savoy made a claim to sovereignty over it; and, in 1418, made it their capital. Since then its history is merged in that of Sardinia. Pop. (1852) 143,157.

TURKESTAN, an extensive country in Central Asia, known also by the name of Bukhara. It is divided by the plateau of Pamir, the Bolor-Tagh, and the Muz-Tagh, into two parts, the western of which is called Independent Turkestan, or Great Bukhara; and the eastern, being included in the Chinese empire, Chinese Turkestan or Little Bukhara. The former having been described under the head of BUKHARA, it is only needful here to give some account of the latter.

CHINESE TURKESTAN lies between N. Lat. 36. and 49.; E. Long. 72. and 96.; bounded on the N. by Siberia, E. by Mongolia, the Chinese province of Kan-su, and the Koko-Nor country, S. by Tibet, and W. by Independent Turkestan. Its dimensions cannot be exactly given; as the country is so very little known, but its area probably exceeds 770,000 square miles. The Chinese government divides this vast region into two provinces, which they designate Thian Shan Nanloo, or the road south of Thian Shan, and Thian Shan Peloo, or that north of these mountains; so called from the two great lines of traffic with the west. The former is Chinese Turkestan proper; the latter is also known by the name of Songaria or Dzoungaria. The whole country is a lofty table-land, traversed by several mountain-chains. At the south-west corner, between N. Lat. 36. and 37., E. Long. 71. and 74., is a knot of mountains from which several chains diverge in various directions. Of these the Bolor-Tagh, extending northwards, forms the western, and the Kuenlun, stretching eastwards, the southern boundary of the country. The latter range is believed to be covered with perpetual snow for a distance of 300 miles, and is traversed by two roads into Tibet, one over the Karakorum pass, 12,000 feet high, and the other further to the east, connecting Khotan with Lhassa. Close to the Bolor-Tagh is the plateau of Pamir, which has so great an elevation as to be entirely destitute of trees. Further north, a continuation of the mountains of Ak-Tagh in Independent Turkestan, stretches to the eastward. It is known by the name of Muz-Tagh as far as 85. E. Long.; and here many of its summits do not rise above the snow-line; but further east, where it gets the name of Thian Shan, it is much loftier, and covers a wider extent of ground. Further north, a series of high lands, hardly deserving to be called a mountain-chain, connects these mountains with the Altai range, which separates the country from Siberia. Towards the east, Turkestan has no mountain-frontiers, but descends to the flat desert of Gobi, part of which is included within its limits. The waters of this region all discharge themselves into inland lakes. In the southern province, that of Lop-nor towards the east of the country, is the principal. It receives from the west the Narim, a stream formed by the confluence of five considerable rivers, the Karakul, Kashgar, Yarkand, Khotan, and Aksu. The whole length of the river, from the source of the Yarkand to the mouth of the Tarim in the Lop-nor, is about 1500 miles; and its height at the latter position is estimated at 1280 feet above the sea. The Tarim receives no affluents from the south, but two of some size descend from the Thian Shan range. The other rivers and lakes of southern Turkestan are of small size. In the northern part of the country the most important lake is that of Issikul, which is nearly 100 miles long by 35 broad. It is surrounded on all sides, at a short distance, by mountains, from which it receives a large supply of water; and it sends out from its west end the Tchoui, which flows into the Russian empire. The largest river in this part of the country is the Ili, which flows westwards for 300 miles, and falls into Lake Balkash. It drains a valley about 400 miles long by 100 broad. In the extreme north of Turkestan the Irtish takes it rise, and, after traversing the lake of Zaisan, flows northwards into Siberia. The greater part of Chinese Turkestan is entirely unfit for cultivation, being occupied with vast sandy deserts. It is only on the slopes and near the foot of the various mountain-ridges that the soil is at all good; but in these situations there are some tracts of considerable fertility. The climate, like that of most elevated plateaus, is remarkable for its dryness: the heat in summer is intense; but in winter, especially towards the west, frost and snow are frequent. Rice, wheat, millet, pulse, cotton, hemp, and flax, are the principal crops raised. Grapes, melons, and other fruits of warm climates, come to perfection here; and silkworms are reared in great numbers. But the principal occupation of the people is the tending of live stock,—horses, camels, yak, and other cattle, sheep, &c., as a large portion of the country, when sufficiently watered by irrigation, affords excellent pasturage. The horse, the camel, the ass, and the sheep, are found wild in the deserts of the country, along with tigers, wolves, jackals, &c. Of minerals, Turkestan possesses gold, found in the Thian Shan mountains and on some affluents of the river Khotan, as well as copper, iron, coal, nitre, asbestos, sulphur, and sal-ammoniac; but the most remarkable are the jasper and the agate, both of which form valuable articles of commerce to China, the latter being a government monopoly, and its working superintended by Chinese soldiers. An extensive trade is carried on in this country with Russia, China, Tibet, Cashmere, and Independent Turkestan. Caravans travel from Pekin to Yarkand, occupying from three to six months on the journey; and bringing tea, porcelain, silver, and manufactured goods, and receiving in exchange horses, cattle, silk, &c. With Cashmere there is a trade in shawls and other articles, in exchange for Russian goods, such as cloth, furs, gold, silver, bullion, iron, steel, copper, &c. Many of the Chinese goods are conveyed to Independent Turkestan, in return for woollen cloth and other manufactured goods. The chief emporium for trade is Yarkand, which may be considered the capital; and the towns next in importance are Kashgar, Khotan, Ili, and Khamil. The great majority of the people are Turks or Uzbeks, superior in civilisation to those of Independent Turkestan, and speaking a very pure Turkish dialect. They are almost all of the Mohammedan religion. The other races comprise Chinese merchants in the towns, Manchoos in the Chinese army, Mongolians towards the east, and a few Hindoos and Jews. The supreme government is in the hands of the Chinese, who have an army of 20,000 and 30,000 men in the country; but in internal affairs the Turks enjoy a large amount of freedom. The population of Chinese Turkestan cannot be accurately ascertained, but it probably does not much exceed one million.

Turkestan, Chinese.

TURKEY.

History. TURK, or Toork, is the generic name of a great family of nations which has been settled from time immemorial in Western Asia and the adjoining portions of Europe, and of which a branch has been for several centuries in possession of the countries around the eastern shores of the Mediterranean Sea, which on that account have received from Europeans the name of TURKEY. The Turks have generally been considered to be members of the Caucasian variety of mankind; but learned orientalists have now succeeded, by the aid of the Chinese annals, in identifying them with the Hiong-nu, a people who lived to the north-west of China many centuries before the Christian era, and carried on frequent and sanguinary wars with the celestial empire. From that region their migrations can be traced westward, till they finally settled in those parts of Asia and Europe in which they are now found. The Osmanlee, or Ottoman Turks, who live in Turkey, and their brethren the Tartars of Casan, Astrakhan, and Crimea, have indeed some of the physical characteristics of Caucasians; but the Nogais, Kirghiz, Turcomans, and others farther east, who speak pure Turkish dialects, have a different organization, approaching nearly to the Mongolian character. It has therefore been inferred that the Turks originally belonged to the Mongolian tribes; and that the portion of them now possessing Caucasian features must have acquired them by intermixture with the Caucasian races, whom they invaded and subdued. Turkish scholars, however, affirm that researches into ancient history prove that there was a predominant nation of the name of "Tark" established about Balkh, which penetrated into India at some very remote period before the Christian era, and of which nation the Mongols were only a portion, who have preserved their distinctive features and primitive language, as seen in the Nogāis; and a branch of the great Tark or Turkish people passing on westwards, and intermingling with the Caucasian races, became assimilated with them in the progress of ages, and acquired their present type.

The existing Turkish empire dates only from the end of the thirteenth century, when it was founded by Osman or Othman, a Turk of a noble family, who had been driven westward from Khorasan by the invasion of Zengis Khan. Osman first invaded the Greek territory of Nicomedia on the 27th of July 1299; but the true era of the empire may be dated from the conquest of the city of Prusa, the capital of Bithynia, which surrendered to his son Orchan in 1326. This Orchan was an enterprising, ambitious, and at first mild, but afterwards stern or cruel prince, who greatly extended the limits of the empire, took possession of Gallipoli, and penetrated into Thrace. Murad I., whom we call Amurath I., his son, subdued without resistance the whole of Thrace from the Hellespont to Mount Hæmus, and made Adrianople the seat of a vice-royalty. He established in 1362 the famous military bands called *yengi cheri*, new soldiers (corrupted into janissaries), once the shield and bulwark of the empire, but in later times the cause of numberless revolts and revolutions. These troops were composed originally of young Christian captives that had been taken in war and educated in the Mohammedan religion, and their numbers were afterwards increased by forced levies of youths from amongst the subjugated Christians. They were trained to warlike exercises, and inured to obedience by severe discipline; and as every sentiment which enthusiasm can inspire, and every mark of honour which the favour of the prince could confer, were employed to animate them with martial ardour, and excite in them a sense of their own importance, these janissaries soon became the chief strength and pride of the Ottoman armies.

On the assassination of Amurath in 1389, by a wounded soldier of the vanquished enemy on the field of Cassova, he was succeeded by his son Bajazet, more correctly Byazid, surnamed Ilderim, or the Thunderbolt, whose reign forms one of the most splendid epochs in the Turkish annals. He subdued and stripped of their hereditary possessions the Seljukian emirs of Asia Minor, whose revolts and disturbances had embarrassed the progress of his predecessors, and protracted the downfall of the Greek empire. His conquests in Europe were equally rapid and important, and whatever adhered to the Greek empire in Thrace, Macedonia, and Thessaly, acknowledged his sway. He turned his arms against Sigismond king of Hungary, and in 1396 defeated, in the battle of Nicopolis, a confederate army of 100,000 Christians, the greater part of whom were slain or driven into the Danube. The conqueror, irritated by the previous slaughter of many thousand Turkish prisoners by the Christian army, commanded his prisoners to be massacred in cold blood, with the exception of a few of the chief nobles, who were set at liberty on the payment of a ransom of 200,000 ducats. But Bajazet had now reached the height of his greatness. His conquests in Armenia and on the banks of the Euphrates had brought him into collision with the famous Mogul conqueror Tamerlane; and in 1402 the plains around the city of Angora were the scene of the memorable battle which ended in the captivity of Bajazet, and the temporary humiliation of the Turks. The death of Tamerlane, and the contentions which arose among his sons, relieved the Turkish provinces from the Mogul yoke. Solyman the son of Bajazet obtained the European dominions of his father; Mousa reigned over the remnant of his dominions in Asia; while Mohammed, the youngest of the sons, held Cappadocia. Eleven years elapsed in the mutual endeavours of the sons of Bajazet to supplant each other, before Mohammed effected his final triumph, and assumed the title of sultan. At his death in 1421 he bequeathed an undivided empire to his successor, Amurath II. The reign of this sultan contributed greatly to increase the splendour of the Turkish empire. He made himself master of Adrianople, by which Romania and Anatolia were again united under one sceptre; and reduced to subjection Servia, Macedonia, Thessaly, Albania, and the whole of Greece to the north of the isthmus. He also besieged Constantinople, but was diverted from his enterprise by the dexterity of the Greek emperor, who stirred up against him a competitor for the throne, assuming the name and character of Mustafa, the eldest son of Bajazet. But the impostor was at length defeated and put to death. The conquests of Amurath received a considerable check from the skill and valour of Hunniades, the celebrated waiwode of Transylvania, and of the Albanian chief George Castriot, called also Iskenderbeg or Scanderbeg; but the fatal battle of Varna, in which Ladislaus king of Hungary and 10,000 Christians were slain, destroyed the hopes that were entertained of checking the progress of the Turkish arms. Amurath twice abdicated the throne, and twice was compelled by the exigencies of the empire to resume the sovereignty. He was succeeded in 1451 by Mohammed II., the conqueror of Constantinople. (For a full account of this memorable siege we must refer to the article CONSTANTINOPOLITAN HISTORY.) On the 6th of April 1453, the Ottoman standard was planted before the gate of St Romanus; and after a siege of fifty-three days, "that Constantinople which had defied the power of Chosroes, the Chagan, and the khalifs, was irretrievably subdued by the arms of Mohammed the Second. Her empire only had been subverted by the Latins; her religion was trampled in the dust by the

History. Moslem conquerors." Constantinople was taken by the Turks on the 29th of May 1453, two thousand and five years after the foundation of Rome, and eleven hundred and twenty-three after Constantine had removed the seat of the empire from Rome to Byzantium.

Three years after the taking of Constantinople, Mohammed laid siege to Belgrade, from which, after an obstinate resistance, he was at length repulsed with the loss of his large ordnance and 40,000 of his best troops. Abandoning his attempt upon Hungary, the sultan undertook an expedition into Greece, and about the year 1460 succeeded in subduing the whole of the Morea. In 1466 the famous Scanderberg, who for twenty-three years had resisted all the power of the Ottoman empire, was finally compelled to take refuge in Lyssa, in the Venetian states, where he died. Mohammed had now extended his sway over the whole of Asia on this side of Mount Taurus, and over all the provinces in Europe which had formerly belonged to the eastern division of the Roman empire. Not satisfied with these conquests, he had despatched his most able general, Achmet Pasha, to invade Italy; and the capture of the strong city of Otranto had laid open that country to him, and spread universal consternation, when the danger was averted by the death of the sultan in the fifty-first year of his age, A.D. 1481. Mohammed was succeeded by his son Bajazet II., whose claims to the vacant throne were, however, disputed by his brother Djem or Zisimes.[1] But the claims of Bajazet were supported by the janissaries; and his competitor, after various unsuccessful struggles, was compelled to seek shelter in Italy, where he was assassinated at the instigation of Bajazet. The infamy of the deed is ascribed to Pope Alexander VI., who is said to have received 200,000 ducats for his reward. Bajazet, after a reign of thirty years, intimated his intention to resign the crown to his son Achmet; but his youngest son Selim, having secured the assistance of the janissaries, compelled his father to abdicate, who, being exhausted by sickness, died before he reached Dometica, his intended place of retirement. Selim was a successful prince, and during his short reign of eight years conquered Egypt, Aleppo, Antioch, Tripoli, Damascus, and Gaza, and defeated the Persians. On the death of Selim, Solyman the Magnificent, surnamed by the Turks Canuni the Lawgiver, ascended the Ottoman throne. Having quelled some insurrections in Asia, he commenced hostilities against the European princes, and entering Hungary, made himself master of Belgrade, then reckoned the chief barrier of that kingdom against the Turkish power. He next turned his victorious arms against the island of Rhodes, then the seat of the knights of St John of Jerusalem. After incredible efforts of valour and military skill, the knights obtained an honourable capitulation, and retired to the small island of Malta. Solyman next advanced into Hungary, and at the battle of Mohacz (A.D. 1526) defeated and slew the Hungarian monarch, with 20,000 of his men, and took possession of the capital and the chief fortresses. Three years later he formed the siege of Vienna, but was compelled to retreat with the loss of 80,000 of his soldiers. In 1541 he again invaded Hungary, and taking advantage of a civil contest between two rival claimants of the vacant throne, he annexed the disputed kingdom to the Ottoman empire. He entered into a destructive war against Persia, and eventually succeeded in obtaining a considerable increase of territory between the Araxes and the Tigris. During the reign of this prince, the political and military administration of the Ottoman empire reached its highest state of perfection; and the arts and sciences, literature and commerce, flourished under his enlightened and munificent policy. His dominions extended from Algiers to the river Euphrates, and from the farther end of the Black Sea to the extremity of Greece and Epirus. The latter years of his reign were embittered by domestic dissensions and cruelties. During the siege of Sigeth, a city of Hungary, before which the Turks lost 30,000 men, Solyman expired, in the seventy-fourth year of his age and forty-sixth of his reign. History.

His son and successor, Selim II., besieged and took Cyprus; but in the famous sea-fight at Lepanto, in 1571, the Turkish fleet was utterly destroyed by Don John of Austria. Selim afterwards invested and took Tunis by storm, putting the garrison to the sword. On his death, Amurath III. ascended the Ottoman throne, and extended his dominions on both sides by the addition of Tigris in Persia, and of Raab, one of the strongest fortresses in Lower Hungary. His son, Mohammed III., has no claim to notice, except on account of his barbarity. He began his reign by strangling nineteen of his brothers, and ordering twelve of his father's wives whom he suspected to be pregnant to be drowned. The war with Hungary was carried on throughout the whole of his reign, which lasted about nine years. During the inglorious sway of his son, Ahmet I., the affairs of Turkey underwent a material change for the worse. Peace was concluded with Hungary; but the sultan was involved in a disastrous war with Persia, in which the Turkish troops were entirely defeated. On his death, his brother Mustapha ascended the throne; but his actions having clearly proved his incapacity and imbecility, the janissaries and the divan compelled him to resign the government after a reign of five months, and threw him into prison. His nephew, Osman, the son of Ahmet, a boy of twelve years of age, was then proclaimed emperor. This prince having formed the design of curbing the power of the janissaries, these turbulent soldiers rose in insurrection, deposed and murdered the sultan,[2] and recalled his uncle Mustapha from his prison to the imperial throne. These atrocious proceedings, however, excited general indignation throughout the Asiatic provinces; and Abasa, the powerful pasha of Erzeroum, took up arms to avenge the murder of Osman. After the lapse of a few months, the janissaries themselves abandoned the cause of Mustapha, who was again deposed, and was soon afterwards strangled. Under Amurath or Murad IV., surnamed Gasi the Intrepid, affairs assumed a new appearance, and the glory of the Ottoman empire was in some measure restored. He put to death great numbers of the janissaries, and by his energetic and ferocious measures reduced these mutinous and formidable troops to a state of subordination. He took Bagdad from the Persians, and massacred the greater part of the inhabitants, after an obstinate resistance, which cost him the flower of his army. A debauch of wine put an end to his life, in the thirty-first year of his age and the seventeenth of his reign. His brother Ibrahim, who succeeded him, was a weak and imbecile prince, deformed in body and destitute of courage. The administration of the government was wholly in the hands of the vizier Mustapha and the sultana Valideh, the widow of Ahmet I.; while Ibrahim gave himself up entirely to the prosecution of his pleasures, till at length his vices rendered him so odious that he was deposed and strangled. During his reign, a bloody war broke out between the Turks and the Venetians, which, after being carried on with great fury for the space of twenty-four years, ended in the extinction of the Venetian power in the Egean Sea. The alleged ground of quarrel was the reception into a Venetian port of six Maltese galleys which had captured an Ottoman ship of war. The divan used various pretences to allay the sus- History.

[1] Some affirm that Djem claimed the crown because he was the eldest son, others because he was the first-born after his father became sultan.

[2] He was killed by a soldier of the 65th orta or company of janissaries, which was in consequence suppressed, and never renewed.

History. picions of the Venetians, and throw them off their guard, till, in May 1643, the Turkish fleet set sail for the important island of Candia, and disembarked an army of 70,000 men on the island. As the Venetians had provided no means for its defence, the whole island, with the exception of the capital, was, after a sanguinary resistance, reduced in less than two years. Mohammed IV., the son of Ibrahim, was scarcely seven years of age at the deposition of his father. His minority was one continued scene of intestine discord and revolt. During this reign, war again broke out between the Austrians and Turks, and after having been carried on for some time with varied success, was concluded by a treaty for twenty years. On the termination of this war, the power of the Ottoman empire was directed against the city of Candia. The siege was actively carried on during the space of twenty-nine months, when the garrison was at length forced to capitulate; and thus ended one of the most memorable sieges of modern history, in which the Venetians lost above 30,000 men, and the Turks more than 120,000. About this period, the Zaporagian Cossacks threw off the Polish yoke, and placed themselves under the protection of Turkey. A war in consequence broke out between the Turks and the Poles; but the result was advantageous to the Porte, who obtained the sovereignty of the important districts of the Ukraine and Podolia. Shortly after, however, the Hetman of the Cossacks having been treated with contempt by the sultan, these proud and fickle barbarians abjured the Turkish service, and transferred their allegiance to the Russian czar.

In 1683 the distracted state of Hungary induced the divan to break the treaty with Austria; and the Turkish army, under the grand vizir Cara Mustapha, penetrated to Vienna, and formed the siege of that city on the 14th of July. The siege was protracted till the 12th of September, when the allied army, under the famous John Sobieski, attacked the besiegers, routed them with prodigious slaughter, and obtained possession of their camp, together with their artillery, baggage, and magazines. A succession of battles followed, in all of which the Turks were overthrown. The number of their enemies speedily augmented, and in the short space of four years all the vast conquests of the Turkish sultans, westward of the Danube, were wrested from them, with the solitary exception of the fortified city of Agram. These extraordinary reverses caused the army to revolt against their commanders, and excited a general insurrection, which cost the sultan his throne. His brother, Solyman II., who succeeded him in 1687, was distinguished for his austerity, sobriety, and devotion. He was happy in his domestic government, but unsuccessful in his wars. He was succeeded in 1690 by Ahmet II., the youngest son of Sultan Ibrahim. He, too, was a weak and credulous prince; and though the affairs of the empire were conducted with great prudence and vigour by the grand vizir Kiupruli, the Ottoman empire declined, and the Turks during this reign were driven out of Hungary and Transylvania. The accession of his nephew Mustapha II. to the Ottoman throne gave a new turn to the affairs of the Porte. Possessed of greater vigour and ability than his predecessor, he resolved to command his troops in person. He accordingly took the field, passed the Danube at the head of 50,000 men, carried Lippa by assault, and, falling suddenly on a body of Imperialists under Veterani, one of the bravest and best officers of the emperor, he defeated them, and closed the campaign with success. But two years afterwards he was defeated by Prince Eugene, in the bloody battle of Zenta, a small village on the western bank of the Theiss, in the kingdom of Hungary. About 20,000 Turks were left dead on the field, and 10,000 were drowned in their attempt to escape; and the magnificent pavilion of the sultan, and all his stores, fell into the hands of Prince Eugene. These terrible disasters compelled Mustapha to solicit a peace, and a treaty was shortly after signed at Carlowitz, which guaranteed Hungary, Transylvania, and Sclavonia to the Austrians; Azoph to the Russians; Podolia, the Ukrane, and Kaminiecz to the Poles; and the Morea, with a strong frontier in Dalmatia, to the Venetians. Shortly after these misfortunes, an insurrection was excited among the soldiers by a sense of the national disgrace, and Mustapha was dethroned. History.

His brother and successor, Ahmet III., gave an asylum to Charles XII. king of Sweden, at Bender, a Turkish town in Moldavia, after his defeat at the battle of Pultowa. (See RUSSIA and SWEDEN.) A war broke out between the Russians and the Turks, in which the Czar Peter, having imprudently suffered himself to be cooped up in an angle formed by the River Pruth, was reduced to the greatest extremities, and compelled to make peace on terms dictated by the Turkish general. Being unsuccessful in his war against Tahmas Koulikhan and the Persians, Ahmet was deposed, and was succeeded by Mahmoud I.

From the deposition of Ahmet III. in 1730, to the accession of Mustapha III. in 1757, nothing of importance occurs in the history of the Turkish empire. During the reign of this latter sultan, was begun and carried on that destructive war with Russia which broke out in 1769, and lasted till 1774, when the successes of the Russians compelled the sultan, Abdul Hamid, to terminate the unequal contest by the dishonourable treaty of Kainargi. By this treaty Russia obtained possession of the tract between the Bog and the Dniester, known by the name of New Servia, the forts of Yenikaleh and Kertch in the Crimea, and the fortress of Kilburn, at the embouchure of the Dnieper, opposite to the town of Ockzakow. The Krim Tartars were declared independent, and Russian merchant-vessels were admitted to the free navigation of the Bosphorus. About this time a formidable rebellion broke out in Egypt, which was suppressed chiefly by the wise conduct and intrepid behaviour of Hassan, the capitan pasha, who, at the age of seventy, fought with all the ardour of youth and all the skill of the most consummate general. That veteran, however, was recalled before he was able to carry all his patriotic designs into execution, that he might aid the divan with his counsel in the critical situation into which the empire was brought by the arrogant claims of the court of Russia. The result of the deliberations was a precipitate declaration of war against that power, contrary to the better judgment of the old pasha. The war commenced in the autumn of 1787, and the hordes of Tartars which were first brought into the field were everywhere defeated by the superior discipline of the Russian troops, commanded by Prince Potemkin. Some enterprises which were undertaken by the Turks against the island of Taman and the Crimea, were attended with as little success as the attempts of the Tartars, while the Emperor Joseph declared to the Porte that he would assist his ally the Empress of Russia with an army of 80,000 men. Four Austrian armies were accordingly assembled, one at Carlstadt in Croatia, under the command of General de Vins; another at Peterwaradin in Hungary, commanded by General Langlois; a third on the borders of Lithuania, under General Febris; and the fourth in the Buckowine, under the orders of the Prince of Saxe-Coburg. Other two generals, ten lieutenant-generals, and thirty major-generals, were all ordered to prepare for active service in the frontier armies.

The war between the Turks and the Austrians was carried on with varied success. At first the advantage was evidently on the side of the former, and the Austrians were repulsed with disgrace in their attempt to obtain possession of Belgrade. The Prince of Saxe-Coburg displayed indeed prodigies of valour; but, being opposed to a superior force, he was long obliged to act only on the defensive. He was at length joined by a body of Russians under General Sol-

History. tikof, and preparations were made for commencing in form the siege of Choczim, which was surrendered to the allied armies on Michaelmas day 1780, after a defence which would have done honour to the ablest general in Europe. Still, however, success seemed to lean to the side of the Turks. The grand vizir made a sudden incursion into the Bannat, and spread consternation and dismay to the very gates of Vienna. The Austrian affairs seemed approaching to a very alarming crisis. Not only the splendid views of conquest, which were beheld in the imagined partition of a tottering empire, had totally disappeared, but had left in their place the sad and gloomy reverse of a discontented and impoverished people, an exhausted treasury, and an army thinned by pestilence and desertion. In this situation of affairs, Marshal Laudon was with some difficulty drawn from his retirement to take the command of the army in Croatia; and under his auspices fortune began to smile on the Austrian arms. He quickly reduced Dubicza and Nevi, though they were both defended with the most obstinate bravery. He then sat down before the Turkish Gradisca; but the autumn rains ensuing with such violence that the Save overflowed its banks, he was compelled to raise the siege. During this period the war in the Bannat raged with the utmost violence. Much desperate valour was displayed on the one side, and many brave actions were performed on the other; while a great part of that fine but unfortunate country suffered all the desolation and ruin that fire and sword, under the dominion of vengeance and animosity, could inflict.

In the midst of these military operations, Selim III., the only son of the Sultan Mustapha, mounted the imperial throne. The new emperor did not want either courage or prudence, and he continued the war with Russia and Austria with great spirit and resolution. Marshal Laudon renewed his attempts upon Gradisca as soon as the season would permit, and, after a brave defence, it fell into his hands. This, with some other successes, roused the emperor from his state of inactivity, and made him seriously determine on the attack which he had long meditated on Belgrade. The enterprise was entrusted to Laudon, who, with his usual good fortune, made himself master of the place in less than a month. The rest of the campaign was little else than a series of the most important successes. While one detachment of Laudon's forces took possession of Czernitz in Wallachia, another made itself master of Cladova in Servia. Bucharest, the capital of the former of these provinces, fell without opposition into the hands of Prince Coburg, while Akerman, on the Black Sea, was reduced by the Russians, and Bender surrendered to Prince Potemkin, not without suspicion of sinister practices.

Soon after this the Emperor Joseph died, and his successor, Leopold, showed a desire for peace. After the reduction of Orsova, therefore, which happened on the 16th of April 1790, the war was carried on with languor on the part of Austria; and in the month of June a conference was agreed on at Reichenbach, at which the ministers of Prussia, Austria, Britain, and the united provinces assisted, and at which also an envoy from Poland was occasionally present. After a negotiation, which continued till the 17th of August, it was agreed that a peace should be concluded between the Austrians and the Ottomans; and that the basis of this treaty should be a general surrender of all the conquests made by the former, retaining only Choczim as a security till the Porte should accede to the terms of the agreement, when it also was to be restored.

In the meantime the Empress of Russia persevered in hostilities, and carried on the war with great vigour and success. In the campaign of 1790, the Russian general Suwaroff carried the strong fortress of Ismail by an assault, which for violence and bloodshed has no parallel in modern times. The Ottoman empire seemed on the verge of destruction, when the empress at length, induced by the darkening aspect of European affairs, concluded with the Porte a definite treaty of peace at Yassy on the 9th of January 1792. The stipulations of the treaty of Kainargi were renewed. The River Dniester was recognised as the boundary of the two empires. Oczakow was ceded to Russia, with the territory between the Bog and the Dniester; and the cession of the Crimea, of the Isle of Taman, and part of the Kuban, was again formally confirmed. History.

It was evidently the desire and endeavour of the Ottoman government to keep aloof from the terrible wars and changes which accompanied the French Revolution; but the invasion of Egypt by the French compelled the sultan to abandon the system of neutrality which he was anxious to maintain. (A full account of this event will be found under the article EGYPT.) On the recommencement of hostilities with France, attempts were made to induce the Porte to take part in the war against that country. "Russia and England united their strength against France in the divan, and the sultan was the sad spectator of a contest of which he was himself the unwilling umpire, the ostensible object, and the proposed prey. The victory of either party alike menaced him with ruin; he had to choose between the armies of France and the fleets of England. Never was sovereign so situated between two negotiators, one armed with the power of the land, the other with that of the sea; both to all appearance able to destroy, but neither capable of protecting him against his antagonist. The precipitate flight of the British ambassador had scarcely relieved him from the embarrassment of making a selection between the menacing parties, when his capital was alarmed for the first time by the presence of a hostile force, and the last of calamities seemed reserved for the reign of Selim.[1] The good fortune which interposed to save the seat of empire was not extended to the sovereign, and the evils which were inevitable from the triumph of either party gathered fast around him from the day that saw the city of the faithful delivered from the insults of a Christian flag."[2]

The year 1807 witnessed one of those sanguinary insurrections which have so often convulsed the Ottoman empire. The cause of this revolt, which cost Selim his throne, was an attempt to introduce the improved system of European tactics into the military and naval establishments. The sultan had evinced, at an early period of his reign, a determination to attempt some changes in the organization of the military force, and for this purpose new regulations were issued in 1796. The chief arrangement was the levy of 12,000 men, who were to be disciplined according to the principles of European tactics, and armed in every respect like British or French soldiers. The new troop were to wear a uniform, and were to be taught the manual exercise; and, in order to detach them as much as possible from the janissaries, it was resolved they should belong nominally to the corps of bostangis. For these bostangi fusiliers, as they were called, were erected handsome barracks three miles to the north-east of Pera, capable of containing 15,000 soldiers. For the same purpose, barracks were also constructed at Scutari, with exercising ground and all other conveniences. The inspector of the new

[1] About three weeks after the departure of the British ambassador from Constantinople, Admiral Duckworth, with eight sail of the line, two frigates, and two bomb-vessels, passed through the Straits of the Dardanelles, and advanced within two leagues of Cape St Stefano. But a sudden calm having rendered the English fleet stationary, the fortifications of the capital were so strengthened that it was soon rendered perfectly free from danger, and the British admiral was under the necessity of hastening from the Propontis before his return was rendered impracticable.

[2] Hobhouse's *Letters on Albania.*

History. troops was one of the principal men of the empire. A reform was introduced into all the military departments. The topgis, or cannoniers, were improved in every respect. Their old barracks were demolished, and new ones were built on a regular and better plan. The *arabdgis*, or troops of the waggon train, were also reformed. The gunpowder manufactories, which had been in a most inefficient state, were placed on an entirely new footing. The bombardiers, anciently furnished from the ziameths and timars, or military fiefs, underwent a total change by the new regulations. The miners, a corps much neglected, were increased, and attached by the new constitution to the bombardiers. The marine was put under the superintendence of a ministry formed on the plan of European admiralties; and the command of vessels, which had usually been set up to sale, was given only to those who were qualified for the office. Dry docks, caulking basins, a harbour for fifty new gun-boats, and all the necessary appurtenances of a great arsenal, were built at the edge of the water at Ters-Hanch, and designs for similar contrivances were to be applied to the other principal harbours of the empire. In addition to these institutions for the formation of the new troops, and the improvement of the Ottoman navies, a general regulation provided that the janissaries should be regularly exercised in the use of the musket, with their *sakas* and other assistants. Magazines for victualling the armies were constructed on the Danube, and at other points near the seat of war. In order to provide for the increased disbursements of the public exchequer, a new revenue was created; and for this end a treasury was formed, under the control of a great state officer, chosen from among the chief men of the empire. Such is a brief outline of the new regulations issued by Selim; and skilful and enlightened though they were, they excited great dissatisfaction in most classes of the community. The janissaries, in particular, foresaw in the formation of the new troops the extinction of their own influence, and therefore determined upon revolt. Their discontent was privately fomented by Mousa Pasha, the kaimacam, a cruel and ambitious character, who entertained the most deadly hatred against the superior officers of the divan, and had long resolved to excite a revolution for the purpose of destroying them. The first symptoms of insurrection manifested itself among the troops belonging to the garrisons of the Dardanelles. A certain number of adventurers, under the name of yamaks, or assistants to the batteries, had shortly before been added to the nizam-jedid, for the service of the batteries of the Bosphorus. They carried the same arms as the nizam-jedid, and were trained to the same discipline. It was at length resolved to incorporate them with the other troops; and accordingly, on the 25th of May 1807, an order was issued for clothing them in the new uniform. The yamaks immediately rose in open mutiny, and put to death the reis-effendi, who had brought the commands of the sultan. Hali Aga, the commandant of the batteries on the Asiatic shore, was murdered on the same day, and his corpse was also thrown into the Bosphorus. On the next morning, the yamaks, to the number of three thousand, having assembled in the plains of Buyukdére, elected a chief, and marched directly to the capital. At this juncture, the kaimacam intimated to the several ortas of janissaries that the time was come for overturning the new institutions; and, accordingly, on the 27th they rose, and, as the signal of insurrection, carried their camp-kettles to the well-known place called Etmeidan, an open square near the aqueduct of Valens, which has been from time immemorial the camp of the insurgents. "The sultan," says Sir John Hobhouse, "was now awakened to a sense of his danger; he assembled his ministers at the seraglio, and the 28th of the month was passed in negotiation with the insurgents in the Etmeidan. During the day, the fate of Selim was on the balance; he transmitted to the Etmeidan an offer to abolish the new institutions, to which the janissaries returned no other answer than a demand for the immediate execution of all the ministers who had advised and presided over the nizam-jedid. Then it was that the kaimacam insidiously assured him that the sacrifice was necessary, and would appease the rebels. All was not yet lost. If, at that moment, the gates of the seraglio had been shut, a cannon had been fired, and the head of Mousa Pasha himself had been struck off and thrown over the walls, Selim would have triumphed and retained the throne of his ancestors. But the instant peril and the presence of his enemies bewildered the faculties and so absorbed the resolution of the sultan, that he seems to have despaired of resistance, and to have placed all hopes of safety in submission alone. It was not suggested to his mind, that with the new troops of Scutari and Tchiftlik, and other soldiers in the vicinity of the capital, he might speedily assemble 30,000 men, not less devoted to himself than inimical to the janissaries; and that until their arrival he could maintain the seraglio against the rebels, by arraying the forces of his numerous body-guard. Yet the testimony of all the reports prevalent at this day in Constantinople concurs in the persuasion that such an opposition, with the instant death of the kaimacam, would have dismayed the insurgents and crushed the rebellion. But the traitor prevailed, and with a cruel ingenuity contrived to include in the prescription the names of two old and innocent men, the kehayah-bey and the reis-effendi, who were called to a conference with Mousa, and, on leaving the room, unsuspicious of their danger, were carried away to the second gate and strangled. The number of heads presented to the janissaries early on the morning of the 29th was seven; but the ruffians, rising in their insolence, were not satisfied with the bloody offering, and, on recognising the aged victims of the resentment of Mousa, declared that they had required another sacrifice. "The heads were not those of the enemies whose punishment they had demanded." The sultan hearing this last intelligence, sent for the mufti, and on learning that he withheld his advice, found that he had ceased to reign. History.

"The janissaries, headed by the traitor Mousa, had already found their way into the seraglio, when the sultan retired to the mosque of the palace, and wrapping himself in the robe of Mahomet, took his seat in the corner of the sanctuary. Here he was found by the mufti, who entreated him to submit to the wishes of the people, and to resign the crown. Another report says that, previously to this moment, he had told his attendants that he would reign no more, and ordered them to bring his successor before him. The circumstances of this actual deposition were not exactly known; but on the evening of the same day (the 29th) it was understood in all the quarters of the capital that the most injured, if not the best, of the Ottomans had stepped from a throne to a prison, and that the reigning monarch was his cousin, Mustapha the Fourth, eldest son of Sultan Abdulhamid." This prince was thirty years old when he was placed on the throne. Of a feeble character and limited attainments, he became a mere instrument in the hands of others, and was the servant rather than the master of the armed multitude to whom he was indebted for his elevation. The supreme power was in the hands of the janissaries, the new institutions were abolished, the new troops dispersed, and their principal officers executed. Their triumph, however, was but of short duration, and the punishment which they so justly deserved was speedily inflicted. Mustapha Bairactar, the pasha of Ruschuk, owed his elevation to the personal regard of the dethroned sultan, and determined to avenge his fall. So early as October 1807, he formally intimated to the sultan that he should advance to the capital to reform the abuses of the state, and to assist him in the administration of public

History. affairs. Accordingly, having collected an army of forty thousand men, he marched to Constantinople, and encamped on the plains of Daout Pasha, four miles from the city. There his camp soon became the centre of the business and affairs of the Porte, whose chief officers directed their visits of ceremony to the tent of the triumphant general. But the pasha, conscious that his authority in such a state of affairs was unstable, resolved upon the restoration of the Sultan Selim. The 28th of July 1808 was fixed upon for the enterprise; and as Mustapha had appointed that day for a hunting expedition, Bairactar determined to enter the palace during his absence, and, by preventing his return, exclude him from the throne. Unfortunately the secret transpired; and when, at the appointed time. Bairactar marched to the seraglio, he found the gates closed, and the body-guard under arms. Orders were given for an immediate assault; and after a brief contest, the insurgents forced their way into the seraglio. But the interval proved fatal to Selim. At the commencement of the contest, the emissaries of Mustapha were despatched to his apartments, and after a powerful resistance, that ill-fated prince was thrown down and strangled. After the murder of Selim, the strictest search was made for Mahmoud, the youngest son of Abdulhamid, and the only remaining prince of the blood-royal. But a faithful slave had concealed him in the furnace of a bath, and before the place of his concealment could be discovered, the insurgents had forced their way into the interior of the palace. Advancing to the third gate, they called aloud for the instant appearance of Selim, when the eunuchs of Mustapha, casting the body of the murdered monarch before them, exclaimed, "Behold the sultan whom you seek!" Bairactar, overpowered by his feelings, threw himself on the disfigured corpse and wept aloud; till Seid Ali, the capitan pasha, exhorting him to seize the moment for revenge, he instantly aroused himself, and commanded that the Sultan Mahmoud should be proclaimed, and Mustapha arrested. The command was immediately obeyed; Mustapha was consigned to the prison of the seraglio, and Mahmoud was released from his painful concealment, and placed on the Ottoman throne. On the ascension of Mahmoud, Bairactar was of course made grand vizir; and he avenged with unsparing severity the death of his benefactor. The traitor Mousa Pasha lost his head, and all the officers of the yamaks and the most seditions of the janissaries were strangled and cast into the Bosphorus; and the females of the harem who had rejoiced at the death of Selim were sewed up in sacks and precipitated into the sea near the shores of Prince's Island.

The vizir openly avowed his intention of reforming the system of the janissaries, and retrenching their privileges; and it was resolved to revive the order of the Seimens, who might supply their place, and be regulated according to the discipline of the nizam-jedid. The name of this corps was more odious to the janissaries than even that of Selim, as belonging to an institution more ancient than their own; and they were only the more resolved to ruin the author of the innovation. Bairactar, however, becoming elated by prosperity, began to despise their enmity; and, blinded to the danger by which he was surrounded, came to the fatal resolution of dismissing the greater part of the provincial troops, and thus remained almost unprotected in the midst of an infuriated soldiery thirsting for his destruction. On the night of the 14th of November, several thousands of janissaries, issuing from their quarters, surrounded the palace of Bairactar, and set fire to the building. The vizir and his friends escaped from the conflagration into a strong stone tower, used as a powder magazine, which the janissaries attacked in vain. But in the middle of the night the whole city was shaken by a tremendous explosion; and it was found that the magazine, with the grand vizir, had been blown into the air, whether by accident or design is to this day unknown. During the two following days the contest raged with unabated fury, till the forces of the arsenal and of Tophana united themselves to the janissaries; and the death of Bairactar becoming known, the Seimens withdrew from the combat. In the meantime, the officers of Mahmoud had strangled the imprisoned Mustapha; and the sultan having no longer anything to fear from the partiality of the janissaries for his predecessor, commanded the cannonading to cease, and at the same time announced to the janissaries that the Seimens were abolished for ever. The friends of the late vizir saved themselves by embarking on board a vessel at the Seraglio Point; but the victorious janissaries completed their vengeance by the destruction of the magnificent barracks of Sultan Selim at Scutari and Ramiz Tchifflik, at the latter of which five hundred Seimens defended themselves with desperate valour against a multitude of assailants, until their quarters were fired, and they all perished in the flames. Thus terminated the most tremendous revolution that Constantinople had experienced since it fell under the power of the Turks, and which, after dethroning two monarchs and spilling the best blood of the empire, ended in the destruction of the meditated reforms, and the entire re-establishment of the ancient institutions. History.

During these events, the war with Russia had languished; but on the accession of Mahmoud, the armies on both sides were augmented, and the contest was carried on with great ferocity. The campaign of 1811 was short, but disastrous to the Porte, the main body of the Ottoman army having surrendered as prisoners of war. The result might have been fatal to the Turkish empire; but in 1812 the prospect of the arduous struggle with France induced Russia to make peace with the Porte, on the latter ceding Bessarabia and part of Moldavia. At the peace of Tilsit, Napoleon left the Turkish empire single-handed to fight or fall, though it had been induced to take up arms solely by French promises and intrigue. The neglect was deeply felt by the Ottomans, and it received its just punishment when the unexpected pacification of 1812 released the Russian army just in time to interrupt the distressed French troops in their attempt to pass the Beresina. The sultan being now happily freed from foreign enemies, resolutely entered on the difficult task of reducing to obedience the great officers of his empire, who during the distracted state of the country had virtually exercised independent power; and in the course of a few years, the famous Ali Pasha and the other powerful and rebellious satraps were all deprived of their governments, and most of them executed. In 1821 began that celebrated insurrection which, after a bloody war of eight years, terminated in the complete emancipation of the Greeks from the Turkish yoke. (See GREECE.) Meanwhile, the janissaries were dissatisfied with certain members of the divan, particularly Halet Effendi, keeper of the signet, then high in power, but who had begun to give umbrage also to the sultan, and he was put to death in November 1822, and four of the other ministers exiled. The disorderly excesses of the janissaries, and their inefficiency in the field during the war in Greece, rendered more urgent the necessity of introducing a new system of discipline, which had long been apparent to every thinking man, and the government was anxious to do so; but every attempt had hitherto proved fatal to the innovator. The sultan resolved to make the effort, long meditated and preparing, and if the janissaries resisted, to extirpate them altogether. In conformity with these designs, 150 men were selected from each orta of the janissaries, who were instructed in European tactics by Egyptian officers. As it was declared that this was merely a revival of an exercise used by Solyman, matters proceeded quietly

History. for some time, till, in June 1826, when the troops were brought together for exercise, they discovered for the first time that they were practising the very evolutions which they had all determined to resist. A furious insurrection immediately took place, the palace of the Porte was pillaged and stripped, and the insurgents, to the number of 10,000 to 15,000 men, assembled in the well-known Etmeidan. The sultan perceived that the crisis which he had both expected and feared had now arrived, and he determined at once to put an end to a domination which had been found so intolerable. He directed the sacred standard of the prophet to be raised, and the zealous Mussulmans rushed from all quarters to range themselves under it. He issued orders to the pasha aga, and to the topgi bashi or commander of artillery, to hold themselves in readiness with their troops. Before, however, proceeding to extremities, four officers of rank were despatched to the Etmeidan, with offers of pardon if the insurgents would immediately disperse; but the offers were scornfully rejected, and the officers were wantonly put to death. The aga pasha had by this time collected about 64,000 troops, besides vast numbers of the population; and surrounding the Etmeidan, where the janissaries were assembled in a dense crowd, totally unsuspicious of the sultan's intention, he opened upon them a general discharge of grape-shot, which killed vast numbers. The survivors retired to the barracks, which were close by, and there shut themselves up. But orders were immediately given to set fire to the buildings. The artillery thundered upon the walls; and after a desperate resistance, with little loss to their assailants, the janissaries were utterly exterminated. For two days afterwards, the gates of the city continued closed, and strict search was made for such of the janissaries as might have escaped the slaughter in the Etmeidan, of whom many when found were immediately executed. By the official records preserved, but which may not reveal the full number of the victims, only about 2000 of the most guilty, after being identified, were thus put to death in the capital, besides thousands who perished in the conflict and by the flames in their barracks, and many were sent into exile in the provinces. Thus, after four centuries and a half, this formidable and capricious corps, once the great bulwark of the empire, but eventually the pest and disturber of the community, and an insuperable barrier to all improvement, was totally destroyed, and the imperial throne freed from its intolerable yoke.

In 1828 war again broke out between Turkey and Russia. The first campaign was unfavourable to Turkey, but not completely decisive; it ended with the loss of Varna. In 1829, however, the Russian general Diebitsch succeeded in passing the formidable barrier of the Balkans; and the war being closed in September by the peace of Adrianople, Turkey consented to several articles both humiliating and injurious.

Shortly after occurred that rupture between the sultan and Mehemmed Ali, the pasha of Egypt, which shook the Ottoman empire to its foundations. In every conflict the Turkish troops were completely overthrown. The battle of Homs decided the fate of Syria, and the victory at Konieh placed the sceptre almost within the grasp of the ambitious pasha. In this extremity the sultan was reduced to the humiliating necessity of applying for aid to Russia; and, through the intervention of the representatives of France and England chiefly, peace was concluded, and the whole of Syria, with its dependent territories, rewarded the successful rebellion of Mehemmed Ali.

In 1839, the sultan and his powerful subject again came into collision; and the Turkish army, under the seraskier Hafiz Pasha, crossed the Euphrates, but was completely routed by Ibrahim Pasha at Nezib, near Aleppo, and the camp, artillery, and baggage, fell into the hands of the Egyptians. This disaster was followed by the loss of the Turkish fleet, which Ahmet Fevzi, the capitan pasha, carried to Alexandria, and delivered up to Mehemmed Ali. The sultan, who had long been diseased, survived this engagement only three days, and was succeeded by Abdul Medjid, a youth of nineteen years of age. The young sultan was taken under the protection of the five great European powers; and on the 15th of July 1840, a treaty was concluded by Britain, Austria, Russia, and Prussia, for the settlement of the eastern question, France having refused to become a party to it. By the terms of this agreement, Mehemmed was offered the hereditary government of Egypt and of the pachalik of Acre. Having, however, refused to comply with the terms, he was excommunicated, and his forfeiture proclaimed by the sultan and the ulema; and the fleets of the allied powers proceeded to reduce the fortified places on the coast of Syria. They soon obtained possession of Beyrout, Saide, and St Jean d'Acre; the last of which was evacuated by the Egyptian troops after a bombardment of only three hours' duration, on the 3d of November 1840, though it had cost Ibrahim a siege of seven months to reduce it in 1832, and though he had subsequently made it one of the strongest fortresses in the world. History.

Soon after, Ibrahim's troops, unable to make further resistance, evacuated Syria. But, with the concurrence of the allied powers, Mehemmed Ali was confirmed in possession of the government of Egypt, which was also made hereditary in the line of his descendants, on payment of an annual tribute to the Porte of 1,333,000 dollars. In other respects, and being entirely excluded from Syria, Palestine, and Arabia, he was placed on the footing of a vassal pacha, subject to the laws of the empire.

By the treaty, dated the 13th July 1841, France joined with the other powers in confirming the rule for shutting the passage of the Dardanelles to foreign ships of war, and in guaranteeing the integrity of the Ottoman territory. Its division under two rival rulers had long been felt as a great source of weakness; and the policy of the British ambassador from 1833 had been to effect the restoration of its unity under the full sovereignty of the hereditary sultan. Arabia was next brought under the direct rule of the Porte, which drew from it a tribute of several millions of hard dollars conveyed to the capital. Kurdistan was also subjected to a state of order and obedience; and commissioners, jointly with those of the great powers, were employed to adjust the long unsettled boundaries between Turkey and Persia. Troubles in Bosnia, arising from aversion to the new system of taxes and military conscription, were suppressed, and Turkey enjoyed a repose of some years, undisturbed by internal commotion or foreign pressure. Some contentions in the Lebanon, never yet healed up, between the Druses and the Maronite Christians, and predatory turbulence of the Arab tribes of the Syrian and Mesopotamian desert, were the only exception. The general shock throughout Europe caused by the French Revolution of 1848 did not affect Turkey, where the Mussulmans have little of the revolutionary element. The tributary Principalities of Wallachia and Moldavia alone became agitated, and the liberals there, composed of the younger and more ardent of the educated classes, weary of their country being overruled by Russia, established provisional governments of their own, which were of a very democratic stamp. They were still desirous to preserve amity with the Porte, or willing to remain under its suzerainty, and one grand vizier of the day was even favourable to their independence. Such was not then the policy of Russia, and the Divan was induced (why, is still unaccounted for) to solicit her joint military occupation of those countries, by which the previous order of things was restored. Meanwhile Hungary had engaged in war with the House of Austria, to regain her full constitutional rights. The Porte was favourable to the Hungarian cause, and seemed disposed to support it by arms had she received encouragement, with which view probably she was collecting the disbanded regulars from her nearest Asiatic province. But England would countenance no step tending to bring on general war, and Turkey remained passive. She was involuntarily placed in jeopardy when the surviving Hungarian leaders, after failing in their struggle, took refuge on her soil, and whom she refused to deliver up in compliance with the remonstrances of Austria, and the threats of Russia, that the alternative would be actual war. Kossuth and his associates were treated with hospitality, and finally lodged for some time at Kutachia, in the enjoyment of liberal pensions. The mission of a British fleet to the Dardanelles

History. effectually protected Turkey from hostile invasion on the occasion, and changed the attitude of Russia. It cost much persevering trouble and efforts to remove the Russian troops, as at length effected, from the Danubian Principalities. The Emperor Nicholas was not the less intent on carrying out the long-cherished project of his house to extend their dominions to the Bosphorus, and occupy the throne of the Constantines; and secret overtures, coldly received, had several years before been made to the British Cabinet to share in the spoils of "the sick man, whom they would soon have on their hands." Again, those overtures were renewed to the British minister at St Petersburg, in course of the disputes relating to the rights of Russia and France to certain churches in the Holy Land. This led to the claim on the part of Russia to a protectorate over the subjects of the Porte who were members of the Greek or Oriental Church; and Prince Menzikof was deputed to Constantinople to make the most imperious demands of that nature, as the ultimatum of the czar. Those pretensions, founded on an overstrained construction of the treaty of Kainargi, and which would virtually have handed over to the supremacy of Russia several millions of Ottoman subjects, were resisted. Russian troops marched in consequence into the Danubian Principalities, which England and France waived treating as a *casus belli*; and negotiations were opened at Vienna to effect an accommodation. The terms there agreed upon as a basis were rejected by the Porte, as bearing a construction to favour the views of Russia, as afterwards admitted. And in October 1853 the Porte declared war against that power.

The Russian forces crossed the Danube, and took possession of some minor forts at its lower extremity, also of the Dobridgea. A contest took place higher up the river at Oltenitza, chiefly by a cannonade, in which Omer Pasha, the Turkish general-in-chief, gained the victory. Widin was secured and rendered impregnable, protected by the fortified position of Kalafat, on the opposite side of the Danube. The British and French fleets, long anchored outside the Dardanelles, at length passed up and took their stations in the Bosphorus. They only entered the Black Sea, when a Turkish squadron sent there and anchored at Sinope was attacked and destroyed, with the crews, by a large superior fleet from Sevastopol. The disaster and massacre attendant roused public feeling in England, which called for war against the aggressors. It was declared in the month of March 1854 by Great Britain and France, whose joint armies, collected at Gallipoli and around Constantinople, proceeded by sea to Varna. Whilst encamped in that quarter, fever made fearful ravages in the British ranks on the swampy borders of the Lake of Derna. Cholera had already accompanied the French army from home, and was superadded to the local fever. From their joint ravages a French division, sent on an expedition into the unwholesome Dobridgea, was almost annihilated without meeting an enemy. Omer Pasha having established his head-quarters at Schumla, there remained stationary with his army, as did the allies in their positions near the sea, whilst the Russians directed all their might against Silistria.

Alone the Turkish garrison of that fortress, animated by the example and counsels of two British officers who, as volunteers, shared their perils, made a most gallant and determined defence, one of the most distinguished on record. After sustaining immense losses in men, and having had all their generals engaged in the siege either wounded or killed, the Russians retired. They had never been able to take the Arab Tabia, so called, an outwork which formed the key of the defence, guarded by a handful of men, chiefly Egyptian troops. The Russian campaign on the Danube had totally failed. Their army next retired from the Principalities, which, in virtue of a treaty with the allied powers then lately made by Austria, was occupied by her troops, and the war was transported to another theatre.

It had been finally resolved in the allied counsels of France and England to attack Sevastopol, the great stronghold and arsenal of Russia in the Black Sea. Their joint armies, in September 1854, were conveyed to the western shore of the Crimea, in a vast array of transports, escorted by their splendid fleets, exhibiting the most grand spectacle ever beheld on the ocean. Their wonted valour shone in the battle on the Alma, when they carried its heights in the face of a tremendous shower of grape from the Russian batteries. On the march inland which followed, their artillery, saved from the engagement, lay unknown a little to the right, exposed to the grasp of the allies. On their appearance before Sevastopol in the south, they might have marched into it, as now admitted, so dispirited were the Russians by their previous defeat, and unprepared for defence. An immediate assault had been proposed by Lord Raglan, the British commander, but declined by St Arnaud, the French. The moral energies were now exhausted which had sustained the enfeebled and dying frame of that gallant spirit up to the fight on the Alma.

The army of Omer Pasha had been later transported to the Crimea, but no active nor glorious part was assigned to it in the operations before Sevastopol. Previous to its capture on the 8th September 1855, the Turkish force, after much hesitation in coming to the decision, was sent to make a diversion in Mingrelia, for the relief of Kars, then hemmed in by the Russians, and reduced to extremity. But Omer Pasha landed at Soukoum Kalé, which lost him three weeks' march, instead of at Redout Kalé, only a few days' distance from Kutais, on which he was to move. After defeating the Russians, with the loss of 500 men, who opposed his passage of the Ingour, he stopped short, as the wet season had set in, and never proceeded to Kutais (the capital of Mingrelia), which lay close at hand, open to his occupation. He had, however, alarmed Mouravieff, who, to arrest his progress in that quarter, weakened his own army before Kars, but unnecessarily; and that important place was left unaided to its fate. History.

The war in Asia had commenced by the capture, on the 3d of November 1855, of the Fort of Shefkélit, on the Gouriel, by a Turkish division from Batoun; and under the direction of Yordan, a gallant Polish officer, it resisted a subsequent attack by the Russian fleet, which afterwards destroyed the Turkish fleet at Sinope. The force at Batoun river exceeding 6000 to 7000 effective men, and wasted by sickness to a skeleton at the end of the war, did nothing further memorable, save advancing on Uzurgheli, under Selim Pasha. When following the Russians, who had evacuated the town, a little further, he was attacked in turn, routed, and his troops narrowly escaped entire destruction. They formed the extreme left of the army of Erzeroum, originally composed of nearly 40,000 of the best Turkish troops, and stationed at Kars. In the end of 1853 it sent two detachments of 7000 men each both against Gumri and Akiska, which were repulsed. The rest of the time, though then weak, was wasted in skirmishes with the Russians until September 1854, when General Guyon, distinguished for his energy in the Hungarian war, having been sent to reorganize the Kars army, recommended a well combined offensive movement; at the moment of execution he was, however, contemptuously set aside by the Turkish general-in-chief (Tarif Mustafa Pasha), who lost the battle of Ingéderé, which he ought to have won, and retired in utter disorder from the field. The Russians, who had suffered the most, might have got into Kars before him. They had meanwhile occupied Byared, from before which, on their advance, a Turkish division of 7000 men dispersed. In October the British military commissioner, General Williams, arrived at Kars, and then returned to Erzeroum for the winter, to make arrangements there for the future. The season was spent at Kars in strengthening the defences; and in May following (1855) General Mouravieff debouched from Gumri with 45,000 men, scouring with his cavalry the country whence any supplies could reach Kars. It must finally have surrendered from famine. But Mouravieff, afraid of Omer Pasha's coming on from Mingrelia, and after having sent off 6000 men to oppose him, ordered an assault in September, though without cannon. His troops penetrated into the intrenchments, but were nobly repulsed, with terrible slaughter, leaving 6000 dead on the spot. They again resumed the siege, encamped before the place, which was forced to surrender in November. This was the last feat performed during the war, and was some counterpoise in favour of the arms of Russia to the greater triumph of the allies at Sevastopol.

The Circassians had been invited by an agent of the British government to take part in the hostilities against Russia, as favourable to their national independence, but this was counteracted by the representatives of the Porte, and Schamyl's depute, the Naib, was preaching Socialism to the Caucasian mountainers; so no combination could be formed with them, and the Russians themselves, after first blowing up their forts along the coast, retired from it. Anapa was reoccupied by them on the return of peace, in which terminated the armistice which followed the taking of Sevastopol. In the latter part of the war, Sardinia had sent an army to co-operate with those of the allies in the Crimean campaign, and which signalised itself in the action at the bridge of the Tchernaya.

By the Treaty of Paris, signed on the 30th March 1856, between the belligerents, and with the participation of Austria and Prussia, Russia was interdicted from possessing any fortified port or naval arsenal on the Black Sea. Nicolaief, as an inland station, was not included in the restriction. But her fleet had already been sunk at Sevastopol, to block up the port against the entrance of the allies, the magnificent docks there were destroyed before their departure; and it was now stipulated by the treaty, that the ships-of-war which Russia and the Porte might have in the Black Sea should be limited to a small flotilla of specified force, for police and revenue purposes. All right of foreign intervention in the internal concerns of Turkey was expressly debarred. Previous territorial limits between Russia and Turkey were re-established, save that the former ceded to the Porte such portion of the Bessarabia as gave access to the Danube. Other stipulations provided for the freedom of its navigation, and

History. the future form of government of the two Principalities of Wallachia and Moldavia, the immunities of which, as also of Servia, were placed under the protection of the five powers. Turkey now took a place also as a member of the European confederation of states.

There ensued, in consequence of some equivocal geographical designation, a serious question as to the right of Russia to retain Bolgrade, a place which left communications open to her with the waters of the Danube. But this point, as also the occupation of the Isle of Serpents, opposite to the mouth of that river in the Black Sea, was settled in conformity with the firm and sustained representations of the British government. It also opposed the union of the two Danubian Principalities into one state as voted by the population, supported by France and Russia; and the double election of the same prince for Moldavia and Wallachia led to a compromise, the Porte confirming the election on the express condition, that in future a different prince should be chosen for each.

The main objects of the war may be said to have been attained. The formidable bulwark of Sevastopol, which gave to Russia the command of the Black Sea, and formed a standing menace to Turkey, was dismantled, with the obligation imposed that it should not be restored. The dangerous predominance of Russia in relation to Turkey was effectually checked, and its security greatly strengthened,—since it is not easy to overrun the country by an invasion overland, and Russia will have no equipped navy at hand, whilst the Porte has her fleet at command in the Bosphorus for immediate dispatch into the Black Sea on any threatened peril, and to repel any expedition which might attempt a *coup de main* on Constantinople, or a landing elsewhere on her coast.

It is only the small population of Montenegro that has since given trouble to the Porte on its frontiers. Claiming complete independence, and discontented with their confined territory, those wild mountaineers, after sanguinary conflicts with their Mussulman neighbours, were on the point of being overwhelmed by Omer Pasha some years before but for the intervention of Austria. A fresh outbreak of those boundary contentions led to the appointment, in 1859, of commissioners from each of the Great Powers to adjust the limits. But their labours, interrupted by the war in Italy, have not yet been brought to a close. When being renewed, a Turkish force of 3000 men, imprudently led by the superior in command into an exposed position, was totally destroyed by the Montenegrins, and during the alleged subsistence of a truce.

In June 1858, occurred at Jedda, to shock the civilized world, the massacre of the British and French consuls, and a number of other Christians, by a fanatic population. This was on account of the re-hoisting of the British flag on a ship from India of disputed ownership, from which it had been hauled down by the authorities on shore. The Porte undertook to afford full satisfaction for the atrocity; but before advice of this being accepted reached the Red Sea from home, it was too late to countermand previous orders for the bombardment of the town, as carried into effect by a British ship of war. The chastisement thus inflicted on the port of transit for pilgrims to the holy cities caused much sensation among the Mussulmans for a time, particularly in Syria, but which subsided without any ill consequences. Two of the greatest criminals concerned in the massacre were, after the bombardment, executed on the spot, but unhappily also eleven persons who were innocent, having been denounced by influential parties really guilty, were sacrificed in their stead.

In January 1856, Turkey lost, by the death of Reschid Pasha, the most distinguished of her statesmen of modern times, and the most accomplished public character she had yet produced. He was the author of the liberal edict of Ghulhane in 1839, and guided the counsels of the Porte in most of the leading events of his day, but was not in power when war was declared against Russia in 1853. His successor in the post of grand vizir was Aali Pasha, also an acute diplomatist, who represented Turkey at the Congress of Paris when peace was concluded. He has been displaced since the discovery of a conspiracy against the government, when on the point of breaking out on the 17th September 1859. Its object was to seize the sultan on the street on his way to the mosque, and depose or put him to death, placing his brother on the throne, in case he should refuse to accede to the scheme to be presented to him for measures of retrenchment, and the re-establishment of the ancient religious system in full vigour,—the obnoxious ministers, with the actual serasker Riza Pasha as the chief, were to be got rid of, and doubtless by sacrificing their lives, with all others in office about the palace who were considered of the same party. The originator of the plot was a sheikh from Suleymanié, in the Kurdistan, and his chief accomplices, two Ferik pashas in the army—the one Hussein, a Circassian, the other Djafer, an Albanian—who, on his way up the Bosphorus to the place of trial, jumped overboard and was drowned. His moral reputation was such as throws some discredit on the professed patriotism of those connected with such an associate. Only thirty-nine persons were brought to trial as implicated, of whom the two surviving leaders, after capital sentence passed against them, were, in commutation of punishment, condemned to perpetual imprisonment in a fortress; others were sentenced to confinement for a limited term, and some to exile; a number were set at liberty. No leading members of the ulema, nor other personages of much note, appear to have taken part in the plot, but the full ramifications of it are involved in uncertainty. Part of the army had been gained, and two regiments fixed upon to act as guard for the safety of the Christians at the capital. The timely detection of the conspiracy in its last stage for execution saved the empire from a perilous reactionary shock, and is calculated to be a serious warning for doing away with the same causes of grievance. Statistics.

List of the Sultans of Turkey.

Othman .....1299.	Selim II. .....1566.	Ahmet II. .....1691.
Orchan .....1326.	Amurath III....1574.	Mustapha II....1695.
Amurath I.....1360.	Mohammed III. 1595.	Ahmet III. .....1703.
Bajazet I. .....1389.	Ahmet I.....1603.	Mahmoud I. .....1730.
Solyman I.....1402.	Mustapha I. ....1617.	Osman II. .....1754.
Musa-Chelebi...1410.	Osman I.....1618.	Mustapha III....1757.
Mohammed I....1413.	Mustapha I. ....1622.	Abdal Hamid...1774.
Amurath II.....1421.	Amurath IV....1623.	Selim III. .....1788.
Mohammed II...1451.	Ibrahim .....1640.	Mustapha IV....1807.
Bajazet II. .....1481.	Mohammed IV. 1649.	Mahmoud II. ...1808.
Selim I. .....1512.	Solyman III. ...1687.	Abdul-Medjid 1839.
Solyman II. .....1520.		

STATISTICS.

The Turkish empire extends continuously into the three quarters of the old world, occupying the contiguous south-eastern corner of Europe, the south-western corner of Asia, and the north-eastern corner of Africa; between 11. and 48. N. Lat., and 8. and 48. E. Long. Its area has been very variously estimated, but is probably not less than 1,800,000 square miles, of which one-ninth is in Europe, upwards of a third in Asia, and the remainder in Africa. The empire is thus naturally divided into three very distinct portions—the European, the Asiatic, and the African.

Turkey in Europe, in its present reduced dimensions, excluding Greece and the islands, but still including the dependant states of Moldavia, Wallachia, and Servia, has an extent of about 700 miles from east to west, between the western border of Croatia and the channel of Constantinople, or the mouths of the Danube, and of 650 from north to south, between the frontier of Greece and the northern extremity of Moldavia; and includes an area of upwards of 200,000 square miles.

In its general aspect Turkey may be described as divided into two great portions—the one consisting of the low country between the base of the Balkan range on the south and the Carpathians on the north, extending north-eastward to the borders of Russia, and forming the basin of the Lower Danube; and the other all the rest of the country southward to the frontier of Greece. The nucleus of the latter portion is formed by various ranges of mountains, which have been considered to be only a prolongation of the Alps, or at least as connected with that range by the very hilly country which is found at the north-eastern corner of the Gulf of Venice. The principal chains of mountains may be enumerated in the following order:—1. The Tchar (ancient, *Scardus*), a high and extensive range, which forms the western part of the central range. 2. The Despoto dagh (ancient, *Rhodope*), which begins near Dubnitza and Djumaka, and runs in an east-south-east direction, diminishing in height till it terminates rather abruptly about 6 leagues south-west of Adrianople. Its loftiest summits are towards the west, and reach an elevation of 8000 feet, or probably more. 3. The group of hills which occupies a large and very wild tract of country between 42° and 43° 30′ N. lat., and 19° and 21° 20′ E. long., and is but little known. 4. The chain of Pindus, which extends from Metzovo (39° 50′ N. lat.) to the north-west, beyond the lake of Ochrida, where some parts of the chain reach an elevation Mountains.

Statistics.

of 6000 or 7000 feet. Its southern extremity is connected with Olympus by a somewhat lower chain, which separates Thessaly from Macedonia. 5. The true Balkan (ancient *Hæmus*), which extends eastward from the neighbourhood of Sophia, to Emineh Burun on the Black Sea. It is a much lower chain than the Despoto-dagh; the southern slopes are generally very steep, but on the north side it is only the highest ridge which is much inclined, and on that side also the country falls by a series of parallel ridges, diminishing in height towards the Danube, which flows past a series of small hills on the Bulgarian side, while on the Wallachian side the country is flat. 6. The western part of the Balkan, which probably reaches an elevation of 4000 feet; but, near the sea, the summits are only from 1800 to 2000 feet above its level. 7. The preceding chains are connected by a large undulating high country or plateau, extending from east to west between Sophia and Pristina, and forming the upper part of the basin of the Morava. From this plateau ranges of mountains extend in every direction into Servia, Macedonia, Albania, and Thrace, some of which attain the elevation of 5000 or 5500 feet. 8. South of Adrianople, between the Maritza and the Dardanelles, are the low ridges and plateaus of the Tekir-dagh, which rise only to the height of about 900 feet; but to the south-east of Aimadtschik there is a somewhat higher range, which, near the Sea of Marmora, is probably 300 or 400 feet higher than the Tekir. 9. Along the south-western shore of the Black Sea, a very low chain extends from the Bosphorus to the north-west, forming the water-shed between that sea and the basin of Adrianople. It is not in immediate connection with the Balkan; while, on the other hand, towards the Bosphorus it becomes divided into a number of small hills, situate on low-lying plateaus. 10. Between the lower Strymon and the lower Vardar, on the coast of Macedonia, there is a group of low hills, of which the almost insulated ridge of Athos may be considered as the south-eastern extremity. A prominent character of the orography of European Turkey is the presence of vast cavities or high plains at the foot of the mountains, and the number of extensive cross-fractures in the latter. The plains may be regarded, for the most part, as longitudinal valleys, and some, if not all of them,

Lakes.

appear to have been once the beds of lakes. Only a few lakes, however, now remain, as those of Ochrida, Kastoria, Joanina, and Scutari, and even these are rapidly filling

Rivers.

up. The only river of any importance is the Danube, which has been already described. (See DANUBE.)

Climate.

In a country consisting of so many high plains, and intersected by so many lofty mountains, the climate must necessarily be very various. Along the western coasts the climate partakes somewhat of that of Italy, though colder, owing to the vicinity of the mountains; but the maritime regions along the east coast are exposed to the north-east winds, which blow frequently, and bring intense cold and thick fogs and rain from the Black Sea. At Constantinople the climate is extremely changeable. Indeed it depends upon the north or the south wind, whether one is shivering in the cold of Russia, or luxuriating in the balmy air of Greece. The winters are extremely long and severe; the roads are often blocked up with snow, and the wind on the Bosphorus is often so violent, that all communication between the city and the villages far up the channel is cut off. Upper Macedonia and Thrace (the modern Rumelia) were considered by the ancients to be cold countries; and it was in the former that they placed the residence of Boreas. The country, nevertheless, is rich in corn and woods, and well adapted for the vine. (For the climate and natural productions of the other provinces, see the articles ALBANIA, BOSNIA, BULGARIA, CROATIA, MOLDAVIA, WALLACHIA, and SERVIA.)

Turkey in Asia.—This large and important part of the empire is situate between 31° and 42° N. Lat., and 26° and 48° E. Long. Its greatest length, measured diagonally from the mouth of the Dardanelles to the mouth of the Euphrates, exceeds 1200 miles; and its greatest breadth, from the southern border of Palestine to the north-eastern extremity of the pashalic of Akhalzik, exceeds 900. Its area may be about 660,000 square miles. It is bounded on the north by the Black Sea and a part of the Russian territory; on the south by the deserts of Arabia; on the east by Persia and Russian Armenia; and on the west by the Mediterranean Sea, the Archipelago, the Dardanelles, the Sea of Marmora, and the channel of Constantinople. It consists naturally of four very distinct portions, namely—1. The peninsula of Ana-doli or Asia Minor, situate between the Black Sea and the Levant part of the Mediterranean; 2. The high tableland of Armenia and Kurdistan to the north-east; 3. The low countries of Assyria, Babylonia, and Mesopotamia, traversed by the Euphrates and the Tigris; and, 4. Syria and Palestine, which together form the eastern shore of the Mediterranean Sea, and extend between it and the Arabian desert.

Statistics.

Armenia and the northern part of Kurdistan form an elevated tableland, or series of plains and valleys, some of which are 5500 feet above the level of the sea, intersected and overtopt by ranges of mountains. This is, however, a fertile corn country, and abounds also in pastures, though the climate is cold, and in winter the whole region is covered with deep snow. From Armenia two ranges of mountains proceed westward. One of these, the ancient Taurus, runs parallel to the shore of the Mediterranean Sea, and then dividing into a number of branches, which intersect the western part of the peninsula, forms as many fertile valleys watered by fine rivers, and terminates on the shores or in the islands of the Archipelago. The other chain, Anti-Taurus, extends in a south-westerly direction into the interior of the peninsula, where it is probably connected, not only with the ranges of Taurus, but also with the lofty mountains which under various names occupy the country between the Kizil-Irmak and the Sea of Marmora. The central part of the peninsula, supported on all sides by these mountains, forms a series of elevated tablelands, nearly destitute of trees, but abounding with pasturage. Some of its valleys are so completely surrounded by mountains as to have no outlet for their waters, which not only overflow large tracts of country in the rainy season, but also form a number of permanent lakes. The climate of this upland region is very severe. The summer is of very short duration, and the low country along the coasts is so much affected by the vicinity of these cold mountains, that neither the aloe nor the cactus, nor any succulent plant, is to be seen. Orange and lemon trees are with difficulty preserved in the sheltered valleys; the olive seldom flourishes, even in a similar situation; and they are all inferior in growth to those of Sicily, Calabria, and Greece.

The countries watered by the Euphrates and Tigris may be distinguished, by their configuration, climate, and natural productions, into three zones. The first, or most northern, comprises the mountainous country traversed by the ranges of Taurus, where the winters are cold and the summers hot, and where the productions are forest and fruit trees, olives, wine, corn, and pasturage. The second zone consists of stony or sandy plains, the fertile parts of which produce mulberry-trees, cotton, maize, sesame, tobacco, and hardy labiate and composite plants. The climate is characterised by great dryness, combined with great variations of temperature; and the zone comprises Northern Syria, Mesopotamia, and the low country to the east of the Upper Tigris. The third zone, which extends from Feluja to the Persian Gulf, consists of low, watery, alluvial plains, which produce date-trees, rice, and pasturage, or saline plants, reeds, sedges, and rushes. The plain is intersected in every direction by the remains of ancient canals, and is still capable of that

Statistics. extensive irrigation which made it in ancient times the richest country in the world. But at present it is nearly a desert, and cultivation is only found like a fringe along the banks of the rivers. (For the description of the remaining parts of the empire, see the articles SYRIA, PALESTINE, ASIA MINOR, EGYPT, TRIPOLI, and TUNIS.)

People. The dominant race are the Osmanli Turks; but they do not call themselves Turks, nor apply the term to each other but in disparagement, as denoting uncouthness or barbarism, whilst they take a pride in the name of Osmanli, from the ancient splendour of the dynasty. Their language has received so large an intermixture of Arabic and Persic as on that account to be denominated *Mulomma*, compounded. Having become blended with various of the nations they conquered, which, joined to the introduction of Circassian and Georgian blood, has improved their original type, and hence they are in general a robust, well-formed race, of rather harsh yet grave and noble physiognomy. Some are of fair, but the most part of brownish, complexion and dark-brown hair. All the men wear moustaches,—many of them also beards, as usual with those advanced in years, which adds to the natural dignity of their mien. They are intelligent, capable of high culture, and of acquiring almost every kind of knowledge; in manners they are hospitable, courteous to each other and to strangers, and respectful to their superiors; in character they are grateful for benefits and mindful of them, and constant in their attachments and friendships for those they esteem. They may contrast favourably for honesty with the Greeks and Armenians who live under the same rule, but cannot be signalised for national honesty more than for veracity. The fatalism inculcated by their religion tends to make them improvident, the despotism of their government to render them addicted to simulation, of which they are perfect masters. They are deficient in humanity and in sympathy with the sufferings or death of their fellows from violence, and their morals are tainted by the notorious prevalence of a disgraceful vice common to eastern countries from the most remote ages, and which exercises a most pernicious, degenerating influence on their social condition and career as a nation. They receive from infancy a most vicious education in the harem, which initiates them in loose principles and the familiar use of grossly indecent expressions, whilst the separation of the sexes deprives them of the truest pleasures of a home. They have little taste or turn for art, or appreciation of its beauties, save as loaded with costly ornaments. Indolent and fond of ease, they are the more pliant to authority, and easily governed. The best qualities of the population would be more conspicuous, their morals more regulated, were a better example given them by the higher classes and those in authority over them. It is mostly to the industry of its Christian subjects, both in the culture of the soil and in trade, that the empire is beholden for its resources; and the Greeks especially far surpass the Turks in acuteness, activity, and that spirit of enterprise which generates and extends commerce.

European Turkey is inhabited by a variety of races, of which the Wallaks or Roumans and the Sclavonic tribes are the most numerous. Very erroneous statements made at random or from political bias have continued to be published of the elements of the population, of which a regular census is taken every ten years and preserved at the Porte, though not made public. The following is from an authentic source:—

Osmanlis, of Turkish origin and speech	3,000,000
Greeks	1,180,000
Albanians	1,600,000
Sclavonians	4,000,000
Wallachians of the Greek Church (in Macedonia, Bitolia, &c.)	600,000
Armenians	300,000
Jews	250,000
Franks	50,000
Gypsies	200,000
	11,180,000
Add population of Wallachia and Moldavia, Servia and Montenegro	5,020,000
Total population of European Turkey	16,200,000

of which 5,900,000 are Mussulmans, 420,000 Catholics in Bosnia, Albania, and Philipopoli, the rest of the Greek Church to the number of 9,080,000, besides the Jews, Franks, and Gypsies.

The population of Asiatic Turkey is still more various. The Osmanlis are very numerous in Asia Minor, which, from the priority of their settlement there, they consider as their own country. They are there chiefly intermixed with Greeks and Armenians, and with Kurds along the Tigris and Euphrates. The Yezedes dwell in the Sinjar, and Jews in more or less number in the towns. Large tracts of the interior are abandoned to the wandering tribes of Turcomans or Yuruks (who are identical), and of Kurds, who pasture their flocks and herds on the hills, wide uplands, and plains. The Turcomans in some places also cultivate the soil, and are burners of charcoal for sale. All the wheat is raised by them which is grown on the fertile range of Emir Dagh, bordering on Konia, and renowned for the superior excellence of the quality. Pastoral and migratory like the Arabs, living in tents and wicker huts, they rove to a great distance where they can best find subsistence for the various animals which constitute their wealth. They breed many horses, which, with their wool, butter, and meat, they sell to the villages and towns, and buy in return arms, clothes, coffee, &c. The women spin wool and make carpets; the men knit coarse socks or stockings, of general wear amongst the people of the country. They settle disputes amongst themselves according to their customs, and were wont to acknowledge some superior chief; but instead of former mere dues for freedom of pasturage, they now pay regular taxes to the government, according to their station and substance. They are of the Turkee family, and in their dialect and pronunciation approach nearest to the genuine Turkish as spoken by the Tartars. Statistics.

The Kurds differ much in manners and totally in language from those tribes. They are a wealthy and independent people, and live entirely in tents. They dwell on the eastern flanks of Mount Arjish, and in the great plain of the Haimaneh, towards Angora. They are found also among the ridges of Taurus, in Northern Syria; but their proper country is the mountainous region to the north-east of the Tigris, which from them takes its name of Kurdistan, and which is nominally divided between Persia and Turkey, without being fully subjected to either. (See SYRIA, PALESTINE, ARABIA, ARMENIA, KURDISTAN.)

The population of Asia Minor, Syria, and Arabia, which is of a very mixed heterogenous character, amounts to.... 16,100,000
Of Egypt to 3,000,000
Of Tripoli and Tunis to..... 1,800,000
20,900,000
Add population of European Turkey 16,200,000
Total of Turkish Empire..... 37,100,000

Population according to Religions.

Creed.	Europe.	Asia.	Africa.	Total.
Mussulmans	5,900,000	12,870,000	3,800,000	22,570,000
Greeks	9,480,000	2,930,000		
Armenians	360,000			
Roman Catholics & various other Christian sects	450,000	640,000	700,000	1,790,000
Jews	70,000	150,000	300,000	520,000
Druses, Ansari, Yezedees, &c.	...	80,000	...	80,000
Total	16,200,000	16,100,000	4,800,000	37,100,000

This enumeration corresponds in essentials with the last census in 1852, and with some uncertainty as to the numbers of the small tribes of the Lebanon and Sinjar. There are, further, the wandering Arab tribes of the Nejd, and Syrian and Mesopotamian deserts, by some reckoned at 2,000,000, by others affirmed to amount to 4,000,000, making the entire population of the empire about 40,000,000. The Mussulmans continue decidedly to predominate, but from inherent causes still in progress their numbers have long been decaying, without any sign of a counteracting impetus to arrest the decline.

Social progress. Unless as regards the mass of the lower orders and more remote provinces, which remain nearly unchanged, the state of society in Turkey cannot be judged from the past. On the sea-coast, steam navigation, which is everywhere established, has facilitated communications, and added to the conveniences of life. In the capital and principal maritime towns, as also some large cities adjacent in less degree, the native merchants, Greek and Armenian, have made great progress in general knowledge and the cultivated manners of society. French, and likewise sometimes English, are familiarly spoken in the families of the better class, especially in those of Saraffs and persons in the employment of the state. Their women have laid aside the oriental dress, and adopted the French fashions; and the custom extends to many of the lower orders, and to towns in the interior. Turkish gentlemen of all ranks mix at ease in European or other good society among the Christians, and have imbibed all its tone and spirit. Polygamy among the Turks of every class is wearing out and becoming rare; but the secrecy and

seclusion of the harem inculcated by their religion always oppose a barrier to their near assimilation with other races.

The government is an absolute monarchy or despotism, vested in a Padisha or Emperor of the race of Osman, founder of the dynasty. As successor to the last of the *Abassi* Kaliffs of Egypt, he is also Kaliff or Vicar of the Prophet, and, as such, supreme head of the Mohammedan religion. He thus unites in himself the power of the Ketab and Kilitch, the book and the sword, and is consequently endowed with an absolute authority, spiritual and temporal. His legitimate power is necessarily bounded by the law of the Koran, in practice it has no limit save his will, and necessity or expediency. He cannot in general infringe the rights of property, nor inflict punishment without a formal condemnation. The arbitrary putting to death of subjects at his command has only been by an abuse of the prerogative. He also assumes the title of Khan, and by the Turkish people is commonly called Hunkiar (in Persian the shedder of blood).[1] There being no hereditary nobility, all the predilections of the people in favour of antiquity and sovereign rank are concentrated upon the family of Osman. This illustrious line, the object of their reverence, has been happily preserved amidst successive revolutions. When nearly extinguished in 1808, at the time Mustafa IV. was being dethroned, who had despatched executioners in search of his brother Mahmoud, the only other surviving scion of the family, he was saved by lying concealed under some covering in a bath, where he was discovered by his deliverers. On the death of Mustafa, Mahmoud having become the sole representative of his line till he had sons who grew up, this undoubtedly tended to consolidate his power, and preserve his life during the stormy periods of his reign.

Immediately on the overthrow of the janissaries, in 1826, a great change took place in the court forms and system of administration. This reform was further greatly advanced soon after the accession of his son, Abdul Medjid, to the throne, by the famous edict of Ghulhane. All sanguinary exercise of the prerogative against law was abrogated and ceased; the sultan is no longer the uncontrolled master of the lives and property of his subjects; the head and fortune of a fallen minister have no more been doomed to forfeiture. The sultan may choose, dismiss, even sometimes disgrace, and reinstate his ministers at will, but he must select counsellors of state capable or willing to carry his commands into execution, or submit to the measures they recommend. Formerly the Sheikh-ul-Islam could exercise a great restrictive power, being entitled to interpose his veto on any act declared by him contrary to the religious law. Sultan Mahmoud took an easy way of evading this intolerable obstacle to his policy and will, by the dismissal of any refractory Sheikh-ul-Islam, and the substitution of one found more pliable. No difficulty in this respect has since been experienced in legalising all the reforms and innovations successively introduced. The changes in the composition of the Divan also now take place with as much placidity as in Christian countries. An order to remain in temporary retirement at his house, or removal to some provincial port, is the worst that befalls a discarded minister, unless charged with some flagrant misconduct. The Ulama, having been least exposed to reverses of fortune, and spoliations of their property, have preserved amongst their order the greatest number of old and opulent families. The actual regimen which affords common protection to every class of subjects is new, and has not lasted a generation. But from the promotion to high office and dignity of the sons of great pashas and ministers, who become also the heirs to their wealth, which is sustained by alliances between their families, a superior hereditary class of Turkish gentry may be in progress of formation. Some of the old courtiers, ignorant of any language but the Turkish, are still in power, but this is no longer a usual passport to office. On the contrary, a knowledge of French and of European politics are now indispensable qualifications of Turkish statesmen, save the very few survivors of the old school, and communications written or verbal may take place between the sultan's ministers and the representatives of foreign powers without the intervention of a dragoman. Turkish diplomatists, also, in their state papers and more intimate intercourse with the politicians of Christendom, evince a keen perception of the interests of the Porte and tact in maintaining their own views.

The succession to the throne does not pass to the eldest male heir in lineal descent from the last sultan, but to the senior in years of the imperial family. Abdul Medjid's brother, and not his eldest son, is therefore now the heir presumptive to the sovereignty, and it would be dangerous to attempt to subvert to his prejudice the ancient established rule. Far, however, from being an immured captive, jealously guarded, as would have been his fate in former ages, he has his own establishment in the country close to the capital, and moves about in his pleasure yacht or otherwise at freedom.

From the time of Byazid II., who had to maintain a contest for the throne with his brother Djem, such competition had caused trouble or anxiety to the reigning Sultan, and the great Solyman even strangled his eldest son, whether from the discovery of his being really engaged in projects of rebellion, or on a false accusation instigated by the celebrated favourite known as Ronalana, to secure the succession for a son of her own. Thenceforward the imperial princes were pent up in the seraglio, attended by eunuchs, and the female slaves of their harem past the age of childbearing. Thus the immured princes vegetated, debarred from the world, and ill educated for the business of life and government. And hence the Osmanli sultans, from being warriors at the head of armies as well as rulers over their people, degenerated for the most part into effeminate slaves of every sensual vice, and tools of eunuchs or women and other worthless intriguers around them. Few amongst them were distinguished for strength of character or intellect. Of those rare exceptions the most illustrious until his time was Selim III., though unfortunately not endued with resolution to enforce, equal to his sagacity in framing enlightened plans of reform. But he had trained to his views his favourite nephew, the stern and determined Mahmoud, for whom it was reserved to break the brutal, debasing thrall of the janissaries, and smooth the path of government for his son. Abdul Medjid has enlarged the rights of the subject, advanced education and toleration, organised the civil administration and the military and naval force of the empire. Estimable for humanity and mildness, but partaking too much of weakness in a sovereign, he carries to excess his passion for expensive ceremonies, edifices, and luxuries. No sultan has been so costly in the maintenance of his harem.

This establishment is still kept up with the ancient etiquette. There is still a Kislar Aga,—"superintendent of the women,"—now styled Darsaadet Agassi, chosen among the black eunuchs, but who no longer retains any political influence whatever. The female train in the harem consists of about 300, composed of the Kadenis or Sultanas, the Ikbals who are next, Odaligeus, and the attendants, besides eunuchs. First in station are the Kadenis, who may be of the number of seven, and are accounted the wives of the Sultan, but he is prohibited from marrying any of them who are slaves. It is now become authentically known that jealousies, with consequent intrigues and broils, constantly prevail amongst those high placed rivals, and that they lead but a very unenviable existence. One of the Kadenis, of great beauty and attractions, being an emancipated Circassian, and therefore espoused by the ceremony of nikiah to enter the harem, after having for some years been a ruling favourite of the sultan's, was not long since divorced. She was then by the imperial order wedded to a military pasha, and of a sudden exiled, unequipped, with her husband to Brussa,—a proceeding considered very harsh, owing to her former station,—without any assigned cause, though various were surmised. Such is one unique epitome of the vicissitudes in the drama of seraglio life. Sisters and daughters of the sultan are married to pashas at an early age, as are also the daughters of these princesses. But no male offspring of theirs has yet survived the sanguinary custom of the seraglio officials, more powerful even than the will of the sultan, by which they are strangled at their birth. Sorrow for such bereavement caused the death of one mother, who was a daughter of the late Sultan Mahmoud.

The sultan is not obliged to be present, and very rarely is at fires. An inflexible usage requires his public attendance at midday prayer in one of the mosques every Friday. This is never omitted, save when arising from serious illness, and absence is always apt to breed dangerous surmises and discontent. Instead of Highness, as formerly, the sultan is now styled Majesty or Imperial Majesty by foreign courts, and always by the higher title in Turkish etiquette. The office of Grand Vizir had been suppressed towards the close of the last reign; but it was renewed under the present. He is not only Prime Minister but Vakeel or Vicegerent of the Sultan, and is usually called the Saadi Azem, literally Great President. Next in dignity is the Sheikh ul Islam, the chief judge of the law and faith. Other ministers and functionaries take precedence, as follows:—The two Presidents of the Councils of Afkiam Adlié and Tansimat in like succession; the Seraskier, who is commander-in-chief and minister at war; the Capudan Pasha, or high admiral; the Malleyé Naziri, minister of finance; Harigié Naziri, minister for foreign affairs (formerly called Reis Effendi); the minister of public instruction, Marif Naziri; the Zarbhané Emini, master of the mint; Tigiaret Naziri, minister of commerce; Dāavā Naziri, minister of justice; Efkaff Naziri, administrator of

[1] The ablest of the Turkish literati of the day, however, affirm it to be derived from the Chinese *Changar, White Eagle*, a title still given to Tartar princes, and pronounced in different Eastern dialects *Songar* and *Khongar*, whence, with a slight variation, the Turkish *Hunkiar*.

Statistics.

mosque property and charitable trusts; and the Zabhé Naziri, minister of police. These personages form the ministry or cabinet. Pashas have long ceased to be distinguished by the number of their tails. Those of three, who were also vizirs, are now styled Mushirs, equivalent in military rank to marshals. The pashas of second class are Feriks, equivalent to lieutenant-general. Those of the third class are named Mirmiran when in the army, or brigadier-general; in the civil service they are called Lima. European foreigners in the Turkish service and Christian subjects of the Porte have also been made pashas of inferior grade, without changing their religion,—some from merit, the most part from intrigue and patronage. Heads of official departments have each their separate establishments and functions, the highest also their Mustéshars or coadjutors, each with an immense staff of clerks, who are termed of the "Kalem," literally pen, as denoting a government office. In the Afkiam Adlié or supreme council are discussed and determined all important matters of state; it is also a court of appeal or revision for causes, civil and criminal, judged in other courts. The other grand council of Tansimat takes cognisance of all matters relating to the internal administration or home department, projects for railroads, &c. The war and admiralty offices are situated apart. All other business of the state is conducted at the Porte, called the Babaliyé, and Bab Humāyoun, or the Sublime Porte, as the Turkish government itself is also designated, but often without the epithet "Sublime" in our diplomacy.

The seat of the Divan or Council of the Porte, formerly described as of mean appearance, is now the Great Saloon of the Arz Odassi,—the superb court-room of the Grand Vizir, and his Highness, as he is styled; and his colleagues have all their commodious, stately apartments for the usual transaction of business at the Porte. It is contiguous to the old seraglio, at the entrance of the Golden Horn, which has not been used as the imperial residence since 1826, when it was transferred to one of the palaces on the Bosphorus, where is collected all that forms the court, and where audiences are given to foreign ambassadors.

Turkey in Europe is divided into nine eyalets or provinces, which are those of Adrianople, Bosnia, Silistria, Roumelia, Macedonia or Salonica, Widin, Nish, Yanina, and Candia. Asia Minor or Anadolia contains twelve eyalets,—Brusa, Aidin, Castamboli, Angora, Sivas, Trebisond, Harput, Van, Diarbekir, and Gerāir, or the islands of the Ottoman archipelago in Asia. In Syria and Palestine there are three eyalets,—Aleppo, Damascus, and Sāida. In Arabia, two,—Jedda and Yemen. In Africa, Egypt and the Soudan form two eyalets; Tripoli, in Barbary, a third; and Tunis is still counted as a fourth. Servia and the two Rouman principalities on the Danube, as tributary under the suzerainty of the Porte, also form part of the Ottoman dominions.

The power of life and death has long been taken away from provincial pashas, save the Viceroy of Egypt, to whom it was granted in 1852 for seven years, now expired. And according to the last Hati Humayoun, no penal sentence can legally be passed against any individual without previous trial before a criminal court. But there is none yet established in a great part of the interior,—an anomaly which leaves scope for following the barbarous forms and practice of the old law. Mushirs who command eyalets receive salaries amounting to L.600 a month, and Kāimakams of sangiaks according to their rank. They do not, as in former times, on payment of a small sum to the Porte, collect the revenue on their own account. For each eyalet there is a Defterdar or receiver-general of taxes, the quota of which for every caza or parish is known and registered at the Porte, and the individual assessments are settled among the communities themselves. An aggregate is thus to be accounted for to the imperial treasury, any deficiency in which can easily be detected. This applies to the fixed annual contributions. Variable imposts, as tithes and customs, are farmed at the capital in mass to contractors, who re-let the tithes in minor lots. Both principals and sublessees may lose as well as gain by the bargain. In 1839-40 the experiment was tried of levying direct those variable imposts, through local governors named mohamls; but owing to the enormous defalcations, it failed, and has never since been renewed. So that as no effectual checks can be devised to render those large branches of revenue otherwise productive, the system of farming them, though most vexatious, generally continues.

Administration of the law.

The Hati Humayoun of 1856 proclaimed an equality of civil rights and justice for all subjects, as far as compatible with the fundamental laws and institutions of the empire left subsisting. Courts in which ulama judges preside, from the cadi-el-asker's at the capital to the mekemmé of the rural cadi, have always the exclusive jurisdiction in causes relating to real property and many others. Those courts are universally corrupt, every case of importance being decided by personal bias or bribery. Even when that is not the case, such is the strictness of the letter and forms of the law, that it is almost indispensable to establish even the right by false witnesses, by which process wrong is done habitually without scruple. The code in force being that of the Koran, which rejects all evidence against Mussulmans save of those of their own faith, and the judge being always inclined to favour that side in suits between them and other parties, it is in such cases almost impossible for rayas to get justice. The Tigiaret or commercial, and the criminal courts, profess to observe some rules of European law and equity, and to admit every sort of evidence without distinction of parties or creed. But all those tribunals are more or less tainted with the same vices as the rest. The members acting as assessors not being paid, do not always choose to lose their time for the public, unless they are members of a ruling clique, and find it their interest to attend, especially at the Tigiaret. Delegates from the Christian communities are members of the criminal courts, but from timidity and venality they are generally found obsequious to the dictum of their Mussulman colleagues and president. However defective the application of the law, still an immense step was gained in the interests of humanity and equity by the recognition of the validity of Christian testimony for the conviction of Mussulman criminals. This was at first confined to the police court at the capital, but it was afterwards introduced into several of the provincial courts through the influence of Lord Stratford de Redcliffe, the British ambassador.

Statistics.

The great merit of the Hati Humayoun of 1856, is the declaration of entire liberty of conscience, which has been so fully observed, that some Mussulmans, converted to the Protestant doctrines of Christianity, enjoy unmolested, as Ottoman subjects, the exercise of their adopted faith at the capital and on their journeys beyond it. No other social benefit has yet emanated from an ordinance to which great political interest was attached, and which was viewed as the installation of a new era in the Sultan's dominions. No diminution of the multiplicity of administrative abuses has yet ensued. Already the Hati Sheriff of Ghulhané has cut down the arbitrary power of the pashas, and abolished their wonted vexatious exactions for their maintenance when travelling, relieving also the raya peasantry from the corveé or forced labour for the State or powerful Turkish proprietors, to which they were previously subjected. The same edict re-established the municipal councils (medglisses) in the provinces, admitting deputies from the Greek and Armenian communities as joint members. Besides taking cognisance of all local matters of public importance, these assemblies are also courts of justice, for the primary hearing or on appeal of almost every variety of causes, being guided in points of law by the ulama judge. As all petitions must be addressed to the pasha, he retains a large discretionary power in the course he may pursue in any suit, and may imprison or not in the first instance any party complained of, or decline letting the case proceed to judgment. Thus, much will always depend on the personal character of the pasha, whether he is inclined to be equitable or oppressive. Amongst other changes of late years, is the formation into a separate community, by imperial charter, of the Protestant subjects of the Porte, chiefly seceders from the Armenian Church, and partly from the Greek and other sects. The proselytes of American Presbyterian missionaries have their own recognised elders and places of public worship.

Whilst raya subjects of the Porte labour under the distinctive disabilities described, the Hati Humayoun of 1856, treating their emancipation as complete, rendered them liable to military conscription for the first time. In commutation a tax was imposed on them called "asker bedéle," army contribution. Under another name it restores the ancient haratch or capitation tax of 15 to 80 piastres, 2s. 6d. to 13s. for each person, according to the class, which had been abolished, and is now usually doubled or trebled in amount.

Such is the actual position of the sultan's subjects, Mussulman and Raya; nor is it to be assumed that the former may not have their wrongs to complain of as well as the latter. All amelioration of the country depends in substance on the sincerity and capacity of its chief rulers and on the selection of provincial governors. Reform to be effectual in Turkey must begin at the highest seat and source of power; and it might be too much to affirm that there are not men qualified to undertake and perform the task, had they the necessary power, and therein lies the difficulty. By the reference in the treaty of Paris to the Hati Humayoun, then recently issued, the Porte gave a virtual pledge to the five powers and to the world, that its salutary provisions and spirit should be carried out; and although all foreign interference between the sultan and his subjects was rightly excluded, in order not again to afford a dangerous handle to Russia, this cannot supersede friendly counsel and warning on emergency.

Religion and laws.

The Osmanli are all Mohammedans, and Islam is the religion of the state; but all other religions are freely tolerated, and with their professors the Osmanli live in the utmost harmony. Both the law and the religion being founded on the same common basis, the Koran, the clergy and the lawyers form but a single order,

Statistics.

divided however into two classes, the ministers of religion and the ministers of justice; for the prayers and ablutions prescribed by the Koran are so numerous and so frequent, that the ministers of religion could never find leisure to execute the office of a judge; they form therefore a separate class, leaving the administration of justice to the cadis. Every Osmanli is entitled to become a member of this body, but he must first receive a suitable education. After a few years' study, and an examination of his capabilities, the candidate may be admitted to the service of a mosque; but having once become an Imaam, his career is closed, unless on a new examination he is found eligible for the judicial order. Those who aspire to higher honours continue their studies for a longer time, and, after several examinations, obtain the rank of *mulazim*, which entitles them to hold the office of deputy to a cadi or judge. If their ambition urges them still farther, and they wish to obtain the degree of muderis or doctor, their novitiate must be continued seven years longer, and they undergo a final examination in presence of the mufti. The title of muderis being once conferred, the first dignities of the magistracy lie open to their hopes. The classification, however, does not end here; the muderises of Constantinople are divided into ten classes or degrees, from the first of which only are chosen the supreme magistrates of the state. This exact organization gives to the clerical body a firm coherence, which makes it the most solid part of the Ottoman institutions. Its unity is secured by the controlling authority of its head, the grand mufti, or sheikh-ul-islam, from whom depend all the appointments to its various ranks and offices, while the members have all a common interest in maintaining its privileges. Of all the offices in the state, that of grand mufti, or sheikh-ul-islam (chief judge of the Moslim faith), is alone held for life. He is the oracle of the law, and the representative of the khalif or sultan in his spiritual capacity; and as all new laws, and even the question of peace and war, must await his sanction, he thus participates in the legislative power of the sovereign, and interferes with all the movements of the government. The privileges common to all the members are exemptions from taxes and arbitrary imposts, arbitrary confiscation, and the punishment of death. They are sufficiently enlightened to understand their interests; the prerogatives on which they depend are of the most solid and important nature; their chiefs are bound to them by the strongest ties, or are proved by long novitiate or repeated trials; they unite the firmness of an aristocracy to the spirit of a profession; in fine, their influence has naturally such a good foundation, and is so artfully fortified, that it would be extremely difficult to overturn it. But all the advantages which result from their combination are exclusively their own; they cannot resist the arbitrary violence of the sultan, but they can impede the alterations of the law. Their power is founded on the false principles which would arrest the progress of civilization, and they are the natural supporters of the present state of things. In the Ottoman empire there is nothing of a solid construction, except this bulwark against innovation. It is difficult to reform law and religion, even when taken separately; but when united, they offer an inert, or even an active resistance, sufficient to baffle the strongest efforts of the best-intentioned despot. The whole body is termed the Ulama.

To give, however, a precise idea of this important body, we should begin with the students, who are called softas. There are schools or colleges, named medessés, established in all the imperial mosques in Constantinople, Adrianople, and Brusa. The pupils first study grammar, and then Arabic and Persian poetry, and rhetoric. When considerably advanced in the Arabic language, they apply themselves to the reading of the Koran, the commentaries upon it, and the books which treat of the civil law. Finally, they study logic, natural philosophy, and metaphysics, in old Arabic works. Totally neglecting mathematics, they also study judicial astrology, as the most sublime branch of human knowledge. Such is the sum of information possessed by the softas. They are chiefly from Syria and Asia Minor, very few being from European Turkey. They are the most savage, the most fanatical, the most turbulent, and the worst subjects among the Turks. Their number also is so considerable, that Constantinople alone contains about 4000 of them. They perform, in their clerical quality, the services of the mosques; their daily sustenance is regularly furnished out of the revenues of these temples; and they are lodged in the numerous cells annexed to them. But as most of them are poor and unprotected, it is very seldom, and only when at an advanced age, that any of them attain the chief clerical dignities. The student who has neither patronage nor distinguished talent to carry him through the ten degrees of muderis or doctorship, which lead to the higher dignities of the law, aspires only to inferior offices; and the greater number of them reach only the rank of simple cadis or judges of Naïb, or subdelegates of the judges in the towns and villages. Riches, birth, and patronage, the powerful instruments of worldly advancement, exercise their usual influence in this body. The first step of promotion is, when, after many previous trials, the student is inscribed in the list of those who aspire to legal offices, and as such, upon the mufti's verbal intimation, called *ishviet aliyah* (the high wink), obtains a written document from the supreme judge, denominated *mulasimet gayadi* (the writing of reversion). Next, if the mulasim acquit himself well in the prescribed trials, he obtains a *medrese* of the lowest income, and afterwards advances, by regular gradation, to the highest rank of the medreses, that of the suleimaniyeh, and then the eldest among them are promoted to the rank of *mahrejmolla*, or superior judges. These posts of mahrejmolla are eight in number, namely, those of Galata and Eyoub, suburbs of Constantinople, Scutari, Smyrna, Salonica, Larissa, Haleb, and Jerusalem. Their function however lasts only a lunar year, when they are succeeded by others. The next step of promotion by seniority is to the four superior mollaships of Adrianople, Brusa, Damascus, and Cairo; the next step to the two titular mollaships of Mecca and Medina; and one is further promoted to the rank of Istambol-effendi, or master of the police of Constantinople. The next step from this rank is to that of kadi-asker of Ana-doli, and then to that of kadi-asker of Roum-ili or European Turkey, and finally to the supreme rank of grand mufti. The grand mufti and the two kadi-askers always reside at Constantinople. Another of the members of the ulama is the nakib-ul-eshraf, or chief of the emirs. There are also four whose function is within the sultan's palace.

Statistics.

Before a simple softa can arrive at the high dignities of kadi-asker and grand mufti, a period of twenty-five years may elapse; but the great ulama, vizir, and other officers, abusing their power and influence, procure for their children from an early age the honorary title of muderis, and afterwards of the other degrees of office, without their ever filling them.

Besides the chain of the ulama, there is yet another class of personages who have a certain religious character, they are the sheikhs, or superiors of tekiehs (dervish monasteries), and subject to the authority of the sheikh-ul-islam. Those are distinct from the sheikhs called *vais*, as preachers in the imperial mosques, and who have, like the chain of the ulama, an actual course of advancement according to the ranks of their respective mosques. There are at present seventeen mosques in Constantinople which bear the title of *humayoun* (imperial). The late Sultan Mahmoud was desirous of building a new imperial mosque, but could not, as not being in accordance with law, which required that it should be out of his own funds, and in some quarter where requisite, neither of which conditions could be fulfilled.

The whole system of internal administration in Turkey was directed to the accumulation of money. Before November 1839, every office was sold; corruption pervaded every department of the state, civil, legal, and ecclesiastical; and under its baneful influence the provinces have been made deserts, and the empire brought to the verge of ruin. The late Sultan Mahmoud, indeed, made many vigorous efforts to reform abuses; and his successor Abdul Medjid (servant of the mosque) issued a hatti-sheriff, published 3d November 1839, promising to seek, by new institutions, to procure for the provinces of the empire the benefits of a good administration. These institutions relate principally to three objects—first, guarantees for the security of honour and property; second, a regular mode of fixing and levying taxes; third, a regular mode of levying soldiers, and fixing the duration of their service. This edict has been pompously called the Magna Charta of Turkey; but such deep-seated corruption and abuses as we have described are not to be cured by edicts.

Revenue.

The mode of collecting the revenues of the state has undergone various radical changes. In the simple institutions transmitted to the Turks by the Arabs, direct taxation was an essential element. With the exception of the haratch or capitation tax levied on the rayas (now Mussulman subjects), the whole regular revenue of the state used to be derived from the miri, a sort of property-tax, of which, the aggregate for each large district being fixed, the assessments for each town, village, and separate community were regulated among the inhabitants themselves, as apportioned by the municipal council of the principal district town. When, however, Mohammed II. introduced the system of farming the revenue, he subverted the functions of those municipal councillors, who, as members of the provincial divan, says D'Ohsson, could interpose their influence against oppression; but no longer with the same weight, when the pashas had purchased their places and the revenues attached to them. Some of those municipal notables continue to retain the title of ayan with considerable local influence, but they are not recognised under that name in the actual municipal system, which is otherwise precisely on the old model, revived and enlarged.

Indirect taxes had long been introduced of the nature of our excise, as well as the customs on exports and imports, which are still levied, and extended to home trade. By the separation of

Statistics. Greece, some loss of revenue has been sustained; the tribute from the Danubian principalities and Servia is small but certain; that from Egypt—an acquisition since it was reduced to submission in 1841, as, for some years before, Mohammed Ali paid nothing. Systematic taxation, with a greater degree of order in the empire, has also been extended to various portions of it in Asia and Europe, and to Arabia, which were before unproductive. On the other hand, the regular expenditure of the army and navy, and of the civil service, has increased many fold, besides the burthen left by the late Russian war, and the excessive cost of the sultan's personal establishment. The revenue for 1859 is as follows:—

	Piastres.
Property tax	276,000,000
Tithes	351,000,000
Customs	201,000,000
Tribute from dependant provinces	47,000,000
Metallic piastres	875,000,000
At the rate of 124 piastres per pound sterling, =	L.7,060,000
Other miscellaneous duties and taxes on tobacco, silk, &c., piastres	210,000,000
Surplus over expenditure from vakouf or mosque, and other religious and charitable endowments	56,000,000
Paper money piastres	266,000,000
At mean exchange of 160 piastres per L.1 sterling, =	L.1,660,000
Total in sterling	L.8,720,000

Of this the interest on loans to the amount of twelve millions made in England absorbs about L.720,000, leaving a balance of eight millions sterling, but vastly curtailed by the exorbitant cost of advances upon it made by moneyed parties at the capital, to meet the pressing exigencies for the day of the imperial treasury.

The budget of 1859 is—

	Piastres.
For the Army	312,000,000
,, Artillery, warlike stores and fortifications	80,000,000
,, Navy	60,000,000
,, Internal administration	134,000,000
,, Public instruction and schools	31,000,000
,, Tribunals	5,000,000
,, Police and guards	95,000,000
,, Civil list	144,000,000
Total	861,000,000
Equivalent to	L.6,200,000

The civil list does not represent the sultan's real expenditure, which has no limit but the imperial will, and the means of supplying its exigencies.

The debts of the palace, including those of the harem, amount to above L.4,000,000 sterling. On account of the insatiable drain on the revenue under those two heads, with the enormous salaries drawn by personages of the highest rank, whilst the pay of the armies is in arrear,—and that of the officers of the lowest grades is miserably scant, great discontents prevail, of which the late conspiracy was a dangerous symptom. So many offices have been accumulated by the actual minister-at-war, that his receipts from the public treasury are reckoned at 350,000 piastres, about L.2200 a month. There are a vast number more of mushirs receiving L.600 to L.1500 a month, besides plunder and peculation on a large scale always going forward. It is not surprising, therefore, that the advances raised on the current revenues at any sacrifice should have cost 250 millions of piastres, L.1,700,000, in a year and a half; and that the finances of Turkey should have become involved in the deepest disorder and embarrassment, such as to threaten a collapse. But this does not necessarily follow. The late Sultan Mahmoud paid off a war indemnity to Russia of ten millions of ducats, nearly five millions sterling, without imposing any new taxes. But a survey is going forward at Brusa of all real property in the district, which is progressively taxed at the rate of two-fifths per cent. on the value, and 4 per cent. more per annum on all incomes derived from it, whilst all other incomes, down to that of the common labourer, are assessed at 3 per cent. This has doubled and trebled the previous amount of those contributions, without, save rarely, causing any hardship. As the system comes to be extended to other parts of the empire, a great increase of revenue must ensue, which might suffice to free the treasury from embarrassment, and meet all necessary expenditure. But without thrift and economy, any amount of money flowing into it would be of little avail; a grand reform needful in Turkey is, therefore, to cut down the exorbitant salaries of the great, increase the lower, and reduce the imperial expenses to what is requisite and adequate to support the dignity. Indeed it is difficult to see how the present order of things in these respects can possibly long continue. Statistics.

There is one great defect in the financial, as it is also in the social and political system of Turkey, arising from the principle of centralization, which Reschid Pasha borrowed and introduced from the institutions of France. On framing the edict of Ghulhané in 1839, or Tansimat, as it is otherwise called, whilst he re-established the municipal councils, he swept away the funds belonging to each muncipality applicable to local purposes of utility, as the construction and repair of causeways, bridges, &c., and included the whole of the special dues hitherto levied for such uses in the general contributions payable to the government. Petitions must therefore be addressed to it, and long delays occur in obtaining grants for those local exigencies which are very sparingly doled out, and often neglected or refused. The consequence is, that great thoroughfares in the neighbourhood even of large towns are in a wretched state, and almost impassable in heavy weather in winter, or after heavy rains; and the country has fallen greatly behind within twenty years in this respect. Some provision is made in the new system of taxes initiated at Brusa for municipal purposes, but on a small scale.

Army The effective of the Turkish army in the present year (1859), with 150,000 men on the rolls, is 112,000 to 115,000 infantry, cavalry, and artillery, besides 210,000 trained redif, liable to serve as soldiers when called upon, 85,000 more redif, forming the retired reserve after twenty years' service; and 69,000 zabtiés and seymen, armed irregulars, who act as guards and policemen throughout the empire. The effective regular force is divided into five armies or corps,—that of Constantinople (Darsaadét), of Roumèli, stationed at Monaster, of Anadoli at Erzeroum, of Arabistan at Damascus, and of Irak at Bagdad. Each of those armies is commanded by a mushir or marshal. The grand vizir has still the power, even if a civilian, to place himself at the head of the army in time of war, but no longer does so; his title would then be Sirdar Ekrem. The monthly pay of the officers is as follows:—

Mushir, 75,000 piastres	=	L.470	0	0
Ferik (lieut.-general), 15,000 piastres	=	94	0	0
Levâ (brigadier-general), 7500 piastres	=	47	0	0
Mirattai (colonel), 3000 piastres	=	19	0	0
Binbashi (major), 1500 piastres	=	9	10	0
Your Bashi (captain), 400 piastres	=	2	10	0
Mulazim (lieutenant), 250 piastres	=	1	8	0

There are besides rations, which, for the mushirs, may amount to two-thirds of their pay; for inferior pashas and other officers, much less in proportion.

Navy The Osmanli have never been a maritime people, nor paid any attention to the art of navigation. Their military navy, after its triumphs in the fifteenth century, was long neglected; but at last, into this department, as into every other, the Sultan Mahmoud infused his energy, and succeeded in creating a very respectable fleet.

The Ottoman navy at the same period (1859), consists of 3 screw and 5 sailing ships of the line; 2 screw, 5 paddle-steam, and 2 sailing frigates; 6 steam corvettes, and 20 war steamers of smaller class; 3 sailing corvettes, 6 sailing brigs, 12 sailing cutters, and 4 new steam gun-boats for the Black Sea service. These vessels are all manned, and in an effective state for sea. There are building, and recently laid on the stocks, 1 screw ship of the line at Constantinople, and 2 screw frigates of very large dimensions, one at Nicomedia, and the other at Ghio (Ghemlek). The fleet, or any division of it, is so seldom sent out to cruise, that the crews have little practice as seamen. Their discipline has, however, been much improved of late years; and the men under the training of a captain (balare) of the British navy attained great excellence in gunnery, both for quickness and precision of fire. The port-admiral at Constantinople, with the title of Pasha, is now Sir Adolphus Stude, K.C.B., a captain in the British navy.

Literature and science There is no nation more passionately attached to literature than the Osmanli; and from the earliest periods of their history they have devoted themselves to its cultivation. Their dialect is the most polished of all the Turkish idioms; rich, dignified, and melodious. In delicacy and nicety of expression it is not perhaps surpassed by any language; and in grandeur, beauty, and elegance, it is almost unequalled. In poetry they display great genius and taste; all classes are its ardent admirers; and to so great a degree has the love of poetic composition been carried, that there is no class of society which has not contributed towards it. The ladies, the sultan, his ministers, doctors, soldiers, all have devoted themselves to the cultivation of poetry; and the divans, or poetical collections of above 600 authors, are existing evidences of the taste of the Osmanli for the productions of the Muse. In the kindred

Statistics.

department of the drama, they are, however, sadly deficient, for they have no theatres; nor have they opportunities of cultivating oratory. In philosophy they have all the speculative knowledge of which the Greeks and the Arabs were masters. In moral philosophy, and in the sciences of government and political economy, they are said to excel; which is the more surprising, as our ideas of the Turks and their polity would lead us to a very different conclusion. In history they possess several good works, particularly those of the early periods of the empire. There has been also a regular series of imperial historiographers; but, generally speaking, of all the branches of knowledge, history and geography are the most neglected by the Osmanli. From the earliest periods, they possessed the best masters of astronomy; and they have a multitude of astronomical works, many of which display great science. In many of the mosques of Constantinople are to be found solar quadrants, fitted for taking observations; and astrolabes, telescopes, and other instruments of their own manufacture, some of them extremely well constructed, are in frequent use. Geometry, algebra, and arithmetic are considered among the necessary acquirements of a man of education; and a course of these sciences forms a portion of the studies of their schools. In the science of numbers their proficiency is very great, and the facility with which their calculations are performed has been frequently observed. On these subjects they possess many excellent works. Their philosophical productions are very numerous, but their speculative and metaphysical writings are similar to those which issued from the schools of Europe during the reign of the Aristotelian philosophy; and it must be admitted, the philosophy of Bacon and Newton has not yet shed its light over the Ottoman empire. Their moral philosophy is, however, a science on which they seem to have bestowed their best energies; it is the subject of many excellent and valuable treatises. Their mode of conveying the principles of morals, by means of imaginative discourses and apologues, adds great force and beauty to the sentiments; and strewing the path of knowledge with flowers, renders the acquisition of it at once agreeable and impressive. The foreign languages which they most study are the Persic and the Arabic, and many Turks are authors of Persian and Arabic works. Only two centuries ago the literature of Turkey surpassed that of Europe; and it was from a Turk that d'Alembert took the idea of the *Encyclopédie*; but unfortunately the want of the press has kept them stationary, while, by its aid, Europe has been making rapid strides in both literature and science. A Turkish printing-press was for the first time established at Constantinople in 1726; in the course of fourteen years it published twenty-three volumes, and then ceased. After an interval of more than forty years, the experiment was repeated. During the reign of Selim III., printing became a part of the new order of things, and the establishment was fixed in the barracks of the new troops at Scutari; but when the revolution of 1807 broke out, the whole was reduced to ashes, and few of those connected with it escaped the fury of the janissaries. During this second period of its existence, not more than forty volumes issued from the press. It was, however, a third time restored by Sultan Mahmoud, and established at Constantinople itself, and continues to issue a number of important works. It is, however, still a government undertaking, and no private individual or company seems ever to have thought of introducing this useful art as a branch of trade for the extension of general literature, although there are various private presses for the printing of newspapers, occasional pamphlets, circulars, official or commercial, and the like. The government publishes a state gazette in Turkish, under the title of *Jacvim Vakayé* (Record of Events), which contains new ordinances, or other official papers, and gives an account of official appointments, and court or other public ceremonials. There are besides the *Géridié Havadis*, in Turkish, a paper giving general news; in French, the daily *Journal de Constantinople*, now bought up by the Porte; in English, the *Levant Herald*, of recent origin; three Greek newspapers, printed in the Greek character, but one in the Turkish language; two Armenian newspapers, one of them in the Turkish language; one Arabic; one Bulgarian paper, in Sclavonic and the Cyrile characters; and one Jewish, in the Hebrew character. A French paper, called *La Presse d'Orient*, was suppressed by the Porte for an offensive article relative to the object of the late conspiracy. The government follows the French imperial system of *avertissemens*, or warning to the press on the like occasions; and every new paper projected must have a special permission from the Turkish authority before it can appear.

Owing to the multitude of offices connected with the law and religion which can be filled only by those who have been qualified by a regular course of study, the number of those who possess the requisite elementary acquirements is very great, and the means of education are most abundant. The schools divide themselves naturally into those for children, or A, B, C schools (*mekteb*); the general instruction given at the mosques (*dersi-aam*); and in the colleges (*medresses*). In the children's schools, which abound in every corner of the city, the master (*khoja*) teaches spelling, reading, and the principles of grammar and religion. In the mosques, again, the pupils receive general, easily intelligible, and popular instruction upon philology and religion, as is indicated by their title of *dersi-aam*, which means general instruction. The lecturers are not khojas, but *muderis* (doctors or professors) of a medress or college. Lastly, in the colleges, the students receive instruction in the higher and more difficult branches of knowledge. These colleges, usually founded beside mosques, libraries, monuments, and sometimes unconnectedly, are presided over by a professor (*muderis*), which, however, may be better translated rector, master, or head of the college, because he superintends not only the course of instruction, but likewise the conduct of the students who dwell in the medressés, as scholars upon the foundation. Out of about 360 such medressés existing throughout the empire, Constantinople alone possesses 240. The most celebrated are those founded by the conqueror Mohammed II., and by Solyman the Great, in connection with their respective mosques. As in Islam all instruction is founded upon religion, and jurists are at once theologians and lawyers, it is natural that mosques should always have been the central points round which scientific institutions are grouped. Thus in the Constantinopolitan mosques are found united the learned institutions, not only of general lectures and of the medressés, but also of libraries; and, finally, other three establishments for education, unconnected with the medressés, and specifically founded. These are the school of medicine attached to the Solymaniyeh mosque, and the lecture-rooms of the Koran and of tradition. Sultan Mahmoud reformed the medical school, and founded a nursery of physicians and a school of surgery, from which the military hospitals now established at Constantinople are supplied. He enlarged the school of engineers founded by Sultan Selim, and connected with it a school of architecture. He also instituted a naval college; several other educational institutions were also established in his reign, both by himself and by private persons. In the mathematical sciences, and especially in those branches most immediately applicable to the art of war, more was done under Mahmoud's reign than had been accomplished under all his predecessors. Under his son educational institutions have been augmented in number, well maintained, and the branches of knowledge they embrace enlarged. The existing public schools are the polytechnic (marif aliyé), the military (harbié), naval (bahrié), the school of arts, and the medical school.

Statistics.

Libraries.

At Constantinople there are a great number of public libraries. D'Ohsson estimates them at 35, there are now 47; but no works are arranged on the shelves, or included in the catalogues, but such as are written in the languages of Islam, namely, Turkish, Arabic, and Persian. All others are thrown aside as lumber, and left to decay. There is no good reason for supposing that the library of the Palæologi was destroyed by the Ottoman conquerors. Mohammed II. was an accomplished prince, the patron of letters, and versed, it is said, in the Greek language. On the conquest of Constantinople, he immediately took possession of the imperial palace; why, then, should he destroy the library? Yet it is now affirmed by the most accomplished of the Turks in European literature, that no ancient manuscripts of any value exist in the stores or vaults of the seraglio.

Manufactures.

Turkey is not a manufacturing country, it has but a very scant population to furnish hands for such labour, and could not pretend to compete with the science and capital of other European countries. But the rich products of its territory enable the inhabitants to obtain, in exchange, all the commodities they require from foreign countries, a mode found to be the cheapest and most suitable. They never could attain to the art of making woollen cloth, to which their nearest approach is a coarse felt, called abbā, always in great use for soldiers' great coats, and the rough wear of the common people. Angora was long famous for its camlets, called shallee. Constantinople, Brusa, Damascus, and Aleppo, with some other places, produced stuffs of silk, and of silk and cotton, as likewise interwoven with gold and silver thread, which were of considerable merit, and extensive sale in the country. All those fabrics dwindled away many years since on account of the introduction of cheaper British manufactures. In latter years, however, a futile attempt was made to set up factories for the production of cloth and various silk and cotton tissues; also glass and porcelain, to supersede the importation of those articles from other countries. It was a sort of mania originated by a powerful minister of the day; and no pasha or other personage of high rank was popular in the seraglio who had not his factory of some sort or other. In the natural course of things all this soon fell to the ground, to the serious loss of the projectors. There survive only some factories of the sultan's at Nicomedia, in most unhealthy sites, where, under the direction of European foremen, some fine cloth and silk stuffs are languidly produced for the use of the seraglio, costing over twenty

Statistics. times their worth, owing to the great capital and expenses wasted on those establishments. Turkey furnishes no manufactured article for exportation worth notice, save the carpets of Ushak, near to Smyrna, still in repute in this country from the solidity of their texture, and the durability and vivacity of the colours, whilst usually of grotesque patterns. The large quantities of cotton yarn, imported from England, are chiefly made up into coarse stuffs, woven by the women for household use among the peasantry, and partly into hand and bath towels; those last, however, are perfectly imitated and rivalled latterly in England. Still dresses and other stuffs of silk, or silk and cotton, are made on a very limited scale, unless in Syria and at Diarbekir, where they seem to be gaining ground,—the superior solidity of their texture being found more economical than British manufactures, with the local sale of which they are interfering. The Porte, however, takes the most effectual means which fiscal policy can devise to thwart and discourage home manufactures, rendering them, in common with other native products, liable to upwards of 13 per cent. of customs, on their transport by sea from one place to another for internal consumption. From this is exempted, because belonging to government, the most important manufacture which Turkey possesses: that of the red caps, called fez, worn by all the soldiers of the army and seamen of the navy, and the adopted national costume of the sultan and officials of every grade and order in the public service, whence, save amongst the Ulama, it has passed to the general population to become a distinctive part of the dress of Ottoman subjects.

Exports. The most valuable export from Turkey is raw silk, with the addition latterly of cocoons, chiefly raised in the Brusa district, where the silk is now nearly all reeled in filatures moved by steam according to the French and Italian method. The product there is worth a million to a million and a half sterling, according to the season, besides the silks of Adrianople, Amasia, and Syria. The other chief exports are wheat and maize, when in demand and the crops abundant; opium, and various other drugs and gums, dried raisins, currants and figs, wines, olive-oil, valonia, madder, gallnuts, carpets, wool, goat's wool, especially that of Angora, to a great and vastly increased amount, almost entirely for England; tobacco from Yenigé in Thrace, sent largely to France, for use in the state monopoly there of cigars; merschaum clay from Eski Sheir and Angora, for making the famed German pipes, emery, and sponges, besides a number of articles, as wax, honey, &c. of minor note. Turkey receives in exchange colonial produce and manufactured stuffs, of almost every sort; also glass, pottery, arms, paper, cutlery, bar-iron, steel, amber (for Turkish pipes,) &c.; and frequently corn from the Russian ports in the Black Sea, for the supply of Constantinople in especial.

Commercial relations between England and Turkey date so long back as the reign of Elizabeth; but the capitulations or treaties from that of Charles II. Till 1826, there existed in England a chartered Turkey company, in which was vested the exclusive privilege of trading with Turkey, and which named and paid the consuls from dues levied on goods. It was rightly abolished as an antiquated anomaly. The trade conducted by the members individually had dwindled away in their hands, save for colonials during the blockade in the latter part of the great continental war ended in 1814–15. Malta had then become a depôt for our trade in the Mediterranean; and, after the peace between Great Britain and Turkey in 1809, the Greeks, ever on the alert in discovering and developing new sources of trade, began making purchases of British manufactures at Malta. These were chiefly sent to Smyrna, and thence distributed to the capital and other parts of Turkey. Only two or three vessels annually with assorted cargoes, of which cotton goods formed but a small portion, went from England to Constantinople till 1812. In that year, an English merchant (Mr Black) established a house there, and for several years had the whole run of the direct trade. Thenceforward, Constantinople became a rival mart with Smyrna, which it soon entirely eclipsed in the supply of British manufactures. The Greeks next engaged in the direct trade, which went on increasing with great rapidity, and has been generally prosperous. In addition to the English there are now a number of Greek houses which trade with England from Constantinople; besides a number of Armenians and other Ottoman subjects, and most of the French, Italian, and German merchants. Those of various nations at Smyrna, in like manner, share considerably in the trade; others at Salonica, and a greater number at Beyrout, Damascus, and Aleppo,—the Syrian branch having become most important, from part of the goods for Persia taking that route. English merchants and manufactures still share in the business with Turkey; while the Greek houses in London have increased to 45, inclusive of 5 Greco-frank firms, having 12 branches at Manchester, and 16 at Liverpool. There is also one Armenian house in London, further 26 sole Greek establishments at Manchester, and 5 at Liverpool, and 6 Armenian at Manchester, making in all 111 Levant firms in England, enjoying respectable, and several first-rate, credit as capitalists. The purchases made in Britain being for the real wants of their destined market, and not merely speculative, the trade is rendered the more steady and safe. Constantinople, besides being in the direct course for Persia, offers the advantage of an intermediate market for goods going there. They are partly taken by steamers straight to Trebisond; and partly trans-shipped at Constantinople for that port, whence they are forwarded inland by way of Erzeroum. Till latterly, this was the sole line of transit; but Russia now affords facilities for landing the goods at Poti, and their expedition through Mingrelia; and, in vain, has the Porte been urged by England to arrest this rivalry by opening a good carriage road across the rude mountain track from Trebisond to Erzeroum. Statistics.

Previously to our commercial convention, of 1838, with Turkey, the regular customs there on imports and exports were three per cent. But British goods were subjected to a variety of vexatious imposts and dues on their subsequent circulation in the country; its products even were subjected to variable internal duties, arbitrary prohibitions and monopolies, all which were by the treaty abolished. It established free trade in all native products without exception, on payment of nine per cent. customs on arrival of the goods at the place of shipment, and three per cent. more on their embarkation for exportation. It fixed the customs on imported goods at three per cent. on landing, and two per cent. more on their sale or removal to any other place,—after payment of which, five per cent. in all, the goods may be sold and resold without further duty or impediment. This treaty did an immense deal of good both to British trade in rendering transactions certain and more easy, and to Turkey by giving our merchants right of access to deal with the native producers at first hand.

The productive resources and scope for trade in Turkey will always be limited by its scanty dispersed population; but these are undoubtedly susceptible of far greater development than they have attained. Its rich copper mines, mixed with the more precious metals, extending for hundreds of miles about Tokat, remain unworked, save in a feeble clumsy manner. It has at Heraclia, and at Koslov beyond, close to the Asiatic shore of the Black Sea, rich veins of excellent coal, the shafts and galleries for working which, opened by British engineers during the Russian war, have been doomed to neglect, and become flooded with water; and splendid forests of naval and other timber, on the Bithynian Olympus, the hills of Nicomedia, and along the south shore of the Black Sea, are suffered for the most part to waste their treasures.

The experiment is being made of a railroad from Smyrna to Aïdin; another more promising is in course of formation from Rassova on the Danube to Kustendgé on the Black Sea coast. Railway progress in the interior of Turkey will much depend on the success of the first essay. But the necessity is palpable for opening some practicable carriage roads through the country, the want of which condemns the cultivator to accept of a third or one-half the price for his corn at a distance from the coast which it is there worth. The same cause which thus paralyses agriculture cramps also the circulation of imports, and trade of every description. For ages the currency of Turkey has been in a disordered declining state, its piastre, originally equivalent to the Spanish dollar, fell in 1859 to less than 1½d. It has a gold coin, the medgidié, of twenty-two carats, worth about eighteen shillings, first issued at 100 piastres, but from a want of bullion, its value has fluctuated from 170 piastres to 130 in course of five months. There have been various projects, within a few years, of reforming and fixing the currency with the aid of a bank; but up to this date, they have been unsuccessful.

The interest of money on account of its scarcity even in a fickle paper currency, has become enormous in Turkey. Loans at eighteen to twenty-four per cent. for a year are common, and in provincial towns even as high as four to five per cent. is paid by the first merchants for the use of sums for fifteen to twenty days on emergency.

The total number of vessels that entered the port of Constantinople in 1856 was 17,868; tonnage (excluding that of 109 Russian vessels), 3,702,469; the number of those that cleared was 18,406, and the tonnage (with the same exclusion), 3,676,302.

The following were the principal nations to which they belonged:—

Countries.	Entered.		Cleared.	
	Ships.	Tons.	Ships	Tons.
Great Britain	2504	898,753	2837	864,454
Greece	3447	553,819	3523	517,301
Turkey	6204	693,583	6204	693,583
Austria	1898	643,350	1933	660,221
France	905	263,884	905	263,884

In the following year the navigation of the port of Constantinople with the principal nations was as follows:—

Turna || Turner.

Countries.	Entered.		Cleared.	
	Ships.	Tons.	Ships.	Tons.
Austria	1406	606,480	1404	647,236
Greece	2738	451,957	2713	394,913
Great Britain	1358	386,775	1348	384,696
Sardinia	1163	244,073	1163	244,073
France	465	150,493	465	150,493

At the port of Salonica, in 1854, there entered in all 117 vessels, with a tonnage of 42,595; and there cleared 112, tonnage 41,865. At Smyrna, in 1856, there entered 1772 ships, tonnage 442,253; and cleared 1750, tonnage 436,975. At Rhodes, in 1857, there entered 626, tonnage 158,185; and cleared 627, tonnage 158,407. At Suez, in the same year, there entered 55 steamers, tonnage 71,650; and cleared 56, tonnage 72,850. At Galatz, there entered and cleared 628 vessels, tonnage 99,785. The trade of the various parts of the Ottoman empire with Great Britain, in the year 1858, is exhibited in the following table:— Turner.

Countries.	Imports.	Exports.
	£	£
Turkey Proper	4,676,488	2,640,606
Wallachia and Moldavia	216,263	1,213,316
Syria and Palestine	774,416	150,150
Egypt	2,141,075	6,026,191
Tripoli and Tunis	11,295	5520
Total	7,819,537	10,035,783

Besides this trade with Great Britain, the Turkish empire has also an extensive commerce with France, Austria, and Russia; and an important commercial intercourse is carried on between its different parts. (D. S—D—N.)

TURNA, a fortified town of Wallachia. See DANUBE.

TURNAU, a walled town of Austria, Bohemia, on the left bank of the Iser, in the circle and 18 miles N.E. of Bunzlau. It has two churches, a theatre, and several schools; and is a place of some trade. Pop. 4500.

TURNEBUS, ADRIAN, one of the most distinguished scholars of the sixteenth century, said by some to have been the son of a Scotchman named Turnbull, who settled in Normandy in the end of the fifteenth, or towards the beginning of the sixteenth century. This conjecture is favoured by his French name Tournebœuf, which, when Anglicised, becomes Turnbull. Be this as it may, Adrian Turnebus was born at Les Andelys' in Normandy, in 1512. He was sent to Paris in his eleventh year, where he soon rose superior to all competitors, and is said occasionally to have shown more knowledge even than his masters. Toulouse was the place selected by Turnebus where he should begin the world as an instructor of youth; but his fame soon followed him, and brought him back to Paris in 1547. Here he attracted immense crowds of students by his great knowledge of Greek, his exquisite taste, and his genuine modesty. He shared with Muretus the fame of the university of Paris. In 1555 he was made Royal Professor, and ten years afterwards, this ardent fervid nature, so modest and so scholarlike, had to pass away from the scene of its triumphs. Turnebus died on the 12th of June 1565.

The works which he has left behind him bear ample testimony to the learning and genius of Turnebus. They consist, for the most part, of philological dissertations, critical commentaries, and translations of Greek writers into Latin. His son, Stephen, published the *Adriani Turnebi Opera*, Strasburg, 3 vols. folio, 1600; and his son, Adrian, brought out his *Adversaria*, in 3 vols. 1564.

TURNER, JOSEPH MALLORD WILLIAM, the great founder of the school of English landscape-painting—for Wilson, great as he was, must rather be classed as the last of the old continental masters, than the first of our new local masters—was the son of William Turner, an humble barber of Maiden Lane. In this poor suburb of Covent Garden, where Voltaire lodged when he visited England, and at No. 26, now a grocer's, over his father's shed of a shop, Turner was educated, if not born in 1775 (?); but the executors have still a doubt as to whether, in putting on Turner's coffin "aged 76," they were right or not. The date is, however, probably not far wrong. From the applications of the next of kin after Turner's death, it was discovered that the Turner family originally came from near Barnstaple; so that, indirectly, in Turner the county of Reynolds, Jackson, Northcote, and Haydon may claim another famous painter. On the north side of the lane, at No. 26, near the corner of Hand Court, Turner's father curled wigs, puffed and powdered toupeés, and sifted out his snowy dust, amid the usual smell of scorched hair and smoking curl-paper. As at that time great actors lived in and near "the Garden," the father, if he did not lay by money, must have earned many golden guineas by bending over shaved heads and wigs of hyacinthine curl.

The only son was destined for the same profession, and used to accompany his father to gentlemen's houses to observe how wigs were to be trimmed, how bags were tied on, and how the "patient's" complexion and age were humoured and flattered. But an accident soon showed the strong bias of the boy's mind, and the intense activity of the dominating faculty that already ruled him, and would rule him for ever. At the house of Mr Tomkison, whom his father and himself waited on, the boy saw on a salver a coat-of-arms emblazoned with a nosegay of heraldic colours, and with a raging lion either as a supporter or crest. He was delighted, and on returning home drew the heraldic monster from memory. The father was pleased, and encouraged the lad; and ever after, when the question of customers was, "Well, Turner, what's William to be?" the ready and decisive answer was, "William's going to be a painter." The course of true love for once ran smoothly and happily.

The boy became a painter, God's will and man's will for once going harmoniously together. The father bought the son water-colours and brushes, and he soon began to take his place among the founders of our English water-colour school—Girtin, Cozens, and Dayes. With Girtin, who was two years older than himself, he worked at print-colouring for John Raphael Smith, a crayon-painter and draughtsman, and an early patron of Chantrey, residing near the barber's shop in King Street, Covent Garden. He also attended a school for perspective, kept by one Thomas Malton, a writer on that art, and who mentioned him afterwards, in one of his works, as "young Turner, who imitates many of the great painters, and excels them all." Turner also occupied his "'prentice hand" in dashing in skies and foregrounds—*i.e.*, blue skies and dock-leaves—to enrich the designs and elevations of a now forgotten architect named Porden; an ill-paid occupation, that, however, gave the painter power and facility. Girtin already had probably led Turner's mind to landscape, and Cozen's practice led him to think of atmospheric effect.

The year Turner was born, Dr Johnson had visited Wales. In 1789, when the doctor had been dead for years, Turner was admitted a student of the Royal Academy, where he studied the figure, of which his sketch-books show many creditable examples, in outline and colour; and in 1790 he sent to the Somerset House Exhibition a water-colour view of Lambeth Palace, which was hung in a small room devoted to statues, drawings, miniatures, and wax models, where even "a Raphael" would have been buried. Slowly the young genius felt his way along the Thames and Medway before he launched into the full ocean of his great

Turner. ambition. In 1791 he exhibited "the Palace at Eltham," and "Swakeley House, near Uxbridge." At first walks on foot, long dusty tramps—then coach excursions and boatings—to "Malmesbury Abbey," "the Avon, near St Vincent Rocks," "St Augustine's Gate at Canterbury," "St Anselm's Chapel, Canterbury," "the Porch of Malvern Abbey," "Tintern Abbey," "the Second Fall of the Monach, in Cardiganshire." Perhaps, too, it was about this time that he and an artist named Cook, who afterwards became a stone-mason, visited Oxford—Cook by coach, and Turner on foot. Many years later he began to do the designs for the Oxford Almanac, which tradition said he continued to do from some early liking he had conceived for the stately city of learning, for in his first tour he had visited Oxford.

Even at this time, though his style was small, pale, and careful, there was power in Turner's work. He spread more sunshine over his paper, and filled it with more light, than other men could do. He was daring, too, in his search after new effect; and his "View of the Pantheon after the Fire in 1792," exhibited in 1792, and his "Rising Squall over St Vincent Rocks at Bristol" (1793), were hailed as proofs of a rising man, more daring than Zuccarelli or Smith of Chichester, and possibly a worthy successor of Wilson and Gainsborough.

As soon as it was discovered that Turner's works had a market value, need we say that patrons sprang up thick as mushrooms. Among the most conspicuous were Mr Tomkison, a pianoforte-maker in "the Garden;" Dr Monro, and Mr Henderson, who aided young artists and bought their works; and the Rev. Mr Crowle, whose special hobby it was to illustrate Pennant's *London*. Monro, it is said, first saw Turner's drawings in a window in the Haymarket or Maiden Lane; but he probably was introduced to Turner through his friend Cozens or Raphael Smith. "Girtin and I," Turner used to say, "have often walked to Bushy to make drawings for good Dr Monro at half-a-crown a piece, and sometimes we got our supper—and no bad thing either." It was the stormy daybreak-time of English art. There was no water-colour society till 1805, and the early watchers for the light died before the light came to their longing eyes. The younger Cozens, whom Beckford patronised, died in 1799 in a mad-house; Girtin in 1802, of consumption; and Dayes slew himself in 1804. Turner, the hardier and greater spirit, survived them all. Being known now as an excellent designer for topographical works, he became largely employed, in 1794, for Walker's *Itinerant* and the *Pocket Magazine*. He now ransacked England, and took blackmail everywhere of the beautiful and the wonderful. The Academy catalogues show that in 1795 he had already visited Oxford, Peterborough, Lincoln, Shrewsbury, and Wrexham; in 1796 he had seen Ely, Llandaff, and the Isle of Wight; in 1798 the abbeys of Yorkshire, the castles of Northumberland, and the fells and lakes of Cumberland. He became, also, known as a sea-painter, for in 1796 he exhibited "Fishermen at Sea;" 1797, "Fishermen coming on Shore at Sunset, previous to a Gale;" and 1798, "Fishermen Becalmed, previous to a Storm—Twilight."

Even at this time the critics—then harsher, cruder, and more ignorant than they now are—spoke highly of Turner's pictures. They called his colouring "natural and masterly," and pronounced his works the productions of an original mind. Even the dreadful Anthony Pasquin (Williams), who, we believe, to have been just, though stern and splenetic, eulogised "the coming man." Pasquin praised his genius and judgment; declared he copied no one, and had revived marine painting. His fame grew, and the most palpable proof of it was that, in 1799, when Flaxman succeeded Bacon as royal academician, Turner was elected associate. Upon this promotion, his restless ambition began to put forth fruit. He struck out new social paths, and he determined that the world should see he was getting on. He left his father's shop, and took a house in Norton Street, Portland Road, where he stayed three years, removing then to No. 64 Harley Street, where Malone and Fuseli lived. Hitherto he had ignored his full Christian name; now he figured in catalogues and court guides as "J. M. W." Hitherto he had only grappled with Thomson's *Seasons*, now he essayed to illustrate the Bible and God's great visitations on the wicked. In 1800 he exhibited "The Fifth Plague of Egypt;" 1801, "The Army of the Medes destroyed in the Desert by a Whirlwind;" 1802, the "Tenth Plague of Egypt." Stunned by these great works, mediocre people preferred what they could understand, and praised, with more sincere eulogy, the "Dutch Boats in a Gale;" "Pembroke Castle—Thunderstorm approaching;" "Fishermen upon a Lee-shore in Squally Weather;" "Falls of the Clyde;" "Edinburgh from the Water of Leith;" and "Ben Lomond." The result of these Scotch scenes was that, in 1802, Turner was elected R.A., his diploma picture being "Dolbaden Castle, North Wales," which is still mellowing within the academic walls. Turner.

This year, 1802, Turner, who had not yet visited, and never did visit Ireland, crossed to France; and for the first time set foot on the continent, ready for fresh conquests. Full of Wilson, Loutherbourg, and Vandervelde, he turned into a dark massive picture the first historical object he saw on landing—*i.e.*, the "*Pier*, with French boatmen putting to Sea, just as the English Packet is arriving." Turner, indeed, always retained a love for Calais, and made many drawings of its best points. From Calais he pushed on to Maçon to see the vintage, which he afterwards painted for Lord Yarborough. From thence he urged his conquests into Savoy and Piedmont, returning with materials for many future pictures. Years after, when Turner accompanied Mr Monro abroad, he took his friend to the Valley of Aosta, as one of the spots that had seemed to him, in earlier life, specially beautiful. This tour, beginning with the "Pas de Calais," was the first of many an annual tour, his silent absence in which caused much anxiety to Chantrey and his other attached friends. In 1807, the year of Wilkie's "Blind Fiddler," Turner exhibited his "*Forge*, and the Sun rising through Vapour." The story of his reddening the forge to injure the young Scotch artist's picture is utterly untrue. In 1807 Turner, who had already outshone Vandervelde and Wilson, began to make deep inroads into the fame of Claude Lorraine by commencing his *Liber Studiorum*, which Charles Turner, Mr Lupton, and others engraved. Turner himself was skilful in mezzotint, and possessed the most thorough and exquisite knowledge of engraving contrasts. As much as L.5000 has been offered for a set of early proofs of the "Liber," for which Turner gave only seven guineas a plate; one unpublished one, "The Man Overboard," is one of the artist's most famed conceptions of the ferocity of sea-storms. In 1807, Turner was elected Professor of Perspective in the Royal Academy in the room of Edwards, A., who wrote the *Supplement to Walpole*. Turner, however, from his singular want of expression, was a bad though conscientious lecturer, and entangled the young artist in a sad cobweb of lines and angles. Though for nearly forty-nine years academicianship, Turner missed sending his works to only four exhibitions, yet some of his greatest pictures were never seen by the general public. His "Gale at Sea," now in the Bridgewater Gallery; his "Wreck," now in the Turner Gallery; and his "Shipwreck," also in the same great collection, were never sent to Somerset House. In 1851 Turner was present at the private view, but did not exhibit. Even then he seemed breaking up fast. In December he grew rapidly worse, and after a few days' illness, died on the 19th, aged seventy-six years. A short time before his death he was taken to the window to see

Turner. the sun rise. His last thoughts were to behold God's world, of whose beauty he had been for sixty years so eloquent and profound an exponent. Turner left some sixty pictures, an immense store of engravings, and several thousand sketches and drawings in various stages. The paintings are now in the Turner Gallery at Kensington, but the money which he left to the nation, through a flaw in the will, has gone to the next of kin, irrecoverably. By his own request, Turner, whose early dream had been Westminster Abbey, was buried in St Paul's, near Sir Joshua Reynolds. Turner was a little stout man, with a coarse, red, weather-beaten complexion and eagle eyes; he had been handsome in youth, and, even in old age, when animated, happy, and at his ease, was pleasing in expression. In look he was something between a Dutch captain and a journeyman carpenter, but the sense of power and genius was always as a halo round him. He was never married; and an old housekeeper managed his rather forlorn house in Queen Anne Street. His old father, the barber, Turner always guarded with the staunchest affection. The old man tended and exhibited with pride his son's gallery, and dying in 1829, aged eighty-four, was buried in St Paul's, Covent Garden, where a simple monument was erected to his memory.

Turner's opinions on art are difficult to discover except from his works. Claude was his special rival in aërial beauty. Hobbima, he said, painted trees nearly as well as Claude, and better than Ruysdael and Wilson; Poussin he sometimes imitated; Reynolds and Girtin he talked much of; and it is thought he derived from Calcott the principle of the preponderance of light over shadow in a picture. Even by his most intimate friends, Turner in the course of his whole life was never known but once to condemn a living artist's work. Where he could not praise he was silent. Though obstinate, Turner often took advice and hints of subjects from friends; and when he painted one of his Trafalgar pictures, was untiringly patient in submitting to naval criticism. From friends he bore raillery, in his more fanciful works, not only with good-nature, but with all the chuckling enjoyment of a humorist. Turner's first residences were Maiden Lane, and Harley Street. In 1808 he went to the Mall at Hammersmith; four years later he removed to No. 47 West Queen Anne Street, Cavendish Square.

His country-house he kept up for some time, then exchanged it for John's Lodge, Twickenham—a villa in sight of the Thames and Sir Joshua's old house. From about 1828 till a short time before his death, when he took lodgings by the water-side, at Chelsea, he lived in Queen Anne Street, seldom seeing friends, but spending long days at the easel, and his evenings at the Athenæum Club. In society he was shy and reserved; but with bosom friends he unbent, and was shrewd, poetical, joyous, and cheerful. At the academy he was ever the staunch advocate of all efforts to keep that body independent of the government, and to reserve all its funds for the erecting an independent building. At the councils he talked much, but in a confused and obscure way; yet those who listened with respect and attention always found that Turner's views were sound and correct, and characterised by excellent sense and thorough honesty of purpose.

Turner's prices, from 1803 to 1815, were not large. His income, as with so many other men in this unjust world, began to increase just as his works began to grow more eccentric and wilful, and to decline in merit. From Dr Monro, the art-patron and the physician, who attended George III. during his madness, he had early in life gone away happy with half-a-crown for a night's work. Later he got a ready market for his rivalries of Vandervelde and Claude, at L.150 to L.200. But it must be remembered that the old masters were still dominant; any black daub from Italy commanded great prices; our national art was still in leading-strings, and noblemen were the only purchasers. Wilson only twice obtained more than L.100 for a picture; Calcott was scarcely luckier; Morland and Nasmyth painted for pawnbrokers, and to defray their tavern-bills. In 1810 Lord Yarborough gave Turner three hundred guineas for the "Wreck," a picture that would now sell for thousands. For a long time Sir George Beaumont's courtly condemnation kept down Turner. For his earliest fantasies (so weird and beautiful) of Venice—which he himself designated to friends as "scraps" and "rubbish," and which he probably painted partly as experiments, partly as wilful defiances of a public that had neglected his more solid pictures—he received L.250 each; one of them, though much damaged, was since bought for L.1500. For one of the great pictures that he had determined to leave the nation, Turner is known to have refused L.5000. For his drawings for books he received prices varying from twenty to twenty-five guineas each. Those executed for Campbell the poet he was never paid for. One of them, the "Flint Castle," has since been sold for L.152, and the value of these wonderful works still advances. Many have since been sold at four or five times the sum that Turner received for them. He also gained money by lending them to be engraved. Turner.

The accusations against Turner, as a miserable, sullen miser, an unsocial sot, and a parsimonious boor, are utterly untrue. His economy arose at first from early indelible habits of care and saving; latterly from the burning and all-absorbing desire to leave his greatest pictures to the nation, and to bequeath a large sum of hard-earned money to found an asylum for decayed artists. This was the one dream, and aim, and hope of his existence. He had lived alone with art till he had grown indifferent to society. He lived alone that he might think and work undisturbed and incessantly. Leslie says of him, "His nature was social, and at our lunch on these anniversaries (varnishing days), he was the life of the table." G. Jones, R.A., who knew him half his life, declares that by all the friends to whose tables he introduced Turner, the painter was respected and esteemed, and that he continued till his death their constant visitor. At academy councils, in all questions of charity, he was the most untiring and liberal in his proposals. He gave no dinners, because he was shy and unable to organise and direct a party; but he has been known at a large Blackwall artist party to take the whole cost upon himself. We have already seen what large prices he refused for the pictures he had vowed to himself to put apart for the nation. Turner, with all his brusque, suspicious, shy manner, had a right good heart, and the proofs of it are innumerable. When Bird, then unknown, sent his picture to the Academy, and no room could be found for it, Turner took down one of his own works, and hung Bird's in its place. When a picture of his, by its vividness, injured one of Sir Lawrence's female portraits, Turner disfigured his own picture to redeem the accident. When a friend's picture has been badly hung, Turner has been known to pray the hanging committee in vain to allow him to sacrifice one of his own places for the benefit of his friend. If he painted a picture which did not please a patron, Turner never objected to retain the rejected work, though he would not repeat the attempt to please. He was thoroughly aware of the general opinion of his parsimony and avarice; but being a reserved, proud, secretive man, and a humorist withal, he enjoyed the imputations, which he knew the mere reading of his will would at once dispel. There were many stories he knew of his selling pictures for large prices, and then squabbling about the price of the frame, the packing-case, or the coach that brought him to the place of meeting. When congratulated on the large prices he obtained, he would reply, "Yes, but there is the carriage, or the time in altering and varnishing." Like Reynolds, Turner was too reserved to praise living artists

Turner. (Stothard was an exception), but he was never heard but in one case to blame. He readily forgave; he bore no rankling hatreds to any one; he was always the first to try and appease the irritability of friends. When a friend was ill, no one was more attentive and tender than Turner. The day after Chantrey died, Turner entered a friend's studio, assayed to speak, broke down, burst into tears, and left the house. At Petworth, and in his annual visit to Sir J. Wyatville at Windsor Castle, Turner displayed great fondness for fishing, and with the rudest tackle in the world was very successful.

The painter seems, about 1812, to have been seized with an incontrollable desire to become a poet. From that year till 1850, his last season of exhibition, he adorned the Academy catalogue with strange, rambling extracts from a poem called by the author *The Fallacies of Hope*. They were in all sorts of metre, from Tate and Brady, and the rhymes of penny song-books, to Homeric and Miltonic blank verse. Sometimes they display a certain grandeur, but usually they are shapeless and confused, and often they are the vilest doggrels. In his sketch-books, amongst flute music and careful botanical notes, were found attempts at patriotic songs, scraps of the *Fallacies*, and short landscape-poems of some merit.

Great as he was as a painter, still it was, after all, by the engravings from his works that Turner won at first his chief reputation and the larger part of his fortune. He worked for the printsellers and publishers. He illustrated Scott, Rogers, Byron, Campbell, Milton, Moore, besides endless topographical works. In commenting on Scott, Byron, and Rogers he is specially happy; Campbell and Milton deal less with landscape. The best engravers worked for him, and he was skilful in discerning young men of genius. The two Cookes, Miller, Lupton, Racole, Armytage, Le Keux, Goodall, Pye, Prior, Wallis, and Willmore, all worked for him, and he knew the whole range of the art as well as any of them. Some avoided him because his work was laborious and difficult; others, more ambitious and enthusiastic, preferred his works to any others, and considered his hints rendered the toil light. He wrangled with them about prices, but he was always just and exact. He devoted much time to touching on the proofs, altering the minutest twig, and adding effects. He would take the greatest pains to carry the engraving further than the picture, adding figures, and heightening and enlarging the buildings. Many of his proofs still in existence are covered with notes, pointing out places to be altered. Of these proofs, and of all sketches, and even notes of effect, he was jealously careful, knowing their future value. Indeed, after his death nearly every sketch-book that he had ever had was found hidden away in his boxes.

In early life Turner studied architectural draughtsmanship; and from Malton attained a very thorough knowledge of perspective. Later, Wilson's breadth and colour, and rich low tone attracted him, while his friend Girtin taught him to select landscapes, and to re-arrange his light and shade. From Calcott's cold and tame manner, some critics think, not unreasonably, that Turner was led to introduce more light into his pictures; and as Rembrandt has darkened and darkened, till he left but one-eighth of light in his pictures, so Turner lightened and lightened till he left but one-eighth of dark. As he went on, he aimed more and more at multitude and infinity; with these, fulness, variety, and great breadth of shadow, was impossible. He began with almost monochrome, a conventional gloom, rich, deep, and true, if you grant his premises. He went on to poetical truth, and ended in poetry without truth, in prismatic fantasies—in fire-works; his work at last became mere transparent works of opaque colour, with a dark spot or two on a distorted figure in the foreground. As Burnett truly says, however, "his excellency in composition never seems to have left him, through all the changes of light and shade and colour; the component parts became gradually smaller in size as the breadth of light increased." At first Turner tried to excel in that quality of landscape that he found the world admiring—that is, abstract light and shade. This was when he had to follow the world; when he could lead, he aimed at positive colour, aërial distance, and multitude. To obtain grand light and shade, he was at first simple and broad; latterly, to gain distance and infinity, he crowded whole kingdoms into his canvas. Wilson had painted no foreground nearer than 30 feet. Turner drew things as he saw them—near and far; he also introduced objects at a greater distance, in order to maintain a breadth of light. The Shakspeare of landscape-painting, Turner paints sunlight oftener and better than any of his predecessors. He laid his axe to the root of that "brown tree," which Sir George Beaumont had planted like an upas-tree in every studio. He painted skies and seas blue as they were, and peopled them with all the true reflections. No one ever painted distance as he did. Less cold, simple pure, and artificial than Claude, he is much more varied and natural, has more of the infinity of the eternal, more of the infinity of nature. Even admirers of Claude confess that his pictures look dark and dingy beside Turner's; that Claude's trees are heavy compared with Turner's lighter, more varied, and more elegant forms. In his best pictures, Turner's figures are not inferior to Claude's, which are indeed often mere barley-sugar puppets, frivolous and effeminate in their rendering. His severest critics indeed allow that Turner's figures, though not severely drawn, have "a broad general look of nature." His fishermen are particularly good; and we know that he studied the class, being in the habit of going out in mackerel boats and colliers in rough weather, to study sea effects. No one surpasses him either in the judicious introduction of figures, where a point is wanted either "for the repetition of colour, or bringing a near object under the most retiring." He knew best of all men how best to give the effect of space, and to assist the perspective diminution of the scene.

Turner.

Besides a wonderful system of shorthand pencil-sketching, and a rapid mode of jotting down colours and effects, Turner possessed the advantage of an iron constitution, and a matchless artistic memory. Driving down once to Mr Woodburn's house at Hendon, Turner stopped the carriage to observe a sunset, of which, however, he made no written note and no pencil-sketch. Nothing more was said; but some weeks after, when Mr Woodburn next visited the Queen Anne Street Gallery, he saw this sky glowing on a canvas. He instantly offered to buy it, but Turner refused to part with it. The following anecdote, too, well illustrates the sureness and quickness of his eye, and the tenacity of his memory. In a certain representation of an Alpine valley, Turner's exact imitation of the very spots and stratified veins of the boulders of a Swiss torrent, arrested the attention of an English traveller, who was curious to know with what degree of care Turner had studied and copied the water-rounded stones. On being asked, Turner said he had painted them from a sketch made on the back of a letter, as he rolled by on the top of a diligence, and that he had never been in the valley before or since.

Turner's first great aim was breadth and tone; obtaining these, he successfully grappled with Vandervelde and Hobbima; then trying for aërial space entirely, and for purer and more radiant colour, he poured his broadsides into Claude, and fought him as Nelson did the Santissima Trinidada at Trafalgar. Claude's elegance, purity, and air he strove hard to surpass, and often, but not always did so. For Claude's eternal blue clearness and calm Arcadian sunshine, Turner gave us a thousand varieties of sky changes, chameleon colour and Protean dyed. Claude gave

Turner. us an ever-sunny lawn and a calm sea. Turner raised storms round his easel by his enchantments, and led us miles further into a blue mystery of distant air. Wouvermans has soft rolling clouds, and Wilson towering thunders, but Turner's skies are in better perspective, and melt deeper into the canvass. He had seen nature in more varied aspects than Claude, and remembered better her different moods. His mind was cast in a less luxurious and calm body, and in a stronger mould. Claude was of the lower empire; Turner was one of the Pyramid builders, a pure demigod in brain and body. Turner borrowed from every painter, but always to improve and to reconstruct. He melted the gold he borrowed, and always ran it into fresh shapes. Every painter that he set himself down to rival, he equalled or surpassed,—every style he attempted, he became pre-eminent in; and he attempted more styles than any other painter has done. You may find in him the sombre richness of Wilson, and the mellow gold of Cuyp; Milton's grandeur and Shelley's lyric sweetness: he was, in a word, as we have before said, the very Shakspeare of landscape.

In early life, when he copied portraits in Reynolds' rooms, he promised great excellence in portraiture. In "The Forge," he displayed great power in figures. In the "Calais Pier" he equalled Vandervelde. In "The Building of Carthage," many thought he surpassed Claude. In his water-colour sketches, he outdid all rivals in that new art. In the "Polyphemus," "Téméraire," and "Venice," he triumphed in real and ideal colour. He finished better than other men; he sketched better than any. In everything he was the *facile princeps*. The strongest and the most tender notes in the great gamut of art were all within his compass. How much truer he is to nature than Claude or Constable, or any of the Dutchmen, Mr Ruskin has eloquently and convincingly shown. In art, as distinct from the mere copying of indiscriminate nature, he was equally learned and pre-eminent. Mr Burnett, the engraver, in his thoughtful remarks on "The Works of Turner," sums up very usefully some of this art Napoleon's technical principles.

When Turner tempers his harshest darks with softness, they are not so black as they seem; but standing against the highest light they seem so. His forms melt into one another. His skies are calm and simple when his scenes are complicated or have many parts; and when they are simple, then his skies are weird, stormy, and changeful, serving for contrast and for harmony. In his Claude compositions, he is fond of bringing a dark clump of green stone pines against the sky, in broad, soft shadow. This mass of dark he spreads and diffuses by smaller and thinner groups, and harmonises the whole by the strong, dark light of his foreground figures. He is fond, in sunsets, of placing the sun bold and full in the centre of the canvass, making it the burning focus that irradiates the picture; and being just over the point of sight, it is also the centre to which the perspective lines all point; thus obtaining by the same means originality, simplicity, and grandeur.

Turner is fond of introducing a broken frieze or a crumbling column, with inscriptions copied from the Vatican galleries, to give his compositions a classical look. He found them useful in reflecting the lighter greys of the sky, and thus fixing the upper and lower tones of his pictures. Like Claude, and unlike Wilson, Turner generally kept his foregrounds light and warm, so as to give greater force to the foreground figures, and to make the distance more retiring. His later water-colour drawings are as strong and rich as if they were painted in oil. His early oil-pictures are dark, solid, and massive; sometimes heavy. He then used light washes and scumbles of thin, opaque colour, to lighten his works. Rich glazings he seldom used. Then came his great characteristic when COLOUR was his sole dream, to the neglect of outline, and, finally, to the forgetfulness of truth. As if to aid him, chemistry just then Turner. discovered fresh colours. Turner was the first to dare to use the gorgeous chromes; Turner was the first to imitate the Lake school in poetry, and resolve to show us nature unconventionalised. He taught us first to paint daylight, and to love daylight. He, as it were, took the roof off the old studio, and let in for ever God's blessed sunshine. He got the freshness of his distant mists, semi-opaque blueness, and clouded sapphires, by painting dim, dark outlines, and then scumbling over them with lighter tints, driven, thin, and filmy. No one ever painted atmosphere as he has. He is never harsh or coarse, but sometimes almost too undefined; so that his works have a fairy-like and spectral appearance, as if they would vanish before you had done looking at them; as in his "Burial of Wilkie," and some of his wilder and more untrue Venetian scenes. His upper foliage is never "cut out" black against white, but melts into grey clouds. His ærial reds and yellows become luminous and transparent from the lighter parts of his skies having no strength of colour. His colour is so true, and his chiaroscuro so magical, that his pictures engrave well, and lose nothing by translation into black and white. Turner's great law was, according to Burnett, "light upon light," and "dark within dark;" "these two masses are reconciled to each other by an exchange of subordinate lights and darks, and to give the whole work the firmness and solidity of nature, strong dark touches and bright lights cross over into each other's boundaries." He maintained also the same antagonism between hot and cold tints, and in his later days sent his pictures to the academy with only these distinctions roughly but carefully mapped out, some ten hours' work on varnishing-day sufficing for all the details. In Turner's early pictures the colours are in low monochrome tone; in his later style he is often rather hot and mustardy in colour; but in his best pictures, of all his different periods, he is always regal, jewelled, and gorgeous. He obtained his effects not by lumps of raw colour, impudently and daringly contrasted, but by magic subtleties of contrast. It is by the very semitones of semitints, minutely and wonderfully intermingled, that Turner gave such value to his touches of pure colour. He knew when to heighten and when to subdue—when to lower and when to raise. They are more broken than Cuyp's semitints, more delicate and spiritual than Claude's. Volumes might be written on the principles of colour and composition to be discovered in Turner's works, yet it would only be to discover rules that the great man used instinctively, yet never thought of. His lights are of a "good shape" and "full of variety," because he had observed the lights in nature for sixty years, and knew what and when to select.

Turner is essentially the great founder of English landscape-painting—the greatest poet-artist our nation has yet produced. His experiments, his challenges, and his senilities we do not defend, though we think even these valuable as warnings, and as daring but unsuccessful attempts at discovery. He excelled in everything from mere diagram and topographic map to the most consummate truth and the most refined idealism. In every touch of his there was profound thought and meaning. He never painted or spoke for the sake of speaking or painting. If he is never so coldly calm as Claude, he is often more radiant and divine; if never so still and quiet as Vandervelde in calm, he is alone in storms. As Napoleon said of Kleber, "he wakes on the day of battle." Other storms are tame and respectful compared to his, where all hell seems loose in holiday, and the great ocean boils like a devil's caldron brimming with howling victims. "No ship could live in such a sea," said old Admiral Bowles when looking at Turner's "Wreck of the Minotaur." His "Man Overboard" is still more gigantic in its Shakspearian horror—in

Turner.

its more than Dantesque sense of raging evil, of man's screaming hopelessness and utter despair.

Inferior to the greatest figure-painters (merely in degree) merely because a tree is a lower thing than a man, Turner's fame will grow and grow; for even more than Hogarth did he paint for the world as well as for England. Titian is more majestic, Cuyp more radiant, Claude more coldly calm, Rubens sometimes more facile; but Turner is more versatile than them all. He best illustrated and pictorially commented on our national poets; he first revealed to us the beauties of our own land; he first showed us the wider beauties of the continent, and so set our great army of travellers "a'gadding." He gave our young art its love for colour, and made us the new Venetians of the modern school. From towing an old war-ship to her last moorings, to Wilkie's burial and the burning of the Houses of Parliament, he let no event of his lifetime pass without record or comment. He showed men that whereas Claude had put neatly and elegantly some three hundred yards of air into his canvas, and paled in with gilt frames some four or five dull-drawn, cold barley-sugar temples, there was no law of nature forbidding *his* putting some twenty miles of air, and mountain, and valley into perpetual imprisonment upon canvas. He exhausted ancient mythology; he illustrated sacred and profane history; and he surfeited our rough island sea-faring minds with every perturbation of rage or fear that the sea that girdles us in like a wall can assume; and when he had exhausted sun, and sea, and earth, and air, he made for himself a new world, with new elements, and there alone, in that sublime solitude, this great enchanter disported himself, like the mammoth in the world before man came.

But here let us sum up Turner's merits. Born a barber's son, without advantages, a cold hour or two before the dawn of English art, Turner appeared, merely, it might be thought, to live an inglorious life, colouring architectural drawings and illustrating topographical magazines. He soon breaks forth, like Napoleon, "50,000 strong," rivals all the old masters, and excels most of them in their own manner. Still his prices remain poor, and his engravings sell badly. Gradually his fame increases, his prices advance; he is known to every one; his later more ideal pictures sell at enormous prices, and the great man, a shy recluse, too late for his enjoyment or his happiness, finds the world stretching its thousand hands towards the great one it had so long slighted. He changes not; he remains in sordid obscurity; he is branded as a miser, as a mean, ill-tempered sot, as a churl, as a fool of one poor faculty; he dies unchanging; his will is opened, and lo! it is found the surly miser has left sixty pictures, one alone worth L.5000, and all invaluable; some L.30,000 worth of sketches and drawings; a matchless store of engravings; and L.120,000 to found an asylum for decayed British artists. This was indeed a good-hearted and a vast-minded great man. (W. T.)

TURNER, *Sharon*, a distinguished historian, was born at London, September 24, 1768. He received his education at a school at Pentonville, and at the age of fifteen was articled to an attorney in the Temple. On the death of his master, before his term of clerkship had expired, Turner took up and carried on the business on his own account. Even while a clerk, he had indulged during his leisure hours a taste for literature and composition; and soon after his establishment in business for himself, he began to collect materials for his chief work, *The History of the Anglo-Saxons;* the first volume of which was published in 1799, and the third in 1805. He afterwards continued the history down to the death of Queen Elizabeth; and the whole work, comprising 12 vols., has taken its place among the standard books upon the subject. He wrote also *The Sacred History of the World*, in 3 vols., and several essays and poems. Until an advanced age, he continued to conduct an extensive business in the midst of his literary labours. Sharon Turner died in London, February 13, 1847.

Turnhout ‖ Turning.

TURNHOUT, a town of Belgium, in the middle of a wide plain, in the province and 25 miles N.E. of Antwerp. The streets are regular, and the houses for the most part substantially built. The chief buildings are the town-hall; an old castle, now used as a courthouse; a prison, several churches and chapels, hospitals, convents, &c. The manufactures are extensive, comprising linen, woollen, and cotton cloth, silk, lace, carpets, paper, cutlery, pottery, tobacco, vinegar, brandy, &c. Pop. 13,250.

TURNING, the art of shaping wood, metal, and other hard substances, into forms with a circular or oval outline, by means of appropriate tools, and a machine called a *lathe*. The art of turning is very ancient. The potter's wheel is a lathe, with a vertical axis, used for turning, or shaping with the fingers articles of pottery. This is referred to in the Old Testament, and is also mentioned by several of the writers of antiquity.

Turning is one of the most important of the useful arts. Almost all solid objects in which the circle or any of its modifications exists are produced by the lathe. The operation of turning is also as simple as it is useful. The work required to be shaped is made to revolve in the lathe with a circular motion about a fixed line or axis, and the surface is worked to the required form by means of edge-tools, presented to it by hand or held by means of a fixed rest. As the projecting parts of the work are brought up against the cutting-edge they are removed, so that the outer surface remains at an equal distance from the axis of motion, and thus has a circular figure. There is generally but one axis or centre line of the work, but there may be two, in different parts or in different directions. In such a case, however, the work must be turned at two or more successive operations. There are also cases in which the axis is made moveable as the work rotates, as in oval and rose-engine turning. The work may also be turned hollow, or inside as well as out. For outside work, the lathe is furnished with two points for supporting the work at each end, and at the same time allowing it to rotate freely. There is also a contrivance for turning the work round, and a rest for supporting the tool. For hollow or inside work, the work is fixed at one end only, and that is to the extremity of a spindle or mandrel, which, on spinning round, carries the work with it, while the tool applied to the free end hollows it out. Such a lathe is called a *spindle, mandrel*, or *chuck* lathe, to distinguish it from the *centre* lathe, in which the work is supported at both ends. Lathes are also named according to the modes of setting them in motion; such as the *pole*-lathe, the *handwheel*-lathe, the *foot*-lathe, and the *power*-lathe; in the last case, horse-power, water, or steam is used. The wooden lathes used by turners in wood are called *bed*-lathes; while the iron lathes used for turning the best work in metal are called *bar*-lathes. The *turn-benches* and *turns* used by watchmakers are small centre lathes made of metal.

The word lathe is derived from a very simple form of the machine, in which a string or catgut is fastened to a treadle, and, passing two or three times round the work, is fastened to the end of an elastic pole or lath, fixed to the ceiling over the head of the workman. Hence the machine was called the *pole-lath*, or simply *lath* or *lathe*. It is evident that, on pressing down the treadle, while a gouge or chisel is held on the rest, with the edge brought up to the work, the work will spin round, and thus be cut to a circular form. The man then releases the treadle, and the elasticity of the pole draws it up and turns the work back, during which the tool cannot of course operate, for it can only cut while the treadle is being pressed down. Such a

Turning. lathe is used for turning the legs of stools, chairs, tables, hand-rails, bobbins, &c., in soft wood. It is more usual, however, to put the work in motion by means of a heavy wheel, worked by a crank and treadle, with an endless cord working in a groove in the circumference of the wheel, and after crossing like a figure of eight, passing over a small pulley attached to the work. The work is thus made to spin round rapidly in one direction with continuous action of the tool.

The *puppets*, or short-posts which rise from the horizontal surface or bed of the lathe, and which are used for holding the centres to which the work is attached, are secured to the bed by means of cross wedges. For turning heavy work, such as ironfounders' or millwrights', the puppets are secured to the bed by means of nuts and screws; and the centre-pin of one puppet is made to project so as carry a pulley which, by means of an endless band, sets the work in motion. A pin projects from the pulley in a direction parallel to the centre-pin, and a piece of iron called a *driver* is fastened to the end of the work, so as to meet the pin attached to the pulley, and thus impart mo tion to the work.

The spindle or mandrel-lathe usually consists of uprights of oak or mahogany, supporting a bed formed of two bars of iron with a space between. Lathes formed entirely of metal are subject to an unpleasant elastic tremor. The back puppet, which supports one end of the work, can be moved along the bed, and fastened to suit the length of the work; it also carries a conical point or back centre, which penetrates and supports the work, and this having been adjusted by means of a screw, can be secured by a clamp. The mandrel must be nicely fitted, so that its centre line may be parallel with the bed, and the centre line of the spindle must exactly coincide with the point of the back centre. The neck of the mandrel must be well fitted into its collar, so as to turn smoothly; and the projecting part must carry a screw for holding the work or the various chucks which serve the same purpose. The other end of the mandrel is supported by a point or in a collar, and the mandrel itself is turned by a catgut band passing round a pulley, and a large iron foot-wheel attached to a crank-axis. The treadle is fixed by three rails to an axis on which it moves, and is united by means of an iron link to the crank. The rest for supporting the tools is fixed to the bed of the lathe by a forked foot and a screw-bolt, so that it can be moved to and from the centre of the work, and be adjusted to the required diameter of the work; and by means of a pin and socket, it can also be adjusted as to height. For turning cones, the edge of the rest is inclined to the axis of the work; and for ornamenting balls and other round objects, a circular rest is used.

The turner uses a variety of gouges and chisels, the former for roughing out the work, the latter for smoothing it and bringing it to form. The gouge is made nearly half round to an edge, with the two ends sloped off, so that there may be no corners to catch in rough wood. The blade is a good deal inclined, so that the bevel or outside of the edge may form nearly a tangent to the surface of the work, while the cutting edge is over the level of the centre. The chisels are usually bevelled on either side; or the line of the edge may be inclined to the direction of the blade, or be rounded, or made with angular points. In using the chisel, the rest is raised above the centre of the work, and the line of the cutting edge is made oblique to the axis of the cylinder, to prevent the chisel from running into the work. In order to regulate the dimensions of his work, the turner uses *callipers* and *gauges*, and various chucks, also *milling tools*, or small wheels on which a pattern is cut; so that when pushed close up to the work, the pattern is impressed by a few turns of the lathe. When the turning is finished, and the ends of the work are made flat, it is polished with shark's skin, or Dutch rushes for soft woods, with pumice-stone and chalk for works in ivory and horn; while the metals are polished with tripoli and putty powder. Turning.

There is an immense mass of details connected with plain and ornamental turning, which in a regular treatise would require to be illustrated by numerous engravings; but which can be only just glanced at here. The various arrangements of different kinds of lathe can only be understood by means of diagrams; while the very numerous forms of chuck, the modes of mounting the work, and the details of ornamental turning, require a similar treatment. We may, however, notice a few particulars, such as the velocity of the lathe required for the particular work in hand: thus wood should move as quickly as possible, and the shavings should be thin; brass and bell metal quickly, but with less than half the velocity of wood; wrought-iron and copper must move more slowly, and the tool be kept cool by water trickling on it; steel must be moved still more slowly, and cast-iron the slowest of all. Screws are usually cut by means of a pattern attached to the end of the mandrel, so as to give it a screwing motion endways in its collars, while a cutting tool held to the work in one position will cut a spiral channel or screw upon it. The screws may be less accurately cut *flying*, as it is called; in which case a screw-cutting tool is applied to the work, and moved along endways while the work rotates. With respect to chucks, the *concentric* or *common* chuck produces circular work, while the lines which form the circles may be enlarged or diminished by varying the distance of the tool. By means of the *excentric* chuck the patterns are circular, but the centre of the work can be shifted as required. Oval or elliptical figures are designed by the *oval* or *elliptic* chuck; the *geometric* and *compound excentric* chucks produce geometric and curved designs, while curious intricate patterns are produced by the *oblique* and *epicycloidal* chucks; and there is the *straight-line* chuck, which executes its work in straight lines. Skilful turners pride themselves as much on difficulty of execution as on the delicacy and elegance of the result; and amateurs in general value turned works in proportion as they are opposed to the circular figure. The best lathes are furnished with an *overhead motion*, which gives motion to the tool, while the work remains fixed. The excentric cutter, so much used by the ivory turner, is used in this way. *Rose-engine turning* produces those peculiar patterns called *rosettes* by the French, whence the term *rose-engine*. This kind of work requires a particular adjustment of the lathe, and the use of special chucks. In this lathe, the centre of the circle in which the work revolves is not a fixed point, as in the common lathe, but is made to oscillate with a slight motion while the work is revolving upon it, the tool remaining fixed, so that the figure will be *out of round*, or deviate from the circular figure as much and as often as motion is imparted to the centre. The work is fixed in a chuck at the end of the mandrel, and the tool is held by a slide rest; while the oscillating motion of the mandrel is produced by means of metal rosettes or wheels, with the edges indented and curved, so that, as the mandrel revolves, the waving line of the rosette adjusts itself to a roller, which produces the oscillating motion of the mandrel and of the frame which contains it. There is also a strong spring, which restores the mandrel to a central or vertical position when disturbed therefrom by an indentation in the rose. The mandrel may contain a large number of these rosettes of different patterns, so as to vary the work as it proceeds. In what is called the *pumping movement* of the rose-lathe, the mandrel is made to move endways on its bearings. By this motion waved lines can be cut upon the surface of a cylinder in the direction of its length. The rose-engine is not moved

Turpentine || Tuscany.

with the foot, but by means of a hand-winch. With the straight line chuck the rose-engine patterns follow a straight instead of a circular direction. The slide-rest for holding the tool and regulating its motions by means of screw adjustments is a most valuable adjunct to every lathe. Indeed it is scarcely possible to over-estimate the signal services which this unpretending piece of apparatus has conferred on machinery; for, instead of the varying and uncertain action of the human hand and arm in applying the tool to the work, we have here an iron hand which never tires, and which, when once set right, will continue to work with accuracy. (C. T.)

TURPENTINE, a transparent viscous substance, flowing either naturally or by incision from several resinous trees.

TURRETIN, FRANCIS, descended from an illustrious family of Italy, was born at Geneva, on the 17th October 1623, where his father, Benedict Turretin, who had embraced the views of Calvin, was pastor and professor. Francis studied with great distinction under Spanheim, Morus, and Diodati; and when he had completed his preliminary preparations for the sacred ministry, he was ordained pastor at Geneva in 1647. Having removed, on the death of Aaron Morus, in 1650, to fill the pastorate of Leyden, which that esteemed clergyman had left vacant, he, in 1653, was invited to Geneva to be professor of theology. This place he filled with uncommon lustre, which was rendered all the more arduous and difficult to effect from the number of celebrated men that had already shed their light there, or were still disseminating a radiance around that city. His celebrated *Institutio Theologiæ Elencticæ*, 3 vols. 1679-85, which he employed as the exponent of his own views of Calvinistic divinity, has still considerable fame among theologians of that particular school, and serves to make its author's name known in regions far removed from Geneva, down to the present day. The whole *Opera* of Turretin were published at Geneva in four volumes in 1688, the year after his death. A reprint of his *Institutio* was afterwards made at Leyden in 1696, and one has recently been completed at Edinburgh in 4 vols. 1847. His son, John Alphonso Turretin, who was in some respects even more celebrated than his father, was likewise professor of divinity at Geneva in 1705. He refused to sign the Consensus, and was suspected of Arminianism. His works, theological, philosophical, and philological, were published in 3 vols. in 1774.

TURRIFF, a small burgh of barony, Scotland, county of Aberdeen, pleasantly situated on the right bank of a small stream which flows into the Deveron, 35 miles N.N.W. of Aberdeen, with which it has recently been connected by railway. The spinning of linen yarn, weaving, bleaching, and dyeing, are carried on, but to a very limited extent. There are an Established and a Free Church, an Episcopalian chapel, a neat town-hall, several schools, and an ancient cross, in the town. Pop. (1851) 1693.

TUSCANY, in Italian TOSCANA, a part of ancient *Etruria*, is a division of Central Italy, extending in N. Lat. from 42. 22. to 44. 31. 10., and in E. Long. from 9. 32. 25. to 11. 4. 31. Formerly it was an independent state, called the *Gran Ducato di Toscana*, under a junior branch of the house of Lorraine, but in August 1859 was annexed to Sardinia. Including its dependencies, the islands of Gorgona, Elba, Pianosa, Formica, Montecristo, Giglio, and Gianutri, and the former duchy of Lucca, which was united to it in 1847, Tuscany has an area of 6440 geographical square miles, and a population, in August 1859, of 1,806,940 inhabitants. It is bounded on the N.W. by the former duchies of Modena and Parma, and on the N. and N.E. by the former papal legations of Romagna, all at present annexed to Sardinia; on the E., S.E., and S. by the delegations of Urbino, Perugia, Orvieto, and Viterbo, and on the S.W. and W. by the Mediterranean Sea. Events are now happening (Sept 1860) which eventually may give Tuscany no other boundaries but the other possessions of Sardinia and the sea. Tuscany.

The form of Tuscany is nearly that of a scalene triangle, whose longest side is the seashore, which, from the Papal frontier to the Modenese territory, extends 112 miles in a straight line, and with its sinuosities more than 177 miles. The surface of the country is much diversified, and abounds in picturesque beauty. The main chain of the Apennines in its progress southwards traverses Tuscany from north-west to south-east, and forms on its northern and north-eastern frontier a very mountainous tract of country, in which the lofty mass of Mount Falterona attains an elevation of 5648 feet above the level of the sea. Several ranges branch off from the main chain, which, taking chiefly a western or south-western direction, and diminishing in height as they approach the sea, spread with their numerous branches and ramifications over the greatest part of the country, and divide it into so many valleys, each forming the basin of a more or less important stream. Hence the best local geographers are in the habit of dividing Tuscany into valleys, each of them named by the stream that waters it. The most considerable of these ranges, some of which are scarcely inferior in elevation and size to the main chain itself, are, proceeding from south-west to south-east—The *Alpi Apuane*, a lofty group which branches off west of Pontremoli, divides the valley of the Macra from that of the Serchio, forms the mountainous districts of Massa Carrara, and Serravezza, well known for their extensive marble quarries, and between Pietrasanta and Serravezza comes down with its last spurs close to the shore. Only one portion of this range is within the Tuscan frontier. From the great group of Mount Cimone, on the Modenese territory, another range descends southwards, and, soon after entering Tuscany, divides in two branches, of which the south-western, forming the hilly district of the Baths of Lucca, separates the basin of Lucca from that of Pistoia, and sends down its last ramifications to the banks of the Arno, between Florence and Pisa. The south-eastern branch forms the hilly district of the Mugello, and separates the basin of Pistoia and the valley of the Ombrone from that of the Sieve, both rivers tributaries of the Arno. The lofty range of the *Prato Magno*, which branches off from the group of Mount Falterona, separates the lower valley of the Sieve from the upper valley of the Arno, and with its great mass stretching southwards intervenes between the upper and the lower valley of the latter river, and forces it to take a great bend south-west and north before it reaches the valley of Florence. The mountains of Vallombrosa, La Vernia, and Camaldoli belong to this range, in which the highest peaks are La Penna, 4870, and Monte Catastai, 4700 feet above the level of the sea. The range of the *Catenaia*, branching off also from the Falterona, separates the upper valley of the Arno from that of the Tiber, forms the hilly district of Arezzo, and in its highest point attains an elevation of 4590 feet.

South and south-west of these ranges, from which it is separated by the valley of the Arno and by the remarkable low depression of the Valdi Chiana, is a broad track of hilly country, which in the districts of Volterra and Siena attains an elevation of more than 2000 feet. East of the bed of the Ombrone, this hilly tract is bordered by an extensive volcanic formation, in which Mount Amiata, the central and loftiest peak of the group, rises to an elevation of 5794 feet, whilst the peaks of Radicofani and Mount Labro at its eastern and western extremities attain respectively an elevation of 2470 and 1960 feet.

From Pietrasanta, where, as already noticed, the last

Tuscany. spurs of the Apennines come down to the sea, to the Papal frontier at Torre della Graticciaia, the coast of Tuscany is generally low and lined by extensive marshy tracts that render it unhealthy. Its most prominent physical features are the promontories of Piombino (*Populonium*) and Monte Argentaro, the former of which divides it in two parts, nearly equal in length but different in character. The northern part is almost a continuous sweep, with scarcely any bays or indentations, and, with the exception of Leghorn and Viareggio, affords no shelter to shipping. The southern part, on the contrary, is broken into several bays, of which the largest are those of Piombino, Grosseto, Orbitello, and Porto Ercole, and affords safe anchorage to ships. Most of the Tuscan islands lie between Monte Argentaro and Piombino, from the latter of which Elba is divided by a deep canal only 6 miles broad. A considerable tract of low country, extending in length from the mouth of the small stream Fine to the Papal frontier, and in breadth from the sea to the hills of the interior, goes under the general name of *Maremma*, which consists of a succession of basins, divided by intervening ridges of low hills that descend to the sea and form the barriers of four separate districts, more especially called Maremma di Volterra, Maremma di Massa, Maremma di Grosseto, and Maremma di Orbitello.

With the exception of a small district lying on the north-eastern slope of the main chain of the Apennines, in which are the sources and upper courses of the Senio, the Romeo, and several other small rivers that flow into the Adriatic, the waters of Tuscany flow southwards to the Thyrrhenean Sea. The Arno (*Arnus*), the principal river of Tuscany, is, next to the Po, Tiber, and Adige, the most important river of Italy. It rises on the flank of Mount Falterona, and at first takes a south course till within five miles of Arezzo, when it sweeps round the base of the Prato Magno, and flows nearly due north till it is joined by the Sieve. The spurs of Mount Giovi force it then to take a sudden turn and flow through Florence and Pisa due west to the sea, which it enters, after a course of more than 140 miles, by an artificial canal 6 miles below Pisa. It has numerous tributaries, the most important of which are, from the north, the Sieve, which rises on the south flank of Monte Boni (4100 feet), and drains the retired district of Mugello; and the Ombrone, which drains the valley of Pistoia; and from the south, the Elsa, which drains a hilly district between Colle and San Miniato; and the Era, which drains a district north of Volterra. The upper valley of the Arno, called the *Casentino*, is strikingly beautiful, and combines Alpine scenery with richness of vegetation. Shut up on the north by the Falterona, on the east by the range of the Catenaia, and on the west by the Prato Magno, and irrigated by numerous rivulets, so beautifully alluded to by Dante (*Inf.* 30, 64), it has a constant verdure not often met with south of the Alps. The lower valley of the Arno is remarkable for its great fertility. The Tiber also rises in Tuscany on the south slope of Mount Coronaro, and flows south, parallel to the Arno, till it enters the territory of the Church below Borgo San Sepolcro. The other principal rivers are, beginning from the north, the Serchio (*Auser*) which rises among the Ligurian Apennines, and flowing by Lucca, enters the sea 7 miles north of the mouth of the Arno. In ancient times, the Serchio had no separate outlet, but fell into the Arno just below Pisa. The country between these two rivers, in the lower part of their course, is very flat and marshy. The Cecina (*Cæcina*) drains the Maremma of Volterra, and falls into the sea half-way between Leghorn and Piombino. The Ombrone (*Umbro*), the larger river of that name, next to the Arno the largest river of Tuscany, has its sources among the hills between Siena and Val di Chiana, and after a south-west course of 50 miles, flows into the sea 16 miles north of Mount Argentaro, opposite to a cluster of very small islands called Formiche di Grosseto. The Albegna and the Fiora both rise in the volcanic district of Mount Amiata; but the former, after draining the Maremma of Orbitello, flows into the sea a few miles north of that town, and the latter, after a course of about 30 miles, enters the Papal Territory. Along the coast, and near Chiusi and Fucecchio, there are several marshy lagoons, but they neither deserve the name of lakes nor require any description. Tuscany.

The northern part of Tuscany belongs almost entirely to the upper cretaceous formation, and is composed of limestone strata, in which hippurites and nummulites are found, and which are traversed by strata of sandstone rich in fucoids, and occasionally overlain by broad belts of marls and travertine. The south-western districts are much more varied, and offer ample and interesting materials to the geologist. The plains extending from the outlets of the Serchio and the Arno, and from the shore near Leghorn to a considerable distance inland, exhibit a very recent formation, consisting of deep beds of diluvial gravel and alluvium. On leaving the lower valley of the Arno and proceeding towards Volterra, we find that the strata of sandstones and limestones have been pierced through, at a comparatively recent period, by a peculiar igneous rock, which the Tuscan geologists call *Gabbro rosso*, and which greatly resembles the red porphyries of Australia. The Gabbro forms a group of several pointed hills, of which the highest are Monte Massi, 1910 feet, and Poggio alla Croce, 1710 feet. The stratified rocks, which envelop them like the folds of a mantle, show the metamorphic effects of the igneous action. The Gabbro is surrounded by hills of serpentine, protruded at a subsequent period. Further south, on the right bank of the Ombrone, from Grosseto to the coast, a small district of an oval shape presents a silurian formation; and south of the course of the Ombrone is the interesting volcanic tract of country of which Mount Amiata is the centre. There are no records of this volcanic region having shown any signs of activity in historical times.

The mineralogical wealth of Tuscany is considerable, and if industry and capital were turned to it, its products might be greatly increased. The island of Elba is rich in iron, the ore of which is smelted and cast at Follonica, situated on the opposite shore at the bottom of the Bay of Piombino, where are the grand-ducal ironworks which turn out 10,000,000 Tuscan pounds of metal annually. The combustible is supplied by the forests of the Maremma. The mines of Montecatini, Miemo, Castellina, &c., west of Volterra, are remarkable for the abundance and richness (varying from 20 to 80 per cent.) of their copper ores. The quantity extracted is about 2200 tons annually, but is yearly increasing. *Le Moie*, or saltworks of San Leopoldo, six miles south-west of Volterra, give an annual produce of more than 22,000,000 pounds, entirely derived from the evaporations of eight brine-springs, which owe their origin to large beds of rock-salt, lying at a considerable depth from the surface. Lardarello, or the Lagoni of Monte Cerboli, a district about 15 miles south of Volterra, and of an extent of 30 square miles, is rich in boracic acid, the whole annual produce of which, amounting to more than 1600 tons, is exported into this country, and converted into borax, and largely employed in the manufacture of pottery and glass. A few miles east of Pietrasanta, there are mines of lead, silver ores, and quicksilver; but they are not worked on a large and scientific scale. The quarries of Serravezza yield a great quantity of marble; those of Castellina Maritima yield alabaster, and the hills near Siena the marble well known as *Giallo di Siena*.

The climate is as different as the face of the country. Whilst, in the districts on or immediately adjoining the main chain of the Apennines the snow lies many weeks, and the cold is severe in winter, the summers, which are never too

Tuscany. hot, are healthy and bracing; in the Maremma, on the contrary, as well as in the low flats along the shore from Leghorn to Viareggio, the summers are hot, and subject to the prevalence of the malaria fevers; and it is only in winter that the herdsmen and labourers resort to them with impunity. In the central vale of the Arno and the districts bordering upon it, the climate is healthy all the year round, and, on the whole, one of the best in Italy. In January, the coldest month, the average height of the thermometer is 37, and in August, the hottest month, 90 degrees of Fahrenheit.

With the exception of Lombardy, agriculture is more advanced in Tuscany than in any other part of Italy. In the valleys of the Arno and Chiana the land is admirably cultivated, and is generally divided into small farms from four to fifteen acres each, held by the peasants on the *Mezzeria* or Metayer system, which has existed in Tuscany from time immemorial. The oral agreement between the landlord and the peasant is valid for one year only, after which the cultivator may be discharged by the landlord at a fixed time; but, practically, a good tenant will remain on the estate for generations.

In the *Mezzeria*, "the proprietor supplies all the capital, the oxen and beasts of burden, and the cultivator the labour; the produce being equally divided between them. The tenant is only obliged to supply the labour required in the ordinary cultivation. If the proprietor is desirous of reclaiming waste lands, or draining, he must pay the cultivator wages for extra work. The seed for sowing is supplied at joint expense; that required for the support of the tenant in bad years the proprietor generally supplies. The cattle used for agricultural purposes are supplied throughout Tuscany by the landlord, and maintained at the joint charge of the tenant; in case of casualties, the latter pays a moiety of the value of the animals lost, as he derives a moiety of any profit from their sale. All farm-buildings are kept in repair by the landowner, and the peasants are lodged gratuitously. The tenant who does not possess the necessary machinery for pressing his grapes and olives, pays a small tax to his landlord for their use." The Metayer system keeps up a friendly intercourse between the landowner and the tenant, and gives the latter an appearance of cleanliness and contentment, not often met out of Tuscany; but at the same time it renders the position of the tenant precarious and stationary. A Tuscan peasant seldom rises above the situation that his ancestors have had for ages. In the Maremme, farms are in general of a much larger size, but most of them are also cultivated on the Mezzeria agreement. In the territory of the former duchy of Lucca, on the contrary, the land is generally let out at a fixed rent, which is paid in produce.

The corn grown is not sufficient to the demand, and about 1,400,000 sacks of wheat are, upon an average, yearly imported at Leghorn from the Black Sea to supply internal consumption. Barley and oats are extensively grown on the Apennines; in some parts a large quantity of maize, and in others of rice; and besides these, pease and beans of various kinds. Chestnuts are used as a substitute for bread by the greater part of the rural inhabitants. The plains feed about 400,000 sheep, 30,000 horses, and a multitude of cows and goats. The breed of sheep has been of late years improved by crosses with Merinos, and now the wool is of moderate fineness. The greater part is used at home, but some portion is exported. Large quantities of both red and white wines are made, of which some are very fine and delicate, but not much known by foreigners. Some of the best of the red is exported, mostly in flasks. Olive oil is an extensive object of industry, and is increasing in quantity by the extension of the cultivation of the olive. Much of it is converted into soap, or consumed at home; but that of the best quality is exported to distant countries. The quantity of silk produced does not exceed 200,000 pounds weight, and it is chiefly consumed at home in manufactures. Some flax is raised; but that used for making the finest linen is imported from foreign countries. Tuscan

Extensive tracts of marshy land have been reclaimed and brought into cultivation by means of *colmate*,—a mode of drainage peculiar to Tuscany, where it was first introduced towards the beginning of the last century. It is effected by carrying the streams charged with alluvial matter into the marshy tract, where they are allowed to stagnate and deposit the mud with which they are charged, and by which the subjacent soil is gradually raised, and afterwards they are let out by a fall procured according to ordinary hydraulics. By this process the Val di Chiana, which until the last century was a pestilential marsh, was changed into one of the richest agricultural districts in Italy.

The fisheries employ many persons on the shores of the continent as well as on the islands. The tunny-fishery has establishments near Leghorn, and in Elba; while the anchovy-fisheries are chiefly in the islands, of which Gorgona especially has great reputation for its curing.

There is a variety of manufactures, which being for the most part the produce of manual labour, and carried on by individuals in their own houses, employ a large proportion of the population. There are few establishments in which machinery is employed. Straw-platting and straw-hats employ the largest number of hands, though this branch of industry has much declined of late years. Each girl, by purchasing for a few pence straw to work up, can earn from 14d. to 18d. per day; and many a peasant girl by her industry in straw-platting realizes a small sum to marry upon. The woollen manufactures are chiefly of a coarse kind: the most important of them are the woollen caps, *beretti* and *calabassi*, worn by the Turks, and of which the annual exportation to the Levant amounts to about L.70,000 in value. There are alabaster works at Volterra, which employ more than 1200 persons; and marble-works in Florence, Leghorn, Prato, &c. Thread, silk, and silk stuffs, employ about 3000 looms in the houses of the respective weavers. The other articles of manufacture are coral, fished on the coast of Barbary, and worked at Leghorn; paper, which employs about fifty mills, and is the best in Italy; printing; tanneries; hardware; linens; and hemp tissues, &c., exclusively for domestic use. Cotton manufactures are almost entirely supplied by England and France.

The monetary system is complicated. The fundamental unit, the *lira*, in which accounts are generally kept, is equal to 8d.; but the most common currency is the *paolo*, which contains 8 *crazie*, and is equal to $5\frac{3}{5}$d. The *scudo* or *francescone* is equal to 10 *paoli*, or 4s. $5\frac{3}{5}$d. Gold currency is almost unknown: the *zecchino* is equal to 2 *scudi*, and the *ruspone* to 6. The Tuscan pound is equal to 0·7481 avoirdupois; and the *braccio*, which is the standard measure of length, is equal to 22·98 English inches. The Tuscan mile is = 1 mile and 48 yards English. A *barile* of wine contains 12·042 English gallons. A *soma* of oil contains 2 *barili*, each *barile* = 8·8313 English gallons. The metrical system and the Sardinian coins are now being introduced.

The mercantile navy of Tuscany, in 1858, consisted of 959 ships, of which 344, of 32,846 tons, belonged to Leghorn; 229, of 14,479 tons, to Elba; 190, of 10,382 tons, to Viareggio; and 196, of 1315 tons, to the Presidi; total tonnage, 59,023. The number of men employed in them, between masters, captains, and sailors, was 11,800. The chief emporium of the trade is the free port of Leghorn, where there arrived, in 1857, 7273 ships, of which 940 were steamers. The arrivals of the previous five years had been—in 1852, 5881; in 1853, 6305; in 1854, 6967; in 1855, 5829; in 1856, 6232.

Tuscany. The imports in 1854 were L.3,719,845, and in 1855 L.3,006,565; and the exports in 1854 L.1,734,220, and in 1855 L2,323,238; showing in both years a considerable surplus in favour of the former. The chief articles of import were corn, sugar, coffee, and cotton manufactures; and those of export—straw hats, &c., L.486,480; silk, L.170,200; timber, charcoal, &c., L.132,720; borax, L.96,201; oil, L.88,333; salt meat, butter, tallow, eggs, &c., L.80,000; woollen caps, L.62,000; marble, L.56,000.

Many excellent carriage-roads traverse the country in every direction, and facilitate its internal trade. The only railroads as yet opened are the Leopoldo line, which runs from Florence to Leghorn, a distance of 64 miles, and has two branches—one of 36 miles from Empoli to Siena, and the other of 13 miles from Pisa to Lucca; and the Maria Antonia of 41 miles, which runs from Florence by Prato and Pistoia to Lucca.

Tuscany was an hereditary monarchy, whose sovereign was absolute, but governed according to established laws and customs, and assisted by a Council of state. In 1848, however, a constitution was granted, which having been suppressed in 1850, the government became more absolute than it was before. Since its annexation to Sardinia, the Sardinian constitution—a sketch of which has been given in this work under SARDINIA, forms the public law of Tuscany; but the administration remains as yet distinct, and is carried on by a council of ministers, under a lieutenant appointed by the king.

The army and navy amounted, in January 1859, to 17,205; but they have since undergone a total change.

The revenue arises partly from a land-tax, partly from duties on exports, from stamps, from a lottery, from farming tobacco, from the wines and saltworks, and the public domains. The budget for 1859 was as follows:—

Revenue.		*Expenditure.*	
Direct taxes	L.250,833	Home office	L. 89,850
Customs and excise	961,253	Justice	116,540
Domains, &c.	86,228	War and navy	277,410
Sundries	18,160	Foreign affairs	7,460
		Public instruction	29,070
Total	L.1,316,479	Worship	29,040
Expenditure	1,326,876	Finances, commerce, and public works	777,506
Deficit	L.10,397	Total	L.1,326,876

The civil and the canon law are the foundation of the law of Tuscany, which has been enlarged by precedents established by former decisions, and by a decree of the late Grand Duke Ferdinand III., in which, after his restoration, he embodied several alterations suggested by a commission for the revisal of the civil law, chiefly with regard to intestate succession, parental authority, guardianship of minors, obligations of wives, forms of wills, &c. The forms of proceeding greatly resemble those of France. Justice is imparted by 140 *Preture*, in which small civil or criminal cases are decided; thirteen Tribunals for graver cases; and two Courts of Appeal, held at Florence and Lucca. A Court of Cassation, sitting at Florence, presides over the whole; and an audit court, *Corte dei Conti*, has jurisdiction over all the accountable in the duchy. Tuscany.

The established religion of the state is the Roman Catholic, but great toleration had always existed for every other form of worship; and the encroachments of the papal court in civil matters were effectually checked by the Leopoldine laws enacted in the last century. Even among the Episcopacy, there was a spirit of opposition to some of the Romanist tenets, as it was shown by Leopoldo de Ricci, bishop of Pistoia, who in 1786 held in that see a diocesan synod, in which such propositions were passed that eighty-five of them were condemned as heretical by Pius VI. in 1794. Since 1852, however, the Ex-Grand Duke Leopold II. was suddenly taken with a spirit of intolerance and persecution, and became so subservient to the papal court as to revoke in great part some of the most important of the Leopoldine laws. At present all Christian communions, as well as Jews, are allowed the free exercise of their respective forms of worship. In 1859, there were 1443 families of Jews, numbering 7688 souls, and residing chiefly at Leghorn and Florence; and 442 Protestant families, composed of 2003 persons. The establishment consists of four archiepiscopal and seventeen episcopal sees. The archbishop of Pisa, who is the Primate, has the bishop of Leghorn as suffragan. That of Florence has as suffragans the bishops of Colle, Fiesole, Pistoia and Prato, San Miniato, San Sepolcro, Modigliano. The archbishop of Lucca has no suffragans; whilst that of Siena has Chiusi, Grosseto, Massa and Populonia, Sovano. The other sees are those of Arezzo, Cortona, Montepulciano, Montalcino, Pescia, and Volterra. There are 2641 parishes, of which 50 belong to foreign bishops. Each diocese has a seminary for the education of those who are intended for the church.

In many of the principal towns there are grammar schools, superintended by the fathers of the Scuole Pie, in which instruction is gratuitous. In every commune there are gratuitous elementary schools, where teachers are paid out of the respective municipal taxes. For the higher branches of education, there are the two universities of Pisa and Siena,—the first of them frequented by an average number of 600, and the latter of 300 students.

Tuscany is divided, as the subjoined table shows, into eight *Compartimenti* or provinces, six of which are called *Prefetture*, and the other two *Governi*; each compartimento is subdivided into districts, called *Delegazioni* or *Cancellerie*, and into communes; each commune is subdivided into parishes. The *Prefettura* is administered by a *Prefetto* or *Proveditore*, and each *Governo* by a civil and military governor; under them are the *Delegati* or district governors, and the municipal officers called *Gonfaloniere*, who preside over each commune. They are all appointed by government.

Compartimenti.	Area in geog. m.	Communes.	Parishes.	Pop. in 1859.	Chief Towns.	Population.
Prefettura of Florence	1703	41	672	452,496	Florence	113,304
Sottoprefettura of Pistoia	...	14	129	98,092	Pistoia	11,880
„ of Samminiato	...	15	139	103,575	Samminiato	15,473
„ of Rocca San Casciano	...	12	136	40,603	Rocca San Casciano	3,478
Prefettura of Lucca	387	21	298	259,723	Lucca	65,245
„ of Pisa	890	24	166	182,306	Pisa	47,638
Sottoprefettura of Volterra	...	14	86	49,192	Volterra	12,818
Prefettura of Siena	1103	23	292	125,750	Siena	22,259
Sottoprefettura of Montepulciano	...	15	79	64,977	Montepulciano	12,463
Prefettura of Arezzo	959	42	534	219,537	Arezzo	36,038
„ of Grosseto	1296	20	103	93,859	Grosseto	3,876
Governo of Leghorn and Gorgona	29	1	26	91,741	Livorno	90,113
„ of the island of Elba	73	4	11	22,026	Portoferraio	5,648
	6440	246	2671	1,803,877		

Tuscany. The population of Tuscany has long been steadily, though at times slowly, increasing. Under Ferdinand II. in 1640, when the first general census was taken, it amounted to 696,855; at the death of Gian Gastone, in 1737, it had increased to 890,605. Tweny-nine years of Francis II. of Lorraine's regency increased it by 54,582 souls, and a further increase of 113,867 took place under the administration of Leopold I., after whose departure for Vienna, the census of 1791 gave a return of 1,058,930 inhabitants. In 1800, when Ferdinand III. was turned out by the French, Tuscany numbered 1,104,764 inhabitants, and at his restoration in 1814, 1,154,686. Three years of an epidemic typhus fever had reduced the population, in 1818, to 1,143,286. Since that time the decennial returns were—In 1820, 1,172,342; in 1831, 1,365,705; in 1841, 1,489,980; in 1851, 1,761,140. The great increase from 1841 to 1851 was caused by the acquisition of the Duchy of Lucca, which, after deducting the loss for the Lunigiana, given up to Modena, brought an addition of nearly 100,000 souls. At the rate of increase from 1801 to 1851, the population would double in about 68 years. The yearly increase was checked by the prevalence of cholera in 1855, by which more than 52,000 inhabitants were carried off. From the census of 1858 we gather the following particulars. The population consisted of 332,649 families, each family having an average of 539 souls; and was thus divided:—

	Men.	Women.	Total.
Under 14 years	273,240	258,348	531,588
Unmarried	289,744	245,427	535,171
Married	298,238	298,390	596,628
In Widowhood	42,181	70,758	112,939
Secular Clergy	10,200		10,200
Monastic Orders	3,308	4,313	7,621
	916,911	877,236	1,794,147
BIRTHS—			
Legitimate	31,041	29,001	60,042
Illegitimate	2,141	2,142	4,283
	33,182	31,143	64,325
DEATHS—			
Still-Born	394	219	613
Under 14 Years Old	13,633	12,538	26,171
Unmarried	3,883	2,921	6,804
Married	5,815	5,549	11,364
Widows and Widowers	2,649	4,067	6,716
Priests, Monks, and Nuns	285	116	401
	26,659	25,410	52,069

There had been 15,489 marriages, of which 12,017 between unmarried persons; 2104 between widowers and girls; 751 between widowers and widows; and 617 between bachelors and widows. For every 1000 inhabitants there are 33·41 legitimate, and 2·39 illegitimate births, 8·64 marriages, and 34·60 deaths; and out of 1000 births, 66·58 are of unknown parents. The largest number of illegitimate births takes place in the provinces of Arezzo and Siena, and the smallest in that of Lucca. There are 1219 persons confined in madhouses. With regard to the highest number of mental derangements, the months stood thus—July, June, May, April, August, October, September, February, January, November, March, and December.

A sketch of the ancient history of the country has already been given in this work under *Etruria* and *Etruscans*. The ancient inhabitants, who called themselves *Rasena*, were called *Etrusci* or *Tusci* by the Romans, and *Tyrrheni* by the Greeks. The modern name of *Toscana* is derived from that of *Tuscia*, which was generally used by the later Latin writers, but it does not include the whole of the country designated by the latter name. After the fall of the Western Empire, Tuscia, sharing the fate of the rest of Italy, fell in succession under the dominion of the Eruli, the Ostrogoths, and the Greeks, from whom it was wrested by the Longobards, who divided it into *Tuscia Longobardorum*, which comprised the duchy of Castro, the present delegation of Viterbo, and *Tuscia Regni*, which comprised the duchies of Lucca, Florence, and Chiusi. When Charlemagne put an end to the Longobard kingdom, the name of Tuscia or Toscana had already become restricted to the latter division only. After the restoration of the Western Empire by the coronation of Charlemagne in St Peter's on the 24th December 800, Tuscany was governed for more than two centuries by dukes or marquises of Frank origin, who held it as a fief of the empire. One of them, Boniface II., 826–44, gained a great victory over the Saracens and checked their inroads into Tuscany; and under Hugo, who ruled from 961 to 1006, and was styled the Great, the country made much progress. Tuscany.

The male line of marquises ended with Boniface III., who was also Count of Modena and Mantua, and was murdered between the latter place and Cremona in 1052. His widow, Countess Beatrix, in 1055 married Godfrey, duke of Lotharingia or Lorraine, and governed the country till her death in 1076, when she was succeeded by Matilda, her only child by her first husband. Countess Matilda inherited all the large paternal dominions, and during her long reign was a constant and warm supporter of the popes in their contests with the empire. She was a stanch friend of Gregory VII., and received him in her castle of Canossa near Reggio, where the Emperor Henry II. (III. of Germany), after being kept three days barefooted and bareheaded outside the inner ramparts, obtained at length his absolution from the pope. Matilda died in 1115 without issue, and bequeathed all her vast possessions to the Church. The contest that hence arose between the popes who claimed the inheritance, and the emperors who maintained that Matilda had no right to dispose of imperial fiefs which had to revert to the empire, enabled the principal cities of Tuscany gradually to assert their own independence, and govern themselves under consuls and elders (*anziani*) of their own selection. The rise, therefore, of the Tuscan republics, or, as they are more properly called, self-governed *communes*, may be dated from the death of Countess Matilda. The most important of those republics were Florence, Pisa, Siena, Arezzo, Pistoia, and Lucca.

As the limits of this article will not allow our entering into a survey, however short, of their history, we shall only mention that they were all gradually absorbed by Florence, with the exception of Siena, which was not conquered till some time (1559) after Florence herself had lost her freedom, and Lucca, which preserved its republican institutions till 1799, when it was entered by the French. Pisa distinguished itself, at a very early period, by its commercial enterprise, which made its inhabitants affluent, and its naval achievements, which made them powerful. At the time of the Crusades, Pisa was the rival of Venice and Genoa in the East; but after the great naval victory of the Genoese over the Pisan galleys at La Meloria, on the 6th of August 1284, Pisa never recovered, and gradually sank in power and wealth, till it was at length subdued by the Florentines in October 1406. In 1494, when Charles VIII. descended into Italy, the Pisans again proclaimed their independence; but after many years of disastrous war, on the 8th of June 1509 they were compelled to surrender.

An account of the rise, progress, and fall of Florentine freedom; of the internal feuds and dissensions that constantly stirred it; of the Ghibelline and Guelf parties that in turn swayed it; of the number and names of the various magistrates that at different times constituted its government; of the imperishable works of art and literature which it produced in its best days, &c., is far beyond the limits of this article. It will be enough to say, that at length great

Tuscany. accumulation of wealth and extreme democracy combined in corrupting public as well as private manners, and causing the final overthrow of her free institutions. The family De Medici, who had accumulated enormous wealth by trade and banking, in the beginning of the fifteenth century, began to acquire considerable power by the support of the popular party; but in 1433, the party of the new aristocracy, led by Rinaldo degli Albizzi, succeeded in obtaining the exile of Cosmo, the head of that family. On the 26th of September 1434, however, Cosmo was recalled, and in 1435 he was appointed *Gonfaloniere di Giustizia*, or chief magistrate of the republic. From that time, with the exception of very short intervals, the whole power of the state passed into the hands of the Medici, and there only remained but an appearance of political freedom. Cosmo exercised his power mildly; and at his death, in 1464, the *Signoria* bestowed upon him the title of *Pater Patriæ*. His son Piero succeeded him in the conduct of public affairs; and at his death, in December 1469, his son Lorenzo, surnamed the Magnifico. A short notice of Lorenzo has already been given in this work under MEDICI.

Lorenzo's son, Piero, did not hold long the power of the state. When Charles VIII. descended into Italy in 1494, he was met at Sarzana by Piero, who agreed to deliver into his hands the fortresses of the state. Whereupon, on his return to Florence, the people rose against him, pillaged the houses of the family, and compelled him to seek safety in flight. After several vain attempts to re-enter Florence, Piero was drowned in the river Garigliano, on the 28th December 1503. In the same year, Pier Soderini was named Gonfaloniere during his lifetime; but as he countenanced a council held at Pisa, in November 1511, by the cardinals of the French party, Pope Julius II. espoused the party of the Medici, and caused the viceroy of Naples, Raimondo di Cardona, general-in-chief of the army of the League against France, to enter Tuscany. Soderini, frightened, ran away; a new government was formed, who treated with the viceroy, and agreed that Florence should join the League, and allow the Medici to return. Whereupon, on the 14th September 1512, Cardinal Giovanni de' Medici (who the next year, on being elected pope, took the name of Leo X.), entered Florence with his brother Giuliano and his nephew Lorenzo, and had them again installed in power.

In 1523 cardinal Giulio de' Medici having been raised to the papal chair as Clement VII., sent in 1525, to govern Florence, Alessandro de' Medici, a natural son either of Lorenzo, duke of Urbino, or, according to others, of Clement himself. But, in May 1527, on hearing the news of the pillage of Rome by the imperial army, the party opposed to the Medici rose up in arms, drove them out of Florence, and re-established a free government. The days of Florentine freedom, however, had come to an end. Deserted by her ally France, betrayed by her own general Malatesta Baglioni, surrounded by the combined forces of the Emperor Charles V. and the Pope Clement VII., whose quarrels were made up by their common interest to extinguish freedom, on the 12th August 1530, after eight months of siege, Florence was at length compelled to surrender. Alessandro, who married Marguerite of Austria, a natural daughter of Charles V., was appointed the supreme head of the state by an imperial bull dated Augsburg, October 21, 1530, and re-entered Florence on the 5th July 1531. In 1532, a new constitution was framed, by which he was styled Duke. In 1537 he was murdered by his cousin Lorenzino, and Palma Rucellai tried to restore freedom. But the Medici party, led by Vettori and Guicciardini the historian, proclaimed Duke Cosmo, a son of Giovanni dalle Bande Nere, who, in 1567, obtained the title of grand duke from Pius V.

The Medici family became extinct at the death of Gian Gastone in 1737. Such an event being foreseen in his father's lifetime, the great powers, without the consent or even the knowledge of the reigning grand duke, gave him a successor. At first, by the treaty of London, August 2, 1718, the heir appointed was Don Carlos, a son of Philip V. of Spain; but after his conquest of Naples and Sicily, by the peace of Vienna, October 3, 1735, the future Tuscan succession was bestowed upon Francis, duke of Lorraine, the husband of Maria Theresa of Austria, in compensation for Lorraine, which was given to Stanislaus Leckzinski, with reversion on his death to France. In vain Cosmo III. and Gian Gastone protested against what they called "a violation of the law of nations by the powers who had disposed of the Tuscans without consulting their will;" an Austrian army garrisoned the Tuscan fortresses, and at Gian Gastone's death, Francis of Lorraine was installed as grand duke. Tuscany.

In 1741, being associated to the empire by Maria Theresa, Francis left Tuscany under a regency till 1765, when his second son, Peter Leopold, succeeded him as grand duke. Leopold endeavoured to remedy many feudal and ecclesiastical abuses which the Medici had either introduced or tolerated, and laid the foundation of the prosperity of the country. On the death, however, of Joseph II., he succeeded to the empire as Leopold II. in 1790, and renounced the sovereignty of Tuscany to his second son, Ferdinand, who was driven out by the French in 1801, but reinstated by the Congress of Vienna in 1814.

His son and successor, Leopold II., in March 1848, following the example of Naples, yielded to the demand of his people and granted a constitution; but getting alarmed at the state of affairs, on the 5th of February 1849 he withdrew to Siena, whence, on hearing the news of the establishment of a provisional government at Florence, he repaired to Gaeta. The members of the provisional government, on the 18th of March, proclaimed a republic, and a national assembly that met on the 28th named Guerrazzi dictator.

The constitutional party, however, soon rallied; and on the 12th of April, having overset the republic without any bloodshed, they re-established the grand ducal government under the presidency of the Marquis Capponi, and sent a deputation to Gaeta to invite the grand duke to return, with a request that he should not call in the Austrians. Leopold II. acceded to their request, and named a commissary to represent him during his absence. Soon afterwards, however, an Austrian division under General D'Aspre, entered Tuscany by virtue of a secret convention. Under their protection Leopold returned to Florence, and suppressed in 1850 the constitution. From that moment the Tuscans became convinced that they were governed not by a sovereign of their own, but by an Austrian proconsul, and watched for an opportunity to rid themselves of his despotism.

After ten years of compression, the events of 1859 gave a new life to the liberal party. On the 27th of April a popular demonstration caused the grand duke to offer a constitution; but the people having no more any faith in him, it was suggested that he should abdicate in favour of his son. This, however, he refused to do, and in the evening of that day, he and all his family left Florence and proceeded to Bologna. On his departure, a provisional government was established, which conferred the dictatorship on the king of Sardinia, Victor Emmanuel, who sent an extraordinary commissary to govern the country during the war with Austria. At the end of that war, a national assembly, summoned by the president of the council Baron Ricasoli, voted on the 16th of August 1859 the forfeiture of the house of Lorraine, and on the 20th the annexation of Tuscany to Sardinia. The vote of the assembly was, at the request of France, submitted to the test of universal suffrage, and was approved of almost unanimously. From

Tusculum ‖ Tver.

that day Tuscany became an integral part of the possessions of the house of Savoy.

I.—*House of Medici.* 1531–1737.

1531. Alexander de' Medici, Duke of Florence.
1537. Cosmo de' Medici, only eighteen years old.
1574. Francis I., eldest son of Cosmo who died without issue.
1587. Ferdinand I., a younger son of Cosmo.
1609. Cosmo II., his son.
1621. Ferdinand II., his son.
1670. Cosmo III., his son.
1723. Gian Gastrone, his son, who died in 1737.

II.—*House of Lorraine, Kingdom of Etruria, Restoration, &c.* 1737–1859.

1737. Francis II. of Lorraine.
1765. Peter Leopold I., his son.
1790. Ferdinand III., who, on the 9th of February 1801, in consequence of the occupation of Tuscany by the French, was compelled to give up his rights.
1801. Don Ludovico Borbone, hereditary prince of Parma, created king of Etruria.
1803. Louis II., his son, under the regency of his mother Maria Louisa of Spain.
1808. May 24. Tuscany united to the French empire and divided into three departments.
1809. March. Tuscany erected into a grand-duchy under the French empire, and given to Eliza Baciocchi, Napoleon's sister.
1814. Ferdinand III. is reinstated as Grand Duke of Tuscany.
1824. Leopold II., his son. On the 21st July 1859, after he had already left Tuscany, he abdicated in favour of his son Ferdinand IV.
1859. Victor Emmanuel, king. (* * *)

TUSCULUM, an ancient city of Latium, on a western prolongation of the Alban Hills, about 15 miles E.S.E. of Rome. Its foundation is carried back by tradition to a remote period, and ascribed to Telegonus, son of Ulysses and Circe; but of its history for several hundred years after we have very scanty information. After the expulsion of the Tarquins from Rome, Octavius Mamilius, the chief man in Tusculum, is said to have supported their cause, and led an army against the Romans; but he was totally defeated, and slain at the small lake Regillus, near Tusculum. Thereupon an alliance was formed between Tusculum and Rome, which lasted unbroken for 140 years, until, in 357 B.C., the whole of the Latin cities, and Tusculum among the rest, joined in a war with Rome, which ended in their entire and final subjection to that power. Tusculum was more leniently treated than the other cities, and granted the rank of a free city, which it ever after retained. Towards the close of the republic, and under the empire, it was a favourite country resort of the Romans, though not so much admired as Tibur. Cicero, Cato, Brutus, Cæsar, and others had villas here—that of Cicero being remarkable for the composition of many of his philosophical works, including the well known "Tusculan Disputations." The ancient city continued to exist amid all the vicissitudes of the times till near the end of the twelfth century, when it was demolished by the Romans, and the town of Frascati rose in the vicinity.

TUTTLINGEN, a market-town of Würtemberg, circle of Schwarzwald on the Danube, 20 miles W.S.W. of Sigmaringen. It has manufactures of woollen, cotton, and silk fabrics, and cutlery; and carries on a considerable trade in corn. Pop. 5950.

TUY (the ancient *Ludal ad Fines*), a fortified town of Spain, Galicia, province and 28 miles S. of Pontevedra, on the right bank of the Minho, which here forms the Portuguese boundary, and about 18 miles from its mouth in the Atlantic. The town occupies a height, and is regularly laid out and clean. It has a cathedral, town-hall, prison, barracks, and manufactures of table-linen, leather and hats. The vicinity is highly fertile; but the climate is unhealthy from marshes, and the town is decaying. Pop. about 5000.

TVER, a government of European Russia, lying between N. Lat. 56. and 58. 47., E. Long. 32. and 38. 20.; bounded on the N. by the government of Novgorod, E. by that of Yaroslav, S. by those of Vladimir, Moscow, and Smolensk, and W. by that of Pskov. Area 25,988 square miles. It consists of an elevated table-land; but contains no mountains, although the north-west part is traversed by the Wolkonsky Forest, a chain of hills in which the Volga and other rivers take their rise. These hills are entirely covered with dense forests, in which there are some large morasses. The rest of the country is generally flat. The Volga is the principal river, flowing first in a south-east and then in a north-east direction, and becoming navigable before it leaves the government. It receives here the Tvertza, Medvieditz, and Mologa, which all have their sources in the government. The Southern Dwina, which falls into the Baltic, and the Masta, which joins the Volkhov, and falls into Lake Ladoga, also take their rise in the Wolkonski hills. The Volga is joined by the Vyschnei Volotschok Canal with the Neva, and by another canal with the Dwina. Tver also contains several lakes, the largest of which, Lake Seliger, has an area of 76 square miles. The soil is in general poor, producing hardly more than enough for home consumption. The country, however, enjoys a temperate and healthy climate, although from December to March the rivers are generally frozen. Most of the inhabitants are employed in agriculture or pastoral pursuits. Rye, barley, and oats, with a small quantity of wheat, are the crops chiefly raised. Flax and hemp are also grown to some extent. In 1849, the government contained 4,504,885 acres of arable land, 3,444,240 of meadow, 4,551,961 of wood, and 3,446,137 of waste land. In the same year the live stock amounted to 504,851 horses, 659,636 horned cattle, 474,080 sheep, 63,009 swine, and 5557 goats. Abundance of excellent timber is obtained from the forests. Bears, wolves, and foxes are the chief wild animals of the country; and fish are abundant in the lakes and rivers. Except in the towns, there are few manufactures; but even in the country many hands are employed in saw-mills, brick-kilns, and boat-building. The whole number of manufactories in 1849 was 273, employing 4458 hands. An important transit trade is here carried on between the southern parts of Russia and the ports on the Baltic. The population consists almost exclusively of Russians. The government is divided into 12 circles. Pop. (1856) 1,466,194.

TVER, the capital of the above government, on the right bank of the Volga, at its confluence with the Tvertza and the Tmaka, 96 miles N.W. of Moscow. The Volga is here somewhat broader than the Thames at London, and is crossed by a bridge of boats. The Kremlin, or citadel, of Tver is enclosed by an earthen wall, and thus separated from the rest of the town, which consists of four quarters and a suburb. It is regularly laid out, and built for the most part of wood; but its spacious streets have a dull and desolate appearance. There are here a large Gothic cathedral and twenty-eight other churches, two convents, an imperial and an episcopal palace, a town-hall, court-house, theatre, bazaar, gymnasium and other schools, infirmary, and various hospitals. Linen, cordage, leather, hats, earthenware, and candles are manufactured here; and an extensive transit trade is carried on, favoured by the position of the town on the railway between Moscow and St Petersburg. Pop. 19,000.

Tver ‖ Tweed.

TWEED, one of the principal rivers of Scotland, forming in the lower part of its course the boundary between England and Scotland, takes its rise at the south-western extremity of Peeblesshire, in the upper part of the parish of Tweedsmuir, about 6 miles north of Moffat. During the upper part of its course it is augmented by numerous small streams, and flows in a north-easterly direction, till it receives the Lyne, about 3 miles above Peebles, whence its

general course is eastward to its mouth. A short way farther down it receives the Manor, and at Peebles the Eddlestone, being now a considerable stream; and though only 30 miles from its source, having fallen 1000 feet, two-thirds of its entire descent. Its next considerable affluents are the Quair and Leithen, and it afterwards receives the united waters of the Yarrow and Ettrick. After passing Abbotsford it receives the Gala, and the Leader at a short distance below Melrose Abbey. Passing Dryburgh Abbey, where are deposited the remains of Sir Walter Scott, the Teviot is the only large stream that it receives till past Kelso. Four miles below Kelso it receives the Eden, at Coldstream the Leet, and 3 miles below Coldstream the sluggish Till from Northumberland. The only other considerable stream that it receives, till it falls into the German Ocean at Berwick, is the Whitadder. The Tweed is 96 miles in length, and is estimated to drain an area of 1870 square miles. It is chiefly famous for the beautiful rural scenery through which it flows, and for the important place which it occupies in Scottish song and story. Its traffic is chiefly confined to Berwick. The tide rises to Norham Castle, 10 miles from the sea, but the river is only navigable for boats of 30 tons for the last six miles. The salmon fisheries of the Tweed are of considerable value, though not now so important as formerly.

TWEEDDALE. See PEEBLESSHIRE.

TWEEDMOUTH. See BERWICK-ON-TWEED.

TWENTY-FOUR PERGUNNAHS, a district of British India, in the presidency of Bengal, lying between N. Lat. 21. 55., and 22. 48.; E. Long. 88. 6. and 88. 43..; bounded on the N. by the district of Baraset, E. and S. by the Sunderbunds, and W. by the districts of Hoogly and Hidgelee, from which it is separated by the river Hoogly. Length from N. to S. 60 miles, breadth 32, area 1186 square miles. It consists entirely of a plain, slightly elevated above the sea, and traversed by many rivers and streams. The most important of these is the Hoogly, which forms the western boundary of the district for a distance of 78 miles, and is navigable for the largest vessels as far as Calcutta. A branch of this river, flowing S.E., is important as affording a passage at all seasons, even when the direct channel will not admit large ships. Another river in the district is the Poli, which flows eastward from the Salt Lake near Calcutta into the Sunderbunds. The climate is here very hot from March till June, when the thermometer sometimes reaches 112° in the shade. From June till November the rainy season lasts, and the rest of the year enjoys mild and salubrious weather. Palms and various native and foreign fruits are the chief vegetables raised here. A great part of the country is covered with jungle, in which tigers, hyenas, wild boars, buffaloes, and deer abound. There are few horses, but the chief domestic animals are horned cattle, sheep, and goats. The principal articles of trade are coarse cotton and silk, cloth, hemp, cocoa-nuts, teak and other timber, sugar, molasses, and small quantities of indigo, hides, and rum. Calcutta is locally included in this district, but is under a separate jurisdiction, and the seat of government here is Alipore. The country was granted to the East India Company by the Nabob Jaffier Ally Khan in 1757, and derives its name from its having formerly comprised twenty-four divisions, called in the native language *pergunnahs*. Pop. 701,128.

TWICKENHAM, a village and parish of England, Middlesex, on the left bank of the Thames, opposite Richmond, about 12 miles S.W. of the post-office, London. The village is irregularly laid out, but it has some fine villas and beautiful scenery. Its chief interest arises from its association with the poet Pope, who had a villa here, where he spent the last thirty years of his life. The church, a plain brick building with a tower, stands near the river, and contains the monument of his parents, erected by the poet, and his own by Bishop Warburton. Twickenham has another established church, Independent, and Methodist places of worship, national and other schools. Pope's villa has been destroyed, and a modern house erected on its site; but Strawberry Hill, the residence of Horace Walpole, remains with its curious mixture of castellated and Gothic architecture. Here, too, is Orleans house, the residence for some time of Louis Philippe, while Duke of Orleans. The parish of Twickenham contains powder and oil mills. Pop. 6254.

TWISS, HORACE, an important political and miscellaneous writer, was the son of Francis Twiss, author of a *Verbal Index to Shakspeare*, and of Frances Kemble, sister to the celebrated Mrs Siddons, and was born in 1786. He was called to the bar by the Society of the Inner Temple on the 28th of July 1811, and he was attached to the Oxford circuit, where he became in a few years one of its most distinguished pleaders. In 1827 he was advanced to the grade of king's counsel. But his literary and political tastes were so strong, that they had the effect of lessening his legal success. From 1807 down until 1844, the booksellers of London were kept busy or idle as the topic took the taste of the times, by the poetical, dramatic, political, and biographical effusions of Horace Twiss. He entered Parliament in 1820 as a member for Wootton Bassett; in 1830 he was elected to represent the borough of Newport; and from 1835 to 1837 he was member for Bridport. During his parliamentary career, he signalized himself greatly as an able speaker and a very judicious legislator. His literary fame now rests almost exclusively on his *Life of Lord Chancellor Eldon*, 3 vols., 1844; a work which he was prevailed upon to take in hand by the urgent solicitations of the grandson and heir of that distinguished lawyer. Twiss was the life and soul of every social circle he entered. The wit and fun of him, his affable, kind-hearted ways, and his scholarlike breeding, rendered him one of the most fascinating companions that one could meet in all London. He died suddenly of disease of the heart on the 6th of May 1849.

TYCHSEN, OLAUS GERHARD, a famous orientalist of Germany, was born of poor parents at Tondern, in Schleswig, on the 14th of December 1734. Passing from the gymnasium of Altona, where he was strongly influenced by Maternus de Cila, the distinguished eastern scholar, he entered the university of Göttingen in 1756. When he had finished his studies at this place, he was sent by Callenberg, professor at Halle, on a mission to the Jews, from which he returned in 1760, on the death of his employer, without having converted a single individual. He was subsequently appointed professor of oriental literature at the university of Butzow, where he remained till his death. Tychsen was a man of great knowledge, but he was full of singularities and conceits; and so vain was he of his acquirements, that he often got into very awkward disputes with his contemporaries. He certainly had the best of it in his controversy with Kennicot, but F. P. Bayer of Valencia gave him a smart castigation. He wrote various dissertations on the Arabic and Phœnician languages; he investigated the history of the Christian sects in Asia; and he was the first to point to a curious catechism of the Druses in Syria. The best and most important of Tychsen's works is his *Bützowsche Nebenstunden*, which appeared between 1766 and 1769. He died at Rostock on the 30th of December 1815. His life was written by A. T. Hartmann, in 2 vols., Bremen, 1818–20.

TYNDALE, or TINDALE, WILLIAM, a learned and pious martyr, was born during the latter part of the fifteenth century, probably about 1477. He is said, but apparently without foundation, to have been the grandson of Hugh, Lord Tyndale; who having been engaged in the civil wars between the houses of York and Lancaster, lost his honours,

Tyndale. together with his estate in Northumberland, and, under the borrowed name of Hutchins, sought a place of refuge in Gloucestershire, where he retrieved his fortune by marrying the daughter and sole heiress of Hunt of Hunt's Court. William Tyndale having been early and well initiated in learning, was sent to Oxford, where he was entered of Magdalen Hall. He not only acquired a knowledge of the Latin, but even of the Greek language, which at that period was but little understood in England. He read the Greek Testament to the students of Magdalen College as well as Magdalen Hall. After having taken his degree in arts, he is said to have passed some time in the university of Cambridge. On the 11th of March 1502, deacon's orders were conferred upon him by a suffragan of Warham bishop of London, in the church belonging to the priory of St Bartholomew in Smithfield. He was ordained priest to the nunnery of Lambley, in the diocese of Carlisle; and in 1508 he became a friar in the monastery of the Minorites at Greenwich. Even at this period of his life, he appears to have been impressed with the great importance of presenting to the people the sacred Scriptures in their mother tongue; and he had commenced his version of the New Testament so early as the year 1502. He was afterwards engaged as a tutor and chaplain in the family of Sir John Welch, a knight of Gloucestershire, who kept a hospitable table, and was frequently visited by the neighbouring prelates and other clergy. The careful and anxious study of the New Testament had prepared Tyndale for receiving the doctrines of the reformation. As he found it unsafe to prosecute his pious labours in his own country, he sailed for Hamburg in 1523, and from that port proceeded to Wittemberg, at that time the residence of Luther. There he completed his version of the New Testament. John Fryth and William Roy, who both suffered martyrdom, lent their aid as his amanuenses. "One edition," says Offor, "probably of three thousand, was prepared for general circulation: this was quickly followed by a more elegant edition in quarto, with glosses, commenced at Cologne in 1526, and finished at Worms or Wittemberg. The type, cuts, and ornaments of both these books are those used by the German printers on the Rhine." This version has recently been reprinted under the superintendence of Offor, who has prefixed a memoir of his life and writings. Lond. 1836, 8vo. He likewise undertook a translation of the Old Testament, and having completed his version of the first books in 1529, he began to publish them in separate tracts, ornamented with wood-cuts, and accompanied with notes, which gave no small offence to the bigoted clergy. Having completed the last book of the Pentateuch, he sailed for Hamburg with the view of printing it; but being wrecked on the coast of Holland, he lost his money, his books and manuscript. He however continued his journey, and being joined by Coverdale, they again translated the book of Deuteronomy, and, with the assistance of a pious lady named Van Emerson, printed it in the year 1530. He afterwards translated the book of Jonah. The circulation of the Scriptures in the vulgar tongue excited the utmost alarm in England, where many copies of his version of the New Testament were committed to the flames. The king, the cardinal, and the chancellor, made some ineffectual attempts to induce him to return home. He afterwards fixed his residence at Antwerp; and there one of their emissaries, a miscreant named Henry Phillips, circumvented the worthy and unsuspecting man; and having procured a warrant at Brussels, betrayed his confidence with signal baseness, and delivered him into the hands of the officers. He was committed to prison at Vilvoord, a village between Brussels and Malines. By virtue of a decree made at Augsburg, against what was termed heresy, he was condemned to suffer death; and after having been in custody about a year and a half, he was, in September 1536, conducted to a rising ground near his prison, was first strangled, and his body was then consumed by fire. Tyndale, who was a man of learning as well as talents, appears to have translated the Scriptures from the original tongues; and his pious labours gave a great impulse to the progress of reformation. Of the English language, as written at that period, his own works afford an excellent specimen. In his controversy with Sir Thomas More, he had many advantages over his antagonist. His works, together with those of Fryth and Barnes, were collected into a large volume. Lond. 1572, fol. Dr Geddes has remarked, that although his translation is far from perfect, "yet few first translations will be found preferable to it. It is astonishing how little obsolete the language of it is, even at this day; and in point of perspicuity and noble simplicity, propriety of idiom, and purity of style, no English version has yet surpassed it."

Tyndale ‖ Type-Founding.

TYNE, an important river in the north of England, formed by the union of the North and South Tyne, near the village of Warden, 2 miles above Hexham, in the county of Northumberland, whence it pursues an easterly course to its mouth at Tynemouth. It is about 35 miles in length, for the last 18 of which it forms the boundary between Northumberland and Durham. Its principal affluent is the Derwent, from the south. The towns of Newcastle and North and South Shields are on its banks, and it thus carries on a very extensive trade (see NEWCASTLE and SHIELDS.) North Tyne rises on the border of Scotland, and flows first south and then east, till it receives the Reed, whence its course is S.E. to its junction with the South Tyne. Its length is about 40 miles. South Tyne rises near Crossfell in Cumberland, flows first N. to Haltwhistle, whence its course is eastward, till it meets the North Tyne, its entire course being about 45 miles.

TYNEMOUTH. See SHIELDS.

TYPE-FOUNDING. In the treatise on PRINTING the reader will find that the invention of the art of type-founding was a very early consequence of the discovery of the rude art of taking impressions from laboriously excised letters of wood and metal; and that, after an investigation of the statements of various authors, the honour of the invention has been given to the illustrious partnership of Gutenberg, Fust, and Schœffer, the larger share being allowed to the latter, as having had practice in the design and proportioning of letters in his original employment of an illuminator; that the place of the invention was the city of Mentz, and that the time was about the year 1457. Nor, upon examination, will it appear that any other can dispute the honour with these worthies, inasmuch as they indisputably used cast-metal types before the secession of Gutenberg from his associates, and consequently before the dispersion of their workmen by the capture of Mentz in the year 1462; nor will the claims of Koster of Haarlem in any case interfere with these, the most sanguine of his supporters carrying his pretensions no farther than the art of taking impressions from excised characters of wood, of lead, and lastly of tin. The necessity of some improvement upon the original method of forming types, even on the very limited scale upon which the first efforts of typography were conducted, must be obvious, and it appears to have advanced in a natural and rapid course. The first step seems to have been the striking of a letter of approved cut, answering in some degree to the modern punch, into soft clay or plaster, and the infusion of metal into the mould thus formed; the shaft or *body*, which by so rude and uncertain a method must necessarily have been rough and untrue, being dressed into correctness by manual labour. The art of casting and working metals, however, being at that time by no means defective, and Fust being by profession a worker in gold and silver, it is probable that a process not unlike the modern was soon invented; but of this we have no certain evidence, the whole art of printing being

Type-Founding.

carefully kept a "mystery" by the initiated until about half a century after the probable date of the invention.[1] That the mould was an early invention is shown by the device of Badius Ascensius, an eminent printer of Paris and Lyon in the beginning of the sixteenth century, and also by that of an English printer, Anthony Scoloker of Ippeswych, who modified and adopted the device of Ascensius, as indeed did many other printers of various countries. This curious design exhibits in one apartment the various processes of printing; the foreground presenting a press in full work, the background on the left the cases and the compositor, and on the right the foundry, in which a workman is casting types by means of a mould, bearing a precise resemblance to those at present in use. This introduces to observation the fact that the earlier printers generally combined all the various processes of their profession in their own offices; although it would appear, that as the art spread over Europe, and secrecy became less and less necessary, the most enterprising speedily began to furnish their distant brethren with types from their respective foundries. Thus it would appear that the first types of the English architypographer Caxton were supplied by Ulric Zell, and that it was not until the establishment of his printing-house at Westminster that he began to cut letter in imitation of his own handwriting, and more agreeable to the fashion of writing at that time in use in England. Lettou and Machlinia are supposed to have purchased their types from foreign foundries, perhaps from Lyon or Milan. But Wynkyn de Worde discarded that jealousy which had hitherto obstructed the progress of the art in England, and having cut many founts of considerable beauty, supplied his contemporary typographers. His black letter in especial was so much esteemed as to have been in use to a very late period, and it is said that remnants of his founts are to be found in some of the most ancient printing establishments; nay, it is even possible that some of his original punches or matrices might yet by a diligent antiquary be discovered—a valuable and interesting addition to our many curious relics of the art.

The first record of the separation of the art of type-founding from that of printing would appear to be a decree of the Star-Chamber in the reign of Charles I., dated 11th July 1637. This was probably one of the attempts to suppress the printing of seditious works by the rising Puritans, who, after establishing secret printing-offices in various parts of the kingdom, found it necessary for secrecy to cut their founts themselves. The decree seems to have been in some degree a revival of one of the same nature, 28 Elizabeth, limiting the number of printers to twenty. By the first-mentioned decree it was ordered,—

That there shall be four founders of letters for printing, and no more.

That the Archbishop of Canterbury, or the Bishop of London, with six other high commissioners, shall supply the places of those four as they shall become void.

That no master founder shall keep above two apprentices at one time.

That all journeymen founders be employed by the masters of the trade, and that idle journeymen be compelled to work, upon pain of imprisonment, and such other punishment as the court shall think fit.

That no master founder of letters shall employ any other person in any work belonging to the casting and founding of letters than freemen or apprentices to the trade, save only in pulling off the knots of metal hanging at the end of the letters when they are first cast, in which work every master founder may employ one boy only not bound to the trade.

The four founders appointed by this decree to serve the whole kingdom were John Grismand, Thomas Wright, Arthur Nicholas, and Alexander Fifield.

Type-Founding.

This decree was revived 14th Charles II., renewed 16th Charles II., and again for seven years 1st James II., at which term it expired, and was never renewed.

The founts in use in English printing-offices may be divided into two kinds; those used for book, and those for job printing, that is, hand and posting bills, &c. Of book types there are twelve regular bodies—viz., Great Primer, English, Pica, Small Pica, Long Primer, Bourgeois, Brevier, Minion, Nonpareil, Ruby, Pearl, and Diamond. Besides these, Minion-Nonpareil is a good deal used; and some founders have introduced intermediate founts, as Emerald.

It is much to be regretted that no uniform standard has been adopted by letter-founders for their founts of the same-named letter; they vary not only from those of other founders, but even from their own, owing to which it seldom happens that any two founts *stand* together. This is the cause of much inconvenience, as in the instance of capitals and small capitals, accented letters, signs, and other sorts introduced into common matter; the printer being obliged to purchase a small quantity of each with every fount, whereas, were there any uniformity, he might have a considerable quantity to be used with any fount as occasion required.

Great Primer (Fr. *Gros Romain;* Ger. *Tertia*) is the largest type in use in book printing, being chiefly for large Bibles, on which account it is sometimes called Bible Text; but it is very seldom employed. There are about 51¼ ms to a foot: it is double the body of Bourgeois.

English (Fr. *St Augustin;* Ger. *Mittel*) is much used for church Bibles, and for works in folio and quarto. The French name is probably derived from its being first used to print the works of St Augustin; the German from its being the middle of seven standard founts used by the early German printers. There are about 64 ms to a foot: its body is equal to two Minions.

Pica (Fr. and Ger. *Cicero*, from its having been first used for Cicero's Epistles) is the fount which is used as the general standard of measurement in casting leads, quotations, cutting rule, and regulating the price of press-work, &c. It is in very extensive use for works of a standard character, history, art, and other library works: it is sufficiently large for weak eyes, and not too great for moderately sized 8vo pages, being in fact the just medium. There are 71 ms to a foot, and it is equal to two Nonpareils.

Small Pica (Fr. *Philosophie*; Ger. *Brevier*) is perhaps the most extensively used of all the founts, being a very useful and well-proportioned letter. Novels are almost always printed in this body. 83 ms to a foot, equal to two Rubies.

Long Primer (Fr. *Petit Romain;* Ger. *Corpus*) is likewise much used, being very well adapted for works in 12mo, dictionaries, and other works in which much matter is to be got into a small space; it is the type of the *Encyclopædia Britannica.* 89 ms = 1 foot: two Pearls.

Bourgeois (Fr. *Gaillarde;* the Germans have none to correspond) is much used for the same purposes as Long Primer, and in solid matter is difficult to distinguish by the eye from that body. 102 ms = 1 foot: two Diamonds.

Brevier (Fr. *Petite Texte;* Ger. *Petit* or *Jungfer*) is so called from its having been much used for printing breviaries. It is much employed for small works, and for notes. 112½ ms = 1 foot.

Minion (Fr. *Mignonne;* Ger. *Colonel*) is chiefly in use for newspaper advertisements; it is a very pretty fount, and

[1] A copy of the *Speculum Humanæ Salvationis*, in the library of the late Duke of Marlborough, presents probably the earliest specimen of cast types, twenty-five of its leaves being printed from solid wooden blocks, or perhaps from wooden blocks on which the designs have been so cut that the scrolls, cut upon other blocks, were inserted in spaces left for them; while, in thirty-eight leaves, the scrolls are in cast type, inserted in the designs in lieu of the engraved scrolls. (See PRINTING.)

Type-Founding.

well adapted for pocket editions, prayer-books, and Bibles: it is perhaps the smallest of readable sizes. 128 ms = 1 foot: half English.

Nonpareil (Fr. and Ger. *Nonpareille*), used for the same purposes as Minion. 143 ms = 1 foot: half Pica.

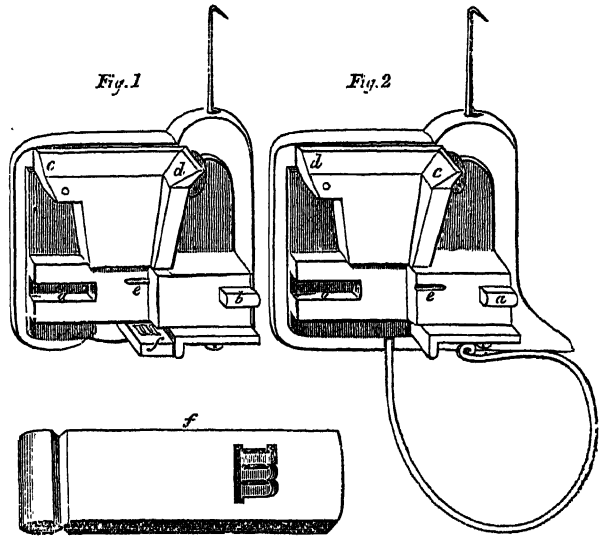
Ruby (no body to correspond in France or Germany), used for pocket dictionaries, prayer-books, &c.; but it is too small for any but the strongest sight. 163 ms = 1 foot: half Small Pica.

Pearl (Fr. *Parisienne;* Ger. *Perl*), used for the same purposes. 178 ms = 1 foot: half Long Primer.

Diamond (Fr. and Ger. *Diamond*) is the smallest body cut; it is distressingly small, and is used mostly for notes to works in Nonpareil and the descending bodies. The French have succeeded in cutting the face so small as to be illegible, and an annual lately sold in London in this letter was accompanied with a magnifying glass. 205 ms = 1 foot: half Bourgeois.

The principal apparatus in the casting of type are the punch, the matrix, and the mould. The punch (or puncheon) is a piece of steel bearing upon one end a single letter, which is formed by hammering, filing, and other processes, and differs in no other respect from ordinary punches than the unusual care and accuracy with which it is worked. It must be remembered, that as each letter is but one of a large number with which it is to harmonise, the height must be obtained with the greatest precision, the breadth both of the heavy and the fine strokes must be carefully proportioned, the turns graceful. This general harmony is not very difficult to attain in the coarser fancy type, there being in this, as in other arts, little merit in imitating the vulgar or the grotesque; but the elegant and symmetrical face of book type is as difficult to attain as the exquisite grace of the higher productions of the arts; and yet, to such perfection have modern artists attained, that the practised eye has little difficulty in assigning an individual letter to its proper fount, and even if the printer has turned his attention to the particulars of his art, to the foundry and the artist, the punch-cutter of a foundry of character having a professional reputation, like a painter or engraver. Mr Moxon, a mechanician of great ingenuity, in his *Mechanical Exercises*, has the credit of first assigning rules for the shaping of letters, laying down geometrical rules for the angles of inclination, the curves, and for adjusting the base from which the shoulders of the letter should rise to obtain the greatest strength. From this the modern artists have varied, obtaining great sharpness of appearance combined with strength and durability. Although beyond a doubt Mr Moxon's formulæ have been of great advantage to subsequent punch-cutters, he was by no means a successful artist himself; his type, cut upon the most philosophical principles, being uglier than that of his contemporaries. The matrix is a small piece of copper into which the punch is struck. Much care is also requisite in doing this, although, provided it be struck sufficiently deep, the surface of the copper may be filed down so as to leave the impress of the exact depth. It has been explained in the treatise on PRINTING, that to obtain equality of impression, the face of the composed type must be in an exact plane, from which it will be easily understood that the just depth of the impression in the matrix is a matter of much importance. The copper must now be carefully dressed at the ends and sides, in order that, when adjusted in the mould, the character, when cast, may be so placed upon its body that it shall stand exactly even with its brother characters: the nicety required in this is surprising.

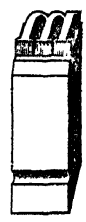
The mould is a very simple but very ingenious apparatus, consisting of two parts, so contrived that, being properly placed together (viz., *a* 2 in *a* 1, *b* 1 in *b* 2, *c* 2 on *c* 1, and *d* 1 on *d* 2), they form in the centre *e* a space which is geometrically described as a parallelopiped, being, in fact, the mould in which the type is formed; the matrix *f* is placed at the bottom; the metal is poured in at the



orifice formed by the closing of the upper parts. It will be seen that the two parts which form the mould slide upon each other, and that the extent to which they close is regulated by the width of the matrix; and that, therefore, all types of one fount, whether the broad 4-em quadrat or the narrow i or l, may be cast in the same mould. The spring at the bottom of figure 2 retains the matrix in its place, and without removing it the new letter cannot be disengaged; the hooks at the top are used to remove the letter from the mould. *f* is an enlarged drawing of the matrix.

The caster, with this apparatus, stations himself by the side of a furnace containing the melting-pot and the fluid metal, of which he takes a portion with a very small ladle, and having poured in a sufficient quantity, jerks the mould into the air with his left hand (a very singular movement), which has the effect of expelling the air and forcing the metal into the finest strokes of the matrix. He then with one finger releases the spring, separates the mould, and hooks out the letter with one of the pieces of bent wire represented at the top of the mould; and so proceeds with considerable rapidity, casting about 500 letters in the hour, of ordinary sized type, although the smaller and the larger sizes require much more time, the first on account of the care requisite, and the latter to allow of the setting of the metal.

The types are now removed from the caster's table by a boy, who strikes off the knob at the bottom, caused by the superfluous metal at the orifice of the mould. A workman next rubs the sides of each letter upon a slab of very gritty stone (his fingers being guarded by a piece of leather), which removes any small knobs or globules attached to the sides or edges. This is done with great rapidity, from 1500 to 2000 letters being dressed in an hour. The letters are then set up in a long stick, and again dressed, and the bottom grooved, by which exact height is insured; and the fount being then proportioned, is tied up and is ready for the printer. A *fount* of type consists of five alphabets, A, A, a, *A*, *a*, with points, spaces, &c., about 200 characters. A small fount of pica, containing its due proportion of all sorts, weighs about 800 lb.


Fig. 3.

The matrix for very large type is differently prepared, the nicety of the punch-cutter's art not being required. The letter having been accurately shaped out by rule and

Type-Founding.

compass upon a piece of copper or brass, the part so marked out is cut away, care being taken to cut the back somewhat wider than the front, the sloping edge forming the shoulder of the future type. The piece of brass now very much resembles the plates used for stencilling the large headings of legal forms: it is next riveted upon a smooth surface of brass, which forms the face of the letter.

Such was the method of casting type invented by the earliest typographers, and continued to the present day by modern type-founders. But the large founts and frequent renewals required by the modern system of literary enterprise have produced many ingenious plans for superseding hand-casting by machinery. The invention which has come into use, and is adopted in most large foundries, is of American origin, but was patented by Mr E. Newton in 1850. It may be described as the primitive mould worked by machinery. The mould-blocks are opened, closed, and adjusted by means of a crank-pin, which works in a slot, formed in an arm connected with the standard of the mould-blocks. The matrix is presented to and withdrawn from the mould-blocks by means of levers. The matrix being in its place, and the mould-blocks adjusted, a jet of molten type-metal is forced through a nipple into the mould by a plunger working in a piston-box inserted in the fusing-pot. The injective force drives the metal into the matrix, so as to form a cast of great sharpness and accuracy, and the metal sets instantaneously. The machinery now opens the mould-blocks and withdraws the matrix; and in the movement the new type, which is made to adhere to one side of the mould-block by a slight projection, is brought under the point of a rod, which picks it from its place. The whole apparatus is set in motion by a small hand fly-wheel. The types are cast with a rapidity varying with the size. The large 3-line and 4-line letters require a slight pause at each stroke of the pump to allow the metal to set; but the smaller types, such as pica, small pica, and long primer, are cast with a continuous motion, at the rate of from 80 to 120 a minute: 10,000 may be easily cast in a day. Quadrats and spaces are thrown down with wonderful rapidity. The types cast by the machine require precisely the same dressing as those cast by hand. Machine-cast types are of somewhat less specific gravity.

The ordinary ingredients of type-metal are lead, antimony, and a small proportion of tin. Each foundry has its own secret, either as to the proportions of these articles, or as to other materials added. Some are known to add arsenic, others copper, in small proportions. Much of the durability of type is also known to depend upon the degree of heat applied, and to the rapidity with which crystallization takes place. A very hard type-metal has been patented, composed of 75 per cent. of tin and 25 per cent. of antimony; or if any lead be added, it must be in very small proportion. Type of this composition is more expensive than that of common metal, but it is specifically lighter, and is said to be durable. Another metal patented by an experienced firm is composed of zinc, nickel, and copper, to which, when fused, a small quantity of lead is added. This mixture is then combined with a fusion of lead and antimony, and the whole subjected to a very high heat.

There have been some so-called improvements in type, which not having proved practically useful, are mentioned only as matters of curiosity. Such is the process of coating the face of type with copper by electro-deposition. Type so treated is of course much more expensive than type plain; but although perhaps electro-faced type may be more enduring of friction, it has proved unable to withstand planing-down and other practical treatment, or the alternations of temperature; and the facing is apt to scale off. If a small portion of the fount becomes thus affected, the whole becomes useless.

Type has been formed of cold metal by pressing the ends of square shanks into dies (*apyrotype*). This, as regards type-metal, is a more expensive and less perfect process than casting; and as to copper, its greater durability is more than countervailed by the great value of the material, the rapid destruction of the dies, and the temptation to the workmen.

Type-Founding ‖ Tyre.

SPECIMEN OF TYPES.

Although in the treatise on TYPE-FOUNDING the names of the different sizes of type used in the printing of books have been given, yet it has been deemed advisable to append here a specimen of the founts which are more commonly in use, with their names affixed, in order that authors may be enabled more readily to point out the type on which they wish any work or part of a work to be printed.

ENGLISH.

"Every printing-house is, by the custom of time out of mind, called a Cha-

PICA.

pel, and all the workmen that belong to it are members of the Chapel; and the oldest free-

SMALL PICA.

man is father of the Chapel. I suppose the style was originally conferred upon it by the courtesie of

LONG PRIMER.

some great church-man, or men (doubtless when chapels were in more veneration than of late years they have been

BOURGEOIS.

here in England), who, for the books of divinity that proceeded from a printing-house, gave it the reverend title of Chapel.

BREVIER.

"There have been formerly customs and bye-laws made and intended for the well and good government of the Chapel, and for the more civil and orderly deportment of all its members

MINION.

while in the Chapel, and the penalty for the breach of any of these laws and customs is, in printers' language, called a Solace.

"And the judges of these solaces, and other controversies relating to

NONPAREIL.

the Chapel, or any of its members, were plurality of votes in the Chapel; it being asserted as a maxim, that 'the Chapel cannot err.' But when any controversy is thus decided, it always ends in the good of the Chapel.

RUBY.

A solace is generally purchased by the Master-printer; as well because it hinders the workmen's work, as because it batters and spoils the quadrats: For the manner how they play with them is thus: They take five or seven more *em quadrats* (generally of the

PEARL.

English body), and holding their hand below the surface of the correcting-stone, shake them in their hand, and toss them upon the stone, and then count how many nicks upwards each man throws in three times, or any other number of times agreed on; and he that throws

DIAMOND.

most wins the bet of all the rest, and stands out free, till the rest have tried who throws fewest nicks upwards in so many throws; for all the rest are free; and he pays the bet. Any of the workmen may purchase a solace for any trivial matter, if the rest of the Chapel consent to it: As if any of the workmen sing in the Chapel,

(T. C. H.)

TYRE is situated on a low peninsula, which is connected by a sandy isthmus with the plain of Phœnicia. The ancient Itineraries accurately place it 24 Roman miles S. of Sidon, and 32 N. of Ptolemais (*Vet. Rom. Itin.* ed. Wess. 149, 514; *Tab. Peut*). It lay within the territory of the Israelites, and was allotted to the tribe of Asher (Josh. xix. 29). It stands in Lat. 33. 16. N., and Long. 35. 12 E. from Greenwich.

Name.

The Hebrew name of Tyre is *Tsur* (צוֹר), which signifies "a rock," but is also used in Scripture to denote "strength" (Is. xxx. 29; Ps. xviii. 2). As applied to the

Tyre. city, it may perhaps have indicated rather the "strength" of its fortifications than the character of its site; for old Tyre was not built upon "a rock," and yet it is called emphatically מִבְצַר צוֹר, "the strongly fortified Tyre" (2 Sam. xxiv. 7). The domestic name צֹר is found on the coins struck at Tyre in the time of the Seleucidæ (Mionnet, *Deser. des Med.* v. 23), and also in several passages of the Old Testament (2 Sam. v. 11, &c.) The Aramæic form was טוּרָא, *Tura;* hence came the Greek Τύρος, and the Latin *Tyrus.* In one passage of Scripture (Is. xxiii. 12), Tyre seems to be called a "daughter of Zidon," though the reference is doubtful. If Tyre be referred to, the passage is remarkable as contrasted with an inscription on one of her own coins לְצֹר אֵם צִדנִם, "of Tyre, mother of the Sidonians" (Gesen. *Monum. Phoen.* i. 262). The former may denote the origin of Tyre, as founded by a Sidonian colony; the latter, its subsequent advancement to be the capital of Phœnicia.

Topography. Tyre was a double city. One part of it originally stood on the mainland, the other on an island. The former has entirely disappeared, and the latter is represented by a miserable village. The island is now a peninsula, Alexander the Great having joined it by a mole to the shore. It was at first a ledge of bare rock, about 1200 yards long by 600 broad; separated from the coast by a channel nearly 1200 yards in width, its greatest depth being three fathoms. The rock was low and flat, not being more than from 15 to 20 feet above the sea-level; but the accumulation of stones and rubbish has made it uneven, and has given it in some places a much greater elevation. The mole, when first made, was only 200 feet broad; but the united action of wind and wave on the loose sand of the coast, aided perhaps by deposits of mud carried up from the mouths of the Nile, has gradually increased it to the width of from 600 to 800 yards. The isthmus joins the peninsula about the middle, and thus leaves promontories on the north and south, which stretch out like the arms of a cross, and from a distance appear to be still farther lengthened by ledges of low insulated rocks. Along the western side of the peninsula is a strip of land cultivated in gardens, and the whole southern section is covered with heaps of rubbish, with deep pits between them, from which building-stones have been taken for the houses of Beyrout and Acre.

The modern village is situated on the north-east side of the peninsula, where the isthmus joins it. It contains about 3500 inhabitants, one-half being Metâwileh, and the other Christians. Most of the inhabited houses are mere hovels, and the streets are narrow, crooked, and filthy; while the walls, and few buildings of a better class, are so shattered by repeated shocks of earthquakes, that one is almost afraid to approach them. There is but one gate; and the numerous breaches in the wall render others unnecessary. The only piece of antiquity worthy of notice is the church. Fragments of the eastern and western ends of it still stand. The intervening space is crowded with wretched cabins, some of which cling like swallows' nests to the massive buttresses. Three huge columns of red granite lie within the ruins; one of them is double, and measures 26 feet in length. These are, doubtless, the remains of the cathedral erected by Paulinus, bishop of Tyre, in the beginning of the fourth century; for which Eusebius the historian wrote a consecration sermon. It was in the same building the historian of the crusades, William, archbishop of Tyre, presided for ten years. Within it the Emperor Frederic Barbarossa was buried; and probably the body of Origen, who died in Tyre, was consigned to the earth in the same spot.

Tyre has been often desolated. Ruins on the top of ruins cover the whole peninsula, and are strewn beneath the waves round it. There was a Phœnician Tyre, a Roman Tyre, and a mediæval Tyre; and now there is a modern Tyre standing over them all. This serves to explain the strange and motley aspect of the site. Along the eastern side of the peninsula the line of the ancient ramparts can still be traced, rising here and there in broken masses above the drift-sand. On the south are some huge fragments of the sea-wall, but manifestly of mediæval architecture; for the foundation consists of granite and marble columns. Along the whole western coast runs a ridge of ragged rocks from 10 to 15 feet high; and the whole shore beneath them, along the edge of the water and in the water, is thickly strewn with beautiful shafts of red and gray granite. At the north-west angle the writer saw more than fifty thrown together in one spot. Many of them are imbedded in the rock; and we find also fragments of pottery, building-stones, and even bones, all cemented together in one solid mass beneath the waves. They have laid Tyre's "stones and dust in the midst of the water" (Ezek. xxvi. 12). Tyre.

Harbours. Tyre had two harbours, one on the north-east, and the other on the south of the peninsula. The former, called the Sidonian port, was in part formed by a little bay in the old island. On the north it was enclosed by two massive piers running parallel, 100 feet distant from each other. On the east side was a heavy wall founded on ridges of rock, having an opening in the centre 140 feet wide, which formed the entrance. It was defended by a boom and two heavy towers. This harbour originally measured about 900 feet by 700. It is now almost filled up with sand; yet fragments of its piers and towers still remain. Without it was an open roadstead, sheltered on the west by ridges of rocks.

The south harbour, called the Egyptian, extended along the whole breadth of the peninsula; but its greatest width scarcely measured 300 feet. It was enclosed by walls, the foundations of which can still be seen beneath the water. Without it was a roadstead, which, according to M. Bertou, was sheltered by a stupendous breakwater, extending from the side of the harbour nearly two miles towards the south-west. The writer can affirm, however, that not a vestige of this can now be seen *above* the water. It appears that the two harbours were once connected by a canal running through the centre of the city. The diminutive size of these harbours strikes one forcibly, as compared with the ancient commercial celebrity of the city. Tyre was the London of antiquity. For several centuries it stood unrivalled as a seaport. It must be remembered, however, that there was an infancy of commerce, just as of man; and we might as well try to put a man back into his cradle as to put the fleets of modern days into the ports of antiquity. Tyre was the cradle of commerce; and now that commerce has grown into such gigantic proportions, the cradle is entirely useless, and must for ever remain so—"Tyre shall be built no more."

Palætyrus. The very ruins of Palætyrus have disappeared. Its exact site is even a matter of doubt. Strabo says it was 30 stadia, or about 3¾ miles, south of the island city; but it would appear from the words of Pliny that the two were united. "The circumference of the city," he writes, "including Palætyrus, was 19 miles." It is probable that the main body, or nucleus of the "old city," lay at the distance given by Strabo; while the suburbs and villas of the merchants extended along the shore as far as the island. Anyone who has seen the modern city of Beyrout will be able to account for the apparent contradiction. About 3 miles south of the peninsula, and a quarter of a mile from the shore, are four of the most remarkable fountains and reservoirs in Syria; and round these, doubtless, once clustered the city of Palætyrus. They stand in a fertile plain, in the centre of rank vegetation. The water gushes up with

Tyre.

great force from the bottom of artificial reservoirs, constructed at some remote period in order to raise it to a sufficient height to be carried to a distance. The largest reservoir is octagonal in form, 66 feet in diameter, and 25 feet high. The walls are of enormous strength; 8 feet thick at the top, and with such an easy slope that one might ride up them. The volume of water flowing from it is very great. A Roman aqueduct formerly connected it with two other smaller reservoirs, and then ran across the plain northwards to a mound with ruins upon it, whence it turned west in the direction of Tyre. The long line of its broken arches and shattered piers has still an imposing look. The fourth cistern is small, and has an aqueduct of its own of a modern date. The age of these reservoirs cannot be determined. They were doubtless designed to convey a supply of pure water to the island city; and it was in all probability by cutting off this supply that Shalmaneser thought to reduce Tyre.

History.

If we adopt a tradition preserved by Herodotus, we must look upon Tyre as far more ancient than any other city of Phœnicia. Having come to Tyre to visit a celebrated temple of Hercules, he inquired of the priests how long it had been built. They replied that it was built when the city was founded, 2300 years before (ii. 44). According to this, Tyre was founded in the year 2750 B.C., or 400 years before the Flood! This must be regarded as a myth, quite characteristic of its authors. Tyre is not once mentioned by Homer, though he frequently speaks of Sidon and the Phœnicians; nor is it referred to in Scripture before the time of Joshua. Ancient writers generally represent it as having been founded by a colony from Sidon. Josephus says that Tyre was founded 240 years before the building of Solomon's temple (*Antt.* viii. 3, 1). The temple was begun in B.C. 1011, and consequently Tyre was built in B.C. 1250. Justin states that the Sidonians, many years after the building of their city, were defeated by the King of Ascalon, and fled in their ships to Tyre, which they founded, one year before the capture of Troy (xviii. 3). This agrees with the date of Josephus, and both the accounts evidently refer to the same event; but there is evidence to show that Tyre existed as a "strong city" more than two centuries before that time (Josh. xix. 29). The historians may either refer to the time when the island city was built, or, more probably, only to an event which raised Tyre suddenly to such a pitch of power as gave it the ascendency over all Phœnicia. We have some ground for believing that, though the principal part of the ancient city stood at first on the mainland, yet the island was, from the very earliest period of its history, used as a sanctuary in time of danger—as a naval station—and as the great seat of the worship of the national deities.

From the time of the Sidonian immigration till the reign of Hiram, we have no annals of Tyre. The city seems to have increased rapidly in population, in commercial enterprise, and in power. Hiram succeeded his father, Abibal, during the reign of David in Israel. The island being now too small for the increasing population, he reclaimed ground from the sea on the eastern side; and by embankments he joined a small island, on which the great temple of Hercules stood, to the large one (Josep. *c. App.* i. 17 and 18). He also built splendid temples, and enriched them with costly ornaments, such as pillars of gold and glass. Hiram was the friend and ally of King David. When the latter built his palace, Tyrian workmen were chiefly employed; and when Solomon began the erection of the temple, the carpenters and masons were taken from Tyre. The elaborate internal ornaments and costly furniture were also executed or designed by a Tyrian artist, who was "skilful to work in gold and in silver, in brass, in iron, in stone, and in timber, in purple and blue, and in fine linen; also to grave any manner of graving" (2 Chron. ii. 14). At this period the Tyrians must have attained to great skill in navigation, for they made regular voyages not only to the coasts of Spain and Britain, but to eastern Africa and India.

The descendants of Hiram ruled Tyre for nearly half a century. The last of the royal line was murdered by Ethbaal, priest of Ashtaroth, whose infamous daughter, Jezebel, is well known in Bible history. The fourth in descent and succession from Ethbaal was Pygmalion, whose sister Elisa, or Dido, founded Carthage (Josep. *c. App.* i. 18) about B.C. 850. During the internal dissensions in the Jewish kingdoms, the Tyrians seem to have grievously oppressed the Israelites, and to have sold many of them into slavery. Hence the origin of most of their own calamities, and of the final destruction of their city, as predicted by the prophets (Joel iii. 4, *sq.*; Amos. i. 9, &c.)

The next remarkable event in the history of Tyre was its siege by Shalmaneser, king of Assyria, in the year B.C. 720. Having overrun all Phœnicia and captured Palætyrus, he attempted to reduce the island city by cutting off the supplies of water. During five years he guarded the fountains, but the inhabitants found sufficient in their cisterns, and he was at length obliged to retire (Josep. *Antt.* ix. 14). About 130 years later, Tyre stood another siege. Nebuchadnezzer, king of Babylon, while engaged in the war with the Jews, sat down before it, and established a strict blockade on the land side. Strange to say, history is silent both as to the incidents of the siege and its results. Josephus merely notices the fact, and says the siege lasted thirteen years (*Antt.* x. 11, 1). The prophecy of Isaiah regarding Tyre, uttered 125 years previously, evidently refers primarily to this event, as he states that the predicted destruction would be accomplished by the Chaldeans (Isa. xxvi. 13). When Isaiah wrote, the Assyrians were the rulers of Western Asia; but in this prophecy the conquest of Phœnicia is ascribed to a people then scarcely known, and who did not attain to power for a century later. The words of the prophet plainly imply that the city was to be taken, and so also do those of Jeremiah (xxvii. 3–6), and Ezekiel (xxvi.) It seems probable, however, that Palætyrus alone was sacked and destroyed, and that the island city capitulated on favourable terms; for Ezekiel, writing at the period, describes the attack upon the city as not having been either so successful, or so fruitful in spoil as had been anticipated (ch. xxix. 18). Apparently referring also to a time subsequent to the siege, he gives a most graphic account of the splendour of the city, and predicts a yet more terrible, and final overthrow. In fact, it is evident that both Isaiah and Ezekiel connect the immediate consequents of the events which they specially refer to with remoter and more gradual desolations. Their prophetic vision saw a succession of terrible calamities in the long perspective of the city's history. "Thus saith the Lord God; 'Behold, I am against thee, O Tyrus, and will cause *many nations* to come up against thee, as the sea causeth his waves to come up;'" that is, in succession (Ezek. xxvi. 3). The prophets give a panoramic picture of Tyre's overthrow, from the beginning to the end of the destroying process—complete, and strictly accurate as a grand whole, but unintelligible, and even contradictory, if we attempt to confine the references to any one particular epoch or event (see Hengstenberg, *de Rebus Tyr.*)

Ezekiel's gorgeous description of the wealth, beauty, influence, and far-reaching commerce of Tyre, deserves the attention of every scholar. For graphic power, high poetic imagery, and historic accuracy of detail, the passage is unequalled in the whole compass of literature. Appropriately he represents the sea-girt city—whose celebrity, whose very existence depended on its commerce—as a noble ship, built of the choicest wood—"fir trees from Senir," and "cedars from Lebanon;" propelled by the strongest oars—saplings from the "oaks of Bashan;" seated with the costliest benches—"ivory out of the isles of Chittim;" rigged with the finest sails—"fine linen with broidered work from Egypt;" manned by the best sailors—"of Zidon and Arvad;" steered by the most skilful pilots—her own "wise men;" defended by the most valiant soldiers from Persia and Lud; laden with the richest products of every country under heaven (Ezek. xxvii. 3–25).

The siege and capture of the city by Alexander the Great was the next and most remarkable episode in Tyre's history. After the battle of Issus, while the conqueror was marching along the coast, a deputation from Tyre met him, offering submission. Alexander would only be satisfied with possession of the city and fleet. The Tyrians refused, and prepared to defend their stronghold. Their fleet had complete command of the sea. Their city was separated from the shore by a wide and deep channel, and defended besides by walls 150 feet high. To any man but Alexander the place would have seemed impregnable. He, however, resolved to capture it. In the year B.C. 332 he encamped on the plain opposite the island, and immediately commenced a scheme of military engineering, which for magnitude and skill is unequalled in the annals of ancient warfare. He determined to construct a solid embankment from the shore to the island. The extensive remains of Palætyrus, which had probably lain desolate from the time of Nebuchadnezzar, afforded ample materials; the forests of Lebanon supplied timber, and the inhabitants of the surrounding country were pressed as labourers. The work was easy at first where the water was shallow; but as the mole lengthened the water became deeper, the current more rapid, the waves more destructive, and the assaults of the Tyrian war-vessels more formidable. Alexander now, by immense labour, collected a fleet which served to keep the Tyrians in check.

The mole was at length completed. The Tyrians, now seeing that long resistance was hopeless, began to transport their children and women to Carthage. After seven months of increasing toil, the wall was breached, and the city taken by storm. Of the inhabitants, 8000 were killed, 2000 were crucified in revenge for the murder of some Greek prisoners, and 30,000 sold as slaves. The king and

Tyre.

chief magistrates took refuge in the temple of Hercules, and were spared. Alexander replaced the population by a colony of Greeks or Carians (Quin. Curt. iv.; Arrian ii.; Diod. Sic. xvii.) With this memorable siege terminated the glory of Phœnician Tyre; and by it were strikingly fulfilled some of the predictions of the Hebrew prophets (Ezek. xxvi. 3–12).

Tyre appears to have speedily revived; for only eighteen years after its capture by Alexander, it stood a siege of fifteen months against a combined army and fleet under the command of Antigonus. From this time till the Roman conquest the city frequently changed masters; but its commerce prospered alike under the sway of the Ptolemies and the Seleucidæ. The only serious check its traffic sustained was when Ptolemy Philadelphus established the port of Bernice on the Red Sea, and opened the canal uniting the Gulf of Suez with the Nile; and thus drew the commerce of the Indian Ocean, formerly in the hands of the Phœnicians, through Egypt.

Under the Romans, we learn from Strabo that Tyre was a large and strong city, with safe and capacious harbours, and a flourishing trade. Its inhabitants were famous as manufacturers, and not a few of them had made great advances in science and literature. Marinus of Tyre, who lived in the early part of the second century, was the first who constructed maps according to latitude and longitude. Another native of Tyre, Paulinus the rhetorician, was honourably received at the court of the Emperor Hadrian (Kenrick's *Phœnicia*, p. 440). In the fourth century the city had again attained much of its ancient renown; Jerome speaks of it as the noblest city of Phœnicia, trading with all the world. But it is its connection with the history of the Crusades that gives Tyre its chief interest in more modern times. Its strength and splendour are minutely described by its archbishop, William. Towards the sea was a double wall; on the north a walled harbour, with an entrance between massive towers; on the east, where Alexander's mole joined the island, was a triple wall of great height and strength. On the 11th of February 1124 the Christian army encamped before it, and on the 15th of the following June it fell into their hands. The strength of its fortifications, the splendour of its houses, and the excellence of its harbours, excited their admiration. For more than a century and a half it remained in their possession. The entrance of the harbour was shut every night by a chain. The city was then celebrated for its manufactories of glass and sugar. Its commerce was mainly in the hands of the Venetians. On the evening of the day on which Acre was taken by the Mohammedans (May 19, 1291), Tyre was abandoned by the Crusaders, and the Saracens entered it the following morning. Under the withering influence of Islamism its commerce rapidly declined, and the sources of its wealth and power were dried up. From the fourteenth till the beginning of the seventeenth century it was entirely desolate. At the latter period a Druze chief called Fakhr-ed-Din attempted to restore it; but the houses he erected soon fell to ruin. When Maundrell visited it in 1697, there was not one house left entire; and its sole occupants were a few poor wretches who harboured themselves in vaults. In the year 1766 it was occupied by Metawilch, a fanatical sect of Shiites from Lebanon, who built a wall round it. Some Christian families joined them, and a little trade was carried on in the export of grain, cotton, and tobacco. It is now again on the decline; and as its commerce is irretrievably gone, it will probably ere long be abandoned.

In surveying the ruins of Tyre, the writer was especially struck with the *bareness* of the site. He could not help wondering, as he looked over that bleak peninsula and sandy isthmus, what had become of Tyre's double and triple walls, her lofty towers, her spacious temples, and her splendid palaces. Not only have they been completely overthrown, but the very materials of them have, in a great measure, disappeared. For a century and more the ruins of Tyre have been used as a quarry for the new buildings of Beyrout and Acre. The columns of porphyry, marble, and granite, which were too heavy for removal, now lie in confused heaps round the shores, "in the midst of the waters;" the sites once occupied by her temples and palaces are now covered with heaps of rubbish, or are "bare as the top of a rock;" fishermen "spread their nets" on the fallen ruins of her ramparts; her harbours are filled up with drift-sand; her commerce and her wealth have long deserted her. "What city is like Tyrus, like the destroyed in the midst of the sea!"

Tyrian purple.

The most important product of Phœnicia, and that which has given immortal fame to the manufactures of Tyre, was the *purple dye*. The dye was obtained from two little shell-fish, the *Buccinum* and *Murex*, which are only found in perfection along the rocky coast of Phœnicia. The unanimous voice of antiquity assigns to Tyre the discovery of the mode of obtaining two most beautiful tints of purple from these animals, and of employing it in dyeing wool. "The mollusks which inhabit these shells have a receptacle or sac behind the head, in which a very minute portion of a colourless creamy fluid is contained, which has a strong smell of garlic. If it be carefully extracted by a hook, or a pointed pencil, and applied to wool, linen, or cotton, which is then exposed to a strong light, it successively becomes green, blue, red, deep purple-red, and, by washing in soap and water, a bright crimson, which is permanent. The Buccinum is found on rocks near the shore; the Purpura or Murex inhabits deeper water." (Kenrick's *Phœnicia*, p. 239). Pliny gives an account both of the modes of taking the fish, and preparing the dye (*Hist. Nat.* ix. 61, *sq.*) The best season for taking them was early spring. Immediately after their capture the liquor was extracted from the Murex; but the Buccinum being small was crushed with the shell, and the dye obtained by boiling down. Robes dyed in this preparation were worn by princes and nobles in every land. Although they were made in other places, yet those of Tyre were so highly esteemed that their manufacture formed a principal source of its wealth, and contributed much to preserve its prosperity, long after its political power had gone. Tyre had the advantage of an inexhaustible supply of fish, and probably its merchants also possessed some chemical secret, by which the colour was made more brilliant. In order to produce the true Tyrian purple, the liquor of both animals was used—the Murex first to give depth and fastness, and then the Buccinum to enliven by its lighter reddish tint. The most costly fabrics were twice dyed. The colour of the imperial Tyrian purple was not less durable than beautiful; and in the days of Roman luxury robes of it were eagerly sought after, and bought at prices that would now seem fabulous. (J. L. P.)

Tyrhoot ‖ Tyrone.

TYRHOOT. See TIRHOOT.

TYROL. See AUSTRIA.

TYRONE, an inland county of the province of Ulster, in Ireland, bounded on the north by the counties of Donegal and Londonderry, on the east by Lough Neagh and the county of Armagh, on the south by the counties of Monaghan and Fermanagh, and on the west by those of Fermanagh and Donegal. It lies between 54. 20. and 54. 59. north latitude, and 6. 15. and 7. 57. west longitude; measuring 46 miles in its greatest length from north to south, and 60 in its greatest breadth from east to west, and containing an area of 1269 square miles, or 806,296 acres, of which 450,286 are arable, 311,867 uncultivated, 11,981 in plantations, 710 towns, and 31,796 are under water, part of which is a section of Lough Neagh. The unimproved pasture-land is chiefly situated in an elevated mountain district, the substrata consisting, for the most part, of mica slate or red sandstone. Of the 312,000 acres of unimproved land, it is probable that 80,000 acres might be improved for cultivation, 120,000 acres by draining alone, and the remaining 112,000 acres may be considered as unimprovable.

According to some authorities the *Erdini*, and to others the *Scoti*, were the earliest known inhabitants of this district. It was afterwards distinguished by the name of Kineal-Evgain, or Tyr-Owen, and was the territory of the O'Neills, descendants of Neal of the Nine Hostages, king of Ireland, and virtually sovereigns of the greatest part of the north of Ireland for several centuries after the English settlement under Henry II. In a writ of Henry III., the head of the sept is styled King of Kenilum or Tiroen. The chief seat of the family was at Dungannon, which, though several times taken and sacked by the English force in their attempts to reduce the country to obedience to the royal authority, continued to be so until the close of the reign of Elizabeth, when it was burned by Hugh O'Neill, earl of Tyrone, to prevent its falling into the hands of Lord Mountjoy, who then commanded the queen's forces in Ireland. The insurrection of 1641 may be said to have had its commencement in this county, by the capture of Charlemont Fort and Dungannon by Sir Phelim O'Neill; and in 1646 the Parliamentary forces under General Munroe received a signal defeat from Hugh Roe O'Neill at Benburb. During the greater part of the war between King William and King James, this county was in the possession of the forces of the latter, and suffered much from the partisan warfare carried on, chiefly by the townsmen of Enniskillen. It was also here that the volunteer convention of

 Dungannon assembled in 1782, and passed a series of resolutions expressive of their opinion of the right of the Irish parliament to make laws independently of that of Great Britain.

The surface is much varied, mostly hilly, with but little level ground. In the north it rises into the mountain-range of Sperrin, forming the boundary between the county and that of Londonderry. Its greatest elevations are Mullaghcarne, 1890 feet; Straw Mountain, 2085; Muinard, 2064; and Sawell, the centre and highest point of the range, 2236. South of these is the lower ridge of Slievekirk, Slievemore, and Munterlony, whose highest point is 1432 feet. Mullaghcarne, six miles north-east of Omagh, is 1778 feet high; Slieve-Gallion, in the north-east, 1730; Croagh, west, 1260; the mountains south of Clogher, which form its boundary towards Monaghan, 1265 feet. Two lofty hills detached from the main group, and situate on each side of the Mourne river, are distinguished by the popular names of Bessy Bell and Mary Gray. The former name has been supposed to owe its origin to the pagan rites celebrated on its summit to the god Bel or Beal; for the latter no conjecture has been hazarded. The eastern districts are chiefly flat, declining towards Lough Neagh. The valleys, several of which are very romantic, serve as the channels to the minor streams, whose confluence forms the river Foyle. The principal are, the Mourne, Munterlony, Owenreagh, Owenkelloe, Derg from Lough Derg in Donegal, and the Dennet. The Foyle forms a small portion of the western boundary, the Blackwater a considerable part of the southern, and the Ballinderry of the north-eastern. There are but few lakes, and those very small. Lough Fae, at the foot of Slieve-Gallion, and Lough Creevy, are the largest.

The substratum of the northern mountainous district is mica slate, interspersed with primary limestone in small detached portions. To the north-west is yellow sandstone, which shows itself also in the central part near Omagh, and again in the south-west, where it plunges into Fermanagh. A bed of granite, enclosed in crystalline greenstone trap, extends from Slieve-Gallion nearly to Omagh. The formation across the county from Lough Erne to Lough Neagh is the old red sandstone. In the south and south-east the carboniferous or mountain limestone appears; and near the borders of Lough Neagh are lias, green sand, and chalk, with new red sandstone. In the sandstone formation in this part, fossil fish have been found, with the characteristic features of their various species strongly marked. Near Cookstown, a great number of organic remains have been discovered. Coal is raised in large quantities in the eastern part, between Dungannon and Lough Neagh, in a district formed of a collection of low hills, not more than a hundred feet in perpendicular elevation, with steep sides and flattened summits. There are two principal fields; Coal Island, measuring about eight miles by three, and comprehending an area of 1200 acres; and Annahone, about a mile each way, and containing 500 acres. The coal—which is of the bituminous or blazing kind, like that of the west of Scotland, burning rapidly, and with a bright abundant flame—rests upon beds of fire-clay and sandstone. The shale has impressions of vegetable substances, among which are reeds of very large dimensions. The quantity of coal raised is abundant in proportion to the extent of the field; but it is difficult to be worked, from the greatness of the angle formed by the layers of coal in many places, which increases the difficulty of drainage, and also from the soft nature of the bottom or flooring, which requires many precautions to prevent the passages from closing. Indications of coal have been perceived at Drunquin, to the north-west of Omagh, but no practical advantage has yet been taken of the discovery. Iron ore and potter's clay are found in the coal districts. A range of escars extends across the southern part of the county, from near Dungannon to Five-mile-town; and the ridges are in some places as regularly arranged as if formed by the hand of man.

The soil in the parts adjacent to Lough Neagh is alluvial, of considerable depth, and based upon limestone. The low lands along the Blackwater are extremely fertile, well timbered, and afford many prospects of great beauty. The valley of the Foyle, which belongs to this county, is also very fertile. The mountainous tracts to the north have a shallow soil, resting either on a tenacious clay, or on bog, which impedes the passage of the water, and renders the land moist, cold, and unproductive. Much of the central parts presents tracts of unprofitable bog and heath. The southern districts are well wooded.

The progress of population during the last hundred years is as follows, according to the authorities stated:—

Year.	Authority.	Number.
1760	De Burgo	76,278
1792	Beaufort	159,000
1812	Parliamentary census	250,746
1821	Ditto	261,865
1831	Ditto	304,468
1841	Ditto	312,956
1851	Ditto	255,734

The density of the population in 1841 was therefore 248 persons to the square mile, and in 1851 203, showing a decrease of 45 inhabitants on the square mile. In 1851, only 400 persons were returned as speaking Irish only, but 14,000 are represented as able to speak Irish and English.

According to the returns of the Commissioners of Public Instruction in 1834, the total population was 312,500; of which 69,320 were members of the Established Church, 69,620 Protestant Dissenters, and the remaining 173,560 Roman Catholics. The proportions of the different persuasions, the total population being taken as unity, were, therefore, 0·222, 0·223, and 0·555 nearly; whence it appears that the Roman Catholic population was more than equal to that of the Protestant, which also was almost equally divided between the Established Church and the Dissenters. The number of children receiving instruction in public schools in 1821, in 1824–26, and in 1837, was as follows:—

Year.	Males.	Females.	Sex not ascertained.	Total.
1821	8,484	4,078	...	12,562
1824–26	10,783	7,598	447	18,828
1837	4,383	2,581	...	6,964

Of the numbers stated in the return of 1824–26, there were, of the Established Church, 4824; Protestant Dissenters, 6404; Roman Catholics, 7480; besides 120 whose religious persuasion was not ascertained.

The number of schools of each description, and of pupils attending them in 1851, was found by the Census Commissioners to have been:—

Description of Schools.	Number of Schools.	Number of Children.		
		Males.	Females.	Total.
National	243	5,179	4,090	9,269
Church Education	92	1,616	1,341	2,957
Endowed	5	117	91	208
Boarding	5	102	88	190
Private	68	972	765	1,737
Parochial	14	340	230	570
Free	20	267	370	637
Mission	8	124	97	221
Charitable Boarding	1	10	11	21
Workhouse	9	526	510	1,036
Gaol	1	132	44	176
Total	466	9,385	7,637	17,022

Tyrone.

After the flight and attainder of the Earl of Tyrone in 1607, the county was parcelled out by King James among English and Scottish settlers, or, as they were then styled, "planters," among whom the native Irish were distributed as tenants, except the swordsmen, who were dispersed throughout the waste districts of Munster and Connaught. Before that period, it was divided into two districts, called North and South Tyrone; but the northern part was about that time transferred to Londonderry, and the remainder divided into the five precincts of Clogher, Dungannon, Mountjoy, Omy, and Strabane. It now consists of eight baronies, which are subdivided into thirty-five parishes, of which twenty are in the diocese of Armagh, eleven in that of Derry, and four in Clogher; the cathedral and bishop's seat of the last named being in the county.

The acreable contents and annual valuation of the baronies are as follows:—

Baronies.	Acreable contents. Acres.	Annual valuation. L.
Clogher	97,569	35,376
Dungannon, Lower	42,855	25,286
Dungannon, Middle	90,539	56,031
Dungannon, Upper	110,168	35,462
Omagh, East	131,710	49,175
Omagh, West	93,308	16,754
Strabane, Lower	118,380	41,070
Strabane Upper	122,110	18,401
Total	806,639	277,555

Tyrone was represented in the Irish parliament by ten members, two for the county, and two for each of the boroughs of Augher, Clogher, Dungannon, and Strabane. By the Act of Union, the number was reduced to three, two for the county and one for the borough of Dungannon.

The assizes are held at Omagh, where also are the county court-house and prison. There are bridewells at Clogher, Dungannon, and Strabane. General sessions of the peace are held at Strabane, Omagh, Dungannon and Clogher; and there are twenty stations for holding petty sessions. The county infirmary is at Omagh, and the accommodation for lunatics in the district asylum at Londonderry. Workhouses for unions under the new poor-law are at Castlederg, Clogher, Cookstown, Dungannon, Gortin, Omagh, and Strabane.

The modes of agriculture differ according to the character of the soil. In the alluvial lands in the east, tillage is pursued universally, and according to the most approved systems, both as to the treatment of the land and the construction of the implements. It is also extending into the mountainous district, wherever the nature of the soil or the declivity of the land admits of it. The land is still much subdivided, but the number of farms is decreasing annually. In the more highly cultivated parts the fences are of white thorn; in the hilly country either of stone carelessly piled together, or, where stone is scarce, of sods topped with furze, here called whins. Land is now seldom allowed to lie fallow as formerly, but is kept in a productive state by a judicious rotation of crops. The extent of land under each description of crop in 1849 and 1859 was:—

	1849.	1859.
Wheat	10,541	5,286
Oats	153,172	146,440
Barley, bere, rye, beans, and pease	7,598	1,226
Potatoes	34,061	57,371
Turnips	16,003	12,581
Other green crops	3,466	3,442
Flax	9,527	23,022
Meadow and clover	28,594	36,161
Total	262,962	285,529

Though it is not a pasturage country, and possesses but few extensive dairies, much butter is made, chiefly for the Scottish market. Cheese is also made in small quantities. The native cows are small, but good milkers. Great numbers of young cattle are fed on the mountains, and after a short time driven down to the lowlands for sale. The horses are hardy and excellent for field purposes, but ill shaped. The breed of sheep is little attended to, whether for wool or carcass; swine, which were not formerly reared in the numbers usual in most other parts of Ireland, now form an important part of the farming stock. The quantity of live stock in the county in 1849 and 1859 was:—

	1849.	1859.
Horses	30,084	26,774
Cattle	157,751	173,808
Sheep	32,305	36,290
Swine	26,099	41,276

The linen manufacture was long the staple trade; and though it lately declined here, as in other parts, for some years, yet it was never wholly relinquished, and has again risen to such a degree that it may now be considered as in a flourishing and improving state. Bleach-greens were very numerous, but most of them have been applied to other uses, the linens wrought in the country being sold in a green state in all the principal towns. Wool is manufactured for domestic use into coarse cloths, blankets, and druggets; which last are still worn by the women, though their use is much diminished by the demand for cheap cottons. Agricultural implements of every kind are manufactured at Coal Island; as are fire-bricks, considered to be equal to those of Stourbridge clay, and also crucibles. There are potteries in several places. Flour, tobacco, soap, and candles are manufactured to a considerable extent. There are several tanneries, distilleries, and breweries. The Ulster Canal passes along the southern border from Lough Neagh to Caledon, near which it enters Monaghan in its progress towards Lough Erne. The Tyrone navigation proceeds also from Lough Neagh, in the bed of the Blackwater river, for a short distance, and thence to Coal Island near Dungannon by a canal 11 miles in length. Its revenue, which is small, arises chiefly from the conveyance of coal from the collieries to the lake. The Foyle is navigable for small craft to St Johnstown, a village on the confines of the county, but on the Donegal bank of the river, and thence by an artificial cut to Strabane. The Blackwater is navigable for boats to Moy, and communicates with the collieries by a short canal. There is also a communication between the river and the collieries.

As every settler placed here by James I. was bound by the conditions of his grant, if he held upwards of 1000 acres, to erect a castle with a bawn or fortified enclosure, numerous large buildings were raised, of a mixed character between the feudal fortress and the modern mansion, several of which are still the residences of the representatives or successors of the original grantees. Besides these, there are many elegant modern mansions and villas of the nobility and landed gentry, foremost among which are Baron's Court, the seat of the Marquis of Abercorn, and Roxboro' Castle, the fine residence of the Earl of Charlemont. The houses of the more substantial farmers are of stone, and generally well built and slated; the habitations of the peasantry very poor, owing partly to the want of timber, partly to the poverty of the inmates. Turf is the general fuel, except in the immediate vicinity of the collieries. The food of the poorer classes is potatoes and oatmeal, with milk and salt fish occasionally; flesh-meat is used only on festal occasions. In their dress, customs, and dispositions, they vary little from those of similar station throughout the province.

There are many remains of raths and Danish forts, several in a state of good preservation; but their number is yearly diminishing, by their being dug up and carried away for farming uses. Several fine monuments, described as Druidi-

Tyrtæus.

cal, are to be seen. A very large cromlech rests on a hill near Newtown-Stewart; another is near Coagh. Some remains of a round tower were visible at Errigal-keroge in the beginning of the present century, but no trace of it now exists. Near Dungannon is an ancient relic, consisting of two circles marked by upright stones, and connected together in the shape of the figure 8. Several brazen trumpets of singular construction were discovered about a century ago near the same town. The remains of monastic buildings and of ancient castles are numerous. Among the most remarkable of the latter is that at Benburb, near which was one of the ancient residences of the O'Neills.

The population is chiefly rural. The largest town does not contain 5100 inhabitants, and there are but few containing a population which exceeds 1000. The county town is Omagh, situated nearly in the centre of the county, on the Drumragh water or Stroule, a branch of the Foyle, and containing 3385 inhabitants. This town was twice destroyed by fire; first in 1689, by the garrison placed in it by King James when they evacuated it; and afterwards, in 1743, by an accidental fire, which left only two houses standing. Strabane, however, on the Mourne, near its confluence with the Finn, is the largest and most improving town in the county. It carries on a brisk trade in grain and provisions, which is greatly promoted by a canal three miles in length, which connects the town with the deeper parts of the Foyle, which is thence navigable for vessels of considerable burthen. The population is 5079. Dungannon, three miles west of the south-west extremity of Lough Neagh, was the principal residence of the O'Neills. The linen manufacture was until lately carried on with great spirit; and it has also manufactories of earthenware, fire-bricks, &c., with several corn-mills, and a large distillery. It returns one member to the imperial parliament. The population is 3854. Cookstown, on the road from Dungannon to Coleraine, has also a respectable share of the linen manufacture, chiefly for the supply of the English market. Its population is 2993. Clogher, where stands the cathedral of the diocese of the same name, a plain modernized building of small dimensions and few architectural pretensions, though dignified with the title of city from the circumstance of its being the seat of a bishop, is but a village. By the Church Temporalities Act, the see was united to Armagh, and the palace with the demesne have since been farmed. (H. S—R.)

TYRTÆUS, a renowned poet, was an Athenian by birth, and flourished about 682 years before the commencement of the Christian era. According to the ordinary account, which is not very trustworthy, he followed the occupation of a schoolmaster, was lame in one foot, and was considered as scarcely sound in mind. By the foolish, genius is sometimes mistaken for fatuity. The causes which led to his being placed in a more conspicuous situation were very peculiar. During their second war with the Messenians, the Lacedæmonians having consulted the oracle of Delphi, were directed to request the services of an Athenian general. The Athenians were unwilling to disregard the injunctions of the oracle, but they were also unwilling to assist a rival state in extending its dangerous power in the Peloponnesus; and with the view of at once complying with the form, and evading the spirit of the response, they sent the lame and eccentric poet to Sparta. By the force of his genius, he speedily effaced the first impressions occasioned by the meanness of his personal appearance; but his victories were achieved by the lyre and not by the sword. He composed various poems in praise of valour and patriotism, and breathed a new spirit into the rude soldiers of Sparta. When they had been thrice repulsed, and their leaders were on the point of ordering a retreat, Tyrtæus, by loudly reciting his noble verses, roused the drooping courage of the army to such a height, that every warrior prepared to conquer or die. In the anticipation that they might all perish on that bloody field, they each fastened on the right arm a ticket, containing his own name and that of his father, lest, in the general mass of carnage, it might be impossible to recognise their mangled bodies. The Messenians fought with great valour and determination, but the Lacedæmonians at length obtained the victory. When civil discords afterwards arose at Sparta, they were dispelled by the potent song of Tyrtæus. As a reward of his eminent services, he was admitted to the rights and privileges of a citizen. According to the statement of Lycurgus, they passed a law, enjoining as a preparation for battle, that the soldiers were to assemble at the king's tent, in order to listen to the recitation of this poet's verses, so well calculated to inspire them with a contempt of danger and death.—*Oratores Attici*, tom. iv. p. 451, edit. Dobson. Of the literary history of Greece, very few portions are so singular as that which we have now detailed; nor must it be forgotten that the people among whom poetry effected such wonders were never distinguished by the cultivation of literature. For various views of the life of Tyrtæus, the reader may refer to the works of Müller, Bernhardy, Clinton and Grote.

Tyrwhitt.

Of the fragments of Tyrtæus, the earliest edition is supposed to be that which M. Aurogallus published along with the *Hymns* of Callimachus, Basil. 1532, 4to. They were afterwards inserted in various collections, those of Turnebus, Winterton, Brunck, Gaisford, and others. A separate edition was published by Dr Moor, Glasgow, 1759, 4to. Two editions, much more elaborate, were published by Klotz, Bremæ, 1764, 8vo, Altemb. 1767, 8vo. This second impression contains various additions and improvements. But the most valuable edition that has yet appeared is included in a volume bearing the title of *Jo. Valentini Franckii, Philos. D. Callinus; sive, Quæstionis de Origine Carminis Elegiaci Tractatio critica. Accedunt Tyrtæi Reliquiæ, cum procemio et critica annotatione.* Altonæ et Lipsiæ, 1816, 8vo. Other excellent editions of Tyrtæus are those of Didot, Paris, 1826, and of N. Bach, Leipzig, 1831. The fragments of Tyrtæus, almost entirely in elegiac verse, are eleven in number, but only two of them extend to any considerable length. One of them consists of a single verse. The fragment beginning Μέχρις τεῦ κατάκειισθε, which is frequently printed among those of Tyrtæus, is by the best critics assigned to Callinus.

TYRWHITT, Thomas, a distinguished scholar, was born in London on the 29th of March 1730. His father, Dr Robert Tyrwhitt, descended from an ancient baronet's family in Lincolnshire, was at that time rector of St James's, Westminster, and sent him to a school at Kensington after he had completed the sixth year of his age. In January 1741 he was removed to Eton, where he first displayed that ardent love of literature for which he continued through life to be eminently distinguished. It was said of Tyrwhitt that he never was a boy, his calm and contemplative disposition always leading him to manly and scholar-like pursuits. After residing at Eton for six years, he was in 1747 entered of Queen's College, Oxford. He took the degree of A.B. in 1750; and having been elected to a fellowship of Merton in August 1755, he took that of A.M. in the ensuing year.

He had previously hired chambers in the Temple, and applied himself to the study of the law; but in December 1756 he was appointed under secretary at war, the principal secretary being his friend and patron Lord Barrington. In August 1762 he obtained the more lucrative office of clerk of the House of Commons, and he then resigned his fellowship. He resigned his office in January 1768, and passed the remainder of his life in learned retirement. In 1784 he was elected a curator of the British Museum, and was zealous in discharging the duties connected with this

Tyrwhitt. honourable appointment. To the museum he bequeathed a portion of his valuable library, comprehending such books as it did not already possess. His constitution had never been robust; and having been attacked by two violent disorders, he expired on the 15th of August 1786, in the fifty-seventh year of his age. He died at his house in Welbeck Street, Cavendish Square, and was interred, as his father had also been, in St George's Chapel, Windsor. He left behind him the character of a learned and amiable man. "In private life," we are informed, "he was a man of great liberality, of which some striking instances are given. In one year it is said he gave away L.2000; and for such generous exertions he had the ability as well as the inclination, for he had no luxuries, no follies, and no vices to maintain. Of such a man it is unnecessary to add, that he died lamented by all who knew the worth of his friendship, or enjoyed the honour of his acquaintance."

Tyrwhitt was a man of solid as well as extensive erudition; well acquainted with the modern, and eminently skilled in the ancient languages. He was an able Grecian, and his name is held in much respect by the scholars of the continent. He distinguished himself by his sound judgment and critical sagacity; nor was he less distinguished by the modesty and candour which he carried into all his inquiries.

His earliest publication was *An Epistle to Florio at Oxford*, Lond. 1749, 4to. This was followed by *Translations in Verse*, 1752, 4to. Here Pope's *Messiah* and Philip's *Splendid Shilling* appear in Latin, and the eighth Isthmian ode of Pindar in English. His next work, which is but of small extent, is entitled *Observations and Conjectures on some Passages of Shakspeare*, Oxford, 1766, 8vo. On the same poet he afterwards communicated various annotations to Steevens and Reed, for their editions of 1778 and 1785. His edition of another English poet brought him a considerable increase of reputation: *The Canterbury Tales of Chaucer; to which are added, an Essay on his Language and Versification, an Introductory Discourse, and Notes*, Lond. 1775–8, 5 vols. 8vo; Oxf. 1798, 2 vols. 4to; Lond. 1830, 5 vols. 8vo. He afterwards lent his aid to the publication of *Poems, supposed to have been written at Bristol, by Thomas Rowley and others, in the Fifteenth Century*; the greatest part now first published from the most authentic copies, with an engraved specimen of one of the MSS.; to which are added a Preface, an Introductory Account of the several pieces, and a Glossary, Lond. 1777, 8vo. This volume was twice reprinted in 1778, with the addition of an appendix, tending to prove that the poems were all written by Chatterton. Tyrwhitt's opinion, which is now sufficiently confirmed, was opposed by several writers, one of whom was Bryant, and another Dr Milles, dean of Exeter. The former published an elaborate volume of nearly 600 pages. He returned an able and temperate answer, under the title of *A Vindication of the Appendix to the Poems called Rowley's*, in reply to the Answers of the Dean of Exeter, Jacob Bryant, Esquire, and a third anonymous writer; with some further Observations upon those Poems, and an Examination of the Evidence which has been produced in support of their Authenticity, Lond. 1782, 8vo. The word *authenticity*, it may be remarked, is here improperly used instead of *genuineness*. On this controversy several other tracts were produced. Tyrwhitt's opinion was adopted by Warton, and was opposed by Mathias.

These were the principal works of literature which he published in English. He was, however, the editor of other two works which deserve to be mentioned: *Proceedings and Debates in the House of Commons in* 1620 *and* 1621, from the original MS. in the Library of Queen's College, Oxford; with an Appendix, Oxf. 1766, 2 vols. 8vo. *The Manner of holding Parliaments in England*, by Henry Elsynge, Cler. Par.; corrected and enlarged from the author's original MS., Lond. 1768, 8vo. He likewise superintended the posthumous publication of his learned friend Dr Musgrave: *Two Dissertations.* I. On the Græcian Mythology. II. An Examination of Sir Isaac Newton's Objections to the Chronology of the Olympiads, Lond. 1782, 8vo. For this work a very liberal subscription had been raised, entirely by the exertions of Tyrwhitt, who had previously relinquished to the author's widow a bond for several hundred pounds which he had lent to her husband.

His classical labours, though not very extensive, have secured him a high reputation as a scholar. In 1773 he published, from a Harleian manuscript, *Fragmenta duo Plutarchi*; and after an interval of three years appeared his *Dissertatio de Babrio, Fabularum Æsopearum Scriptore. Inseruntur Fabulæ quædam Æsopeæ numquam antehac editæ, ex cod. MS. Bodleiano. Accedunt Babrii Fragmenta*, Lond. 1776, 8vo. Of Babrius, otherwise called Babrias or Gabrias, the personal history is altogether obscure. Tyrwhitt supposes him to have flourished during the age of Augustus, or somewhat earlier. A sequel to this work was soon afterwards published, *De Lapidibus Poema, Orpheo a quibusdam adscriptum, Gr. et Lat. ex editione J. M. Gesneri. Recensuit notasque adjecit Thomas Tyrwhitt. Simul prodit Auctarium Dissertationis de Babrio*, Lond. 1781, 8vo. Both the dissertation and the *auctarium* were reprinted under the superintendence of Harles, Erlangæ, 1785, 8vo. Tytler.

Tyrwhitt had contributed various notes on Euripides, which appeared in Musgrave's edition, published at Oxford, in 1778, in 4 vols. 4to. He afterwards produced his *Conjecturæ in Strabonem*, Lond. 1783, 8vo; Erlang. 1788, 8vo. The last work which he lived to publish was an edition of the oration of Isæus, *De Meneclis Hereditate*, Lond. 1785. 8vo. He had bestowed no small labour in the preparation of another work, which was conducted through the press by Dr Burgess, afterwards bishop of Salisbury: *Aristotelis de Poetica liber Græce et Latine. Lectionem constituit, versionem refinxit, animadversionibus illustravit Thomas Tyrwhitt*, Oxonii, 1794, fol., 4to, and 8vo. These animadversions, which may be regarded as his principal work, are very able and elaborate. Another posthumous publication appeared after a considerable interval, *Thomæ Tyrwhitti Conjecturæ in Æschylum, Euripidem, et Aristophanem. Accedunt Epistolæ diversorum ad Tyrwhittum*, Oxon. 1822, 8vo. (D. I.)

TYTLER, WILLIAM, of Woodhouslee, one of the most strenuous defenders of Queen Mary, was born at Edinburgh 12th October 1711. He was the son of Mr Alexander Tytler, writer in Edinburgh, by Jane, the daughter of William Leslie, merchant in Aberdeen, and grand-daughter of Sir Patrick Leslie of Iden, provost of that city,—a cadet of the Leslies of Balquhain. He received his education at the High School and the University of his native city, and distinguished himself by an early proficiency in those classical studies which, to the latest period of his life, were the occupation of his leisure hours, and a principal source of his mental enjoyments. At the age of thirty-one he was admitted into the Society of Writers to the Signet, and till the time of his death he continued the practice of his profession with entire success. In September 1745, he married Anne Craig, daughter of Mr James Craig of Dalnair, writer to the signet, by whom he left two sons and a daughter. In 1759 he published his *Inquiry, Historical and Critical, into the Evidence against Mary Queen of Scots, and an Examination of the Histories of Dr Robertson and Mr Hume, with respect to that Evidence.* Here he warmly espoused the cause of that unfortunate princess, and attacked with severity the conduct of her enemies; effectually, for a time, turning the tide of opinion in her favour. On its first appearance, the book was much read in Britain, and was translated into French. He afterwards published the *Poetical Remains of James the First, King of Scotland*, Edinb. 1783, 8vo. This volume includes a dissertation on the life and writings of the royal author, and a *Dissertation on the Scottish Music.* He contributed several papers to the first volume of the *Transactions of the Society of Antiquaries of Scotland.* In the *Lounger* he wrote a single paper, No. 16. Tytler died on the 12th of September 1792. Of an ardent and enthusiastic temperament, in domestic life his character was particularly amiable. He was the kindest of husbands and most affectionate of fathers.

TYTLER, *Alexander Fraser* (Lord Woodhouselee), son of the defender of Queen Mary, and father of the historian of Scotland, was born at Edinburgh, 4th October (old style) 1747. He was the eldest of eight children, and inherited the domestic virtues as well as the literary abilities of his admirable father, William Tytler. His mother was Anne, daughter of James Craig, Esq. of Dalnair—a woman remarkable for her feminine gifts and graces. In the home of these parents Alexander Tytler imbibed, at a very early period, those tastes which he afterwards cultivated with such singular success. His home proved, moreover, an admirable school of manners; for the defender of Queen Mary

Tytler, Alexander.

had gathered round himself whatever was most distinguished in the northern metropolis—the good and the great of his time; and he lived at a period which may justly be regarded as the golden age of Scottish literature.

Sent to a school at Kensington which was kept by Dr Elphinston, a friend of Johnson, Alexander Tytler attracted the notice of Jortin by his skill in Latin verse, and conciliated the friendship of Dr Russell, a physician of Aleppo, who was then residing in the neighbourhood of Kensington. From him the youth acquired a taste for natural history which never afterwards forsook him. At the age of seventeen he returned to Edinburgh, adopted the profession of the law, and immediately found himself associated, as pupil or as fellow-student, with all the men of that time who afterwards became conspicuous in the literary annals of the northern metropolis. These friendships never forsook him. He was so happy as to retain to the end of life the intimacies of his youth.

His literary and his professional career, though spread over a considerable period of time, and attended with no want either of variety or of success, may be briefly described. He qualified himself to become an author on subjects of such diverse interest as law, history, poetry, language, natural science, and the belles lettres in general, by a most studious youth, spent in domestic seclusion under the paternal roof at Woodhouselee. Nothing that was beautiful, whether in art or literature, was without attraction for Alexander Tytler. At the age of twenty-three (in 1770), he was called to the bar; but neither ambition, nor that humbler but not less effectual spur to exertion which a slender inheritance supplies, impelled the youthful barrister to the laborious practice of his profession. He loved Law, but he loved it as *a science*. By the advice of his friend and patron, Henry Home, Lord Kames, he compiled a supplementary volume to the *Dictionary of Decisions*, which brought that work down to the time which was then called "present." On this, his first undertaking of importance, he spent four years. A further continuation of the same work, which appeared in 1796, formed the solace of a season of prolonged sickness and severe suffering; and a Life of Lord Kames himself, which appeared in 1806, and passed through more than one edition, was among the latest of his literary efforts.

In 1786, Mr Tytler was appointed to the professorship of Universal History and Roman Antiquities in the University of Edinburgh; from which period, until the year 1800, he devoted himself almost exclusively to the duties of his office; and ten years of assiduous study were employed in the composition and improvement of the course of lectures which he read annually before a respectable body of students —one of whom was the future author of *Waverley*. The best known of Tytler's works (the *Elements of General History*) exhibits the substance of those lectures. The *Elements*, which have been translated into most of the languages of Europe, and even into Hindoostanee, established the fame of their author on a solid basis. The lectures themselves were not published till the year 1834, when they appeared in Murray's *Family Library*.

A short account of the *Life and Writings of Dr John Gregory;* some papers in the *Mirror* and *Lounger*, which were found to have been written on the blank leaves of his sketch-book; *An Account of the Origin and History of the Royal Society; A Memoir of Robert Dundas, Lord President of the Court of Session;* and a paper on the *Vitrified Forts of the Highlands*, comprise the sum of Mr Tytler's minor works from 1778 to 1789. In the following year he read before the Royal Society of Edinburgh a series of papers on translation, which he published shortly afterwards under the modest title of an *Essay on the Principles of Translation*. This performance attracted great and deserved notice, passed through five editions, and has long been regarded as a standard work. He also wrote a treatise on the Law of Courts Martial.

Tytler, Alexander.

But it is high time to allude to the private side of this excellent man's history, exhibiting as it does one of the loveliest pictures which the annals of literature will be found to supply. Happily wedded, at the age of twenty-nine, to Ann, daughter and heiress of William Fraser, Esq. of Belnain, he became the father of seven children, several of whom attained to eminence or to literary celebrity. Ann Fraser Tytler, his eldest daughter, at a mature period of life, delighted the world by her inimitable stories (*Mary and Florence, Leila*, &c.); Alexander, his third son, achieved for himself no common reputation in India; Patrick, the youngest, is the best known of any who have ever borne Lord Woodhouselee's honoured family name. William Fraser Tytler of Belnain, his eldest son, the late much-respected sheriff and vice-lieutenant of Inverness-shire; and James, his second son, now of Woodhouselee, have been men honourable in their generation, and would have been of those "who have left a name behind them," if the highest public character and the most sterling private worth constituted a title to the world's abiding homage. The youngest daughter became the wife of James Baillie Fraser, Esq. of Reelick, the well-known Eastern traveller.

In 1790 the subject of the present memoir was appointed Judge-Advocate of Scotland; and Lord Melville, to whose friendship he owed his advancement, subsequently raised him to the bench of the Court of Session, where he took his seat in the beginning of 1802, with the title of Lord Woodhouselee. Free from academical engagements, and placed in more than easy circumstances by the death of his venerable father in 1792, it henceforth became his delight to create a scene of rural and domestic bliss in his beloved Woodhouselee. There, supremely happy in the society of his wife and children; blessed with health, affluence, and leisure; assiduous in the cultivation of those literary pursuits which formed the joy of his existence, and which had the entire homage of his well-stored mind, refined classical taste, and tutored understanding; given, morever, to a graceful hospitality, which made Woodhouselee the favourite resort of all the most distinguished of his contemporaries (for the delightful converse and perfect manners of its owner was a favourite topic with his friends),—this excellent man passed through life beloved and respected, and honoured by all who knew him. Among his familiar and frequent guests were Sir Walter Scott, Dugald Stewart, Henry M'Kenzie, Dr Gregory (his friend and physician), Sir James Mackintosh, Sydney Smith, and the Rev. Archibald Alison (father of the historian), who afterwards became Lord Woodhouselee's very feeling biographer. Many picturesque anecdotes of these persons, as well as very lively sketches of those bright days, are preserved in the touching reminiscences committed to writing, so late as the year 1856, by his daughter Ann, and since published. Of his acute taste, a singular indication is afforded by the fact, that he detected the poetical powers of Lord Byron when, by the "Scotch Reviewers," they were made the subject of public ridicule. But it is still in the bosom of his family, in the strict privacy of his home, amid the sweet charities of daily life, that the admirable subject of this short memoir shines out in most attractive colours. The unaffected piety of his disposition was ever overflowing in gratitude to the Giver of all good for the happiness he enjoyed. Keenly alive to the beauties of nature, he delighted in nothing so much as fostering a like passion in his children, to the level of whose tastes he loved to come down, and to relax his mind by entering with almost boyish ardour into their games and amusements. Music, in which all the family were skilled, closed the day at Woodhouselee; and, seated at the early supper-table with his children, together with his son Patrick's accomplished tutor Mr John Black (author of some

Tytler, Alexander.

pleasing poems and a *Life of Tasso*), he delighted to entertain the little circle with lively converse and witty anecdote; while a catch or glee, in which himself occasionally joined, concluded the happy evening. Lord Woodhouselee's tastes were all of that unambitious kind which find their fullest gratification amid the sacred charities of home. "Every evening whilst he was in town," writes his daughter Ann, "Mr Black used to assemble us in his favourite room, his library in the tower at the top of the house. The back window looked upon a little dell, through which ran the rippling burn which Leyden, whilst on a visit to Woodhouselee, addressed in a beautiful sonnet. The front window of the library commanded a most extensive view of the distant country; and in those days, when we knew my father was to be detained in town till late, we always placed a candle in the window. Often did he remark, that he never gained sight of this twinkling light through the trees of the avenue, without feeling his heart raised in gratitude to heaven for the many blessings by which he was surrounded, and the happy home to which he was returning."

"Of all my literary labours," he writes in his commonplace book, "that which affords me most pleasure, on reflection, is the edition I published of Derham's *Physico-Theology*." It appeared in 1799. "When engaged in that work, I had a constant sense that I was well employed, in contributing, as far as lay in my power, to those great and noble ends which this most worthy man proposed in his labours—the enforcing on mankind the conviction of an Eternal, Almighty, All-wise, and All-beneficent Author of Nature; the demonstration, in short, of that truth on which depends our greatest present happiness and our future hopes." Paley's *Natural Theology* had not yet appeared.

A political pamphlet, entitled, *Ireland profiting by Example*—of which 3000 copies were sold on the day of publication—and a *Dissertation on the subject of Laura and Petrarch*, are the only productions of the same prolific pen which it remains to notice. In the beginning of 1812, Lord Woodhouselee conveyed to London, and presented to the Prince-Regent, the insignia of the Bath which had been worn by his cousin, Sir J. H. Craig, governor-general of British North America, the last survivor of the Dalnair family. His description of that interview, sent to his wife on the same day, is very interesting. A baronetcy was soon after offered to him, which he declined.

Already was this excellent man conscious of a presentiment that his end was not far distant. In the beginning of winter he was prevailed upon to leave his favourite residence, and to remove to his town house—No. 65 (now 108) Prince's Street. On the 4th January 1813 he felt himself more than usually unwell; requested to have the service of the Church read to him, and solemnly blessed each one of his children before he retired to rest. Next morning he ordered his carriage, and desired that it might drive out on the road towards Woodhouselee. On coming within sight of his own grounds, he raised himself in the carriage, and his eye was observed to kindle as he looked once more upon the hills which he was so soon to leave, and which he had loved so well. The influence of the scene appeared to renew his strength, and on returning, he walked up the stairs of the house with more than usual vigour. But the excitement was momentary. He had scarcely entered his study before he sank down upon the floor, without a sigh or groan. Dr Gregory, the tried friend of half a century, was sent for; but when he arrived, it was found that medical skill was no longer of any avail.

Thus, at the age of sixty-five, died Lord Woodhouselee, one of the most accomplished gentlemen of his time. His literary performances have won for him the respect and gratitude of posterity, as, in his own day, they secured for him the admiration and applause of his contemporaries. Few have left behind them a more fragrant memory; few have bequeathed to their children a lovelier example, or to their country a more unsullied name. In every relation of life he was admirable. He excelled in most departments of polite learning, as well as of the fine arts. He died universally beloved and regretted; and carried with him to the grave the abiding regrets of his children, and of a large circle of friends. (J. W. B.)

Tytler, Patrick.

Tytler, *Patrick Fraser*, author of the *History of Scotland*, was born at his father's house in Prince's Street, Edinburgh, on the 30th August 1791. He was the youngest of seven children, as will be found stated in the foregoing memoir.

The son of Alexander Fraser Tytler, Lord Woodhouselee, and grandson of William Tytler, the defender of Queen Mary, may be said to have inherited a claim to literary celebrity. But his boyhood afforded no signs of the powers which he afterwards displayed, except, indeed, to the partial eyes of his fond father. To *him* the boy's passion for poetry and romance was a sufficient indication that he would prove a studious man in after-years. In truth, a general taste for whatever is beautiful in literature or in art, combined with a vast amount of humour, high spirit, and lofty principle, might well have satisfied those who watched the boyhood of *Peter* Tytler, as his intimates ever called him. The influence of his father, whom he idolized, was ever at hand to direct his taste and stimulate his endeavours.

At first he was sent to Miss Stalker's reading-school in Edinburgh. This lady was daughter to the well-known reading-master from whom Walter Scott received his own early instruction. Thence he was removed to the High School, under Professor Christison, and Dr Adams, the rector of the institution. His progress at school was unmarked by any distinction. He kept a respectable place in his class, and took a spirited share in *the bickers* which then raged between the youthful heroes of the High School and of the University. But it was no mean reputation to have been respected by his schoolfellows for his inflexible truthfulness, as well as beloved for the generosity of his temper and the playfulness of his disposition. At Woodhouselee, under his father's roof, and under the fostering influences already adverted to, he made considerable progress. The Rev. John Black was no common tutor, and Walter Scott was no common friend. Neither were his father's intimates common guests. It was not, however, until Peter Tytler was sent to an English school, at the age of seventeen, that the transition from boyish thoughtlessness to manly gravity took place. His father made choice of a school at Chobham, kept by the Rev. Charles Jerram, a worthy man and good scholar, addicted to the opinions miscalled "evangelical." Tytler remained at Chobham for a year, and then returned finally to the paternal roof. His after-life showed what beautiful results may be obtained even from irregular culture.

Tytler offers a singular illustration of the extent to which the tastes and inclinations of early youth develop themselves in manhood, and become the ruling passions of after-life. His boyish love of fishing and shooting never forsook him. His early passion for music, poetry, and drawing was prolonged to the end of his days. Revelations of singular tenderness and softness of disposition were found in his early papers, as well as proofs of the exceeding piety and purity of his heart. Who that knew him well in after-life was not struck with the same characteristics? The humour of the child was very conspicuous in the man. At a debating-society which he helped to form at Chobham, we find him showing great historical knowledge, and acquiring much credit as the advocate of the favourable effect of the Crusades on Europe. "I had a copious source for materials," he writes to his father, "in your *Elements*, and *Charles V.*, and only regretted I had not more time to collect them. .... I shall, whenever I can, propose historical questions

Tytler, Patrick.

of this nature. It is impossible, my dearest father, to describe the delight with which I look forward to September. I shall be much obliged to Boyd if he will oil the lock and clean the barrel of the general's gun." To his brother Sandy, in India, he wrote (in 1810):—"At Mr Jerram's I began to understand and like Greek, and to make some progress in Latin versification. But I acquired a high relish for another noble branch of literature, and which I am at present perusing with the greatest pleasure—I mean *History*. To me it seems the noblest of all studies."

After three years of cloudless sunshine, spent at Woodhouselee in the society of his parents and sisters, in January 1813 Tytler lost his father. He was now little more than twenty-one years of age, and the only remaining unmarried son. On him, therefore, the burthen of grief most heavily fell. This bereavement, though it bowed his spirit and almost broke his heart, served to bring out the manliness of his character, and to touch the secret springs of his inner life. In the following month of July, having passed the public examination with credit, he was admitted into the Faculty of Advocates.

It was in the society of William and Archibald Alison, and Mr David Anderson of Moredun, that Tytler visited Paris, in the months of May and June 1814. His imagination was much struck by the many remarkable sights which he witnessed in the French metropolis at that memorable season, and the letters which he sent home are full of graphic and interesting details. Napoleon embarked from Frejus for Elba on the very day when the friends reached York, on their way south. They saw the allied sovereigns, our own Wellington, Platoff, Blucher; together with all the treasures of art which were at that time accumulated at Paris. "Only think," wrote Tytler to his mother, "of seeing the Apollo Belvidere one morning, and the Emperor Alexander the next!" From Dr Crichton, the emperor's physician, the young Scotchmen picked up many striking anecdotes of the recent campaign. But Tytler's heart was in his own loved home, and almost in his father's grave. When Lord Meadowbank, then Lord Advocate, soon after his return, appointed him king's counsel in the Exchequer, what made the favour acceptable was the consciousness that it could only be ascribed to respect for his father's memory. He often stole back to revisit Woodhouselee, and nurse his grief amid the sorrowful records of the happy past.

This visit to Paris led to the appearance (in 1815) of two interesting little volumes by Sir Archibal Alison, to which Tytler contributed certain chapters. It constituted his first appearance in print; but both the *Travels in France* and the contributed chapters were produced anonymously. The interval between 1814 and 1822 (which was diversified by a tour in Norway, taken in company with Mr David Anderson of St Germains, in 1818, and of which his letters and journals preserve a very interesting account) is marked by no striking personal incidents, nor by any literary achievement of moment. Tytler was, during all this time, professedly a barrister; and although by no means a successful practitioner of the Law, yet he wanted not that measure of success which was sufficient to stimulate him to further exertion, had he been able to give up his heart to his profession. But he never loved it. The din of the Courts distressed him; the excitement of a criminal trial he could not endure. Though passionately fond of society, and eminently qualified to shine, the distractions of the Edinburgh season were the reverse of congenial to him. He was not unconscious of possessing many perilous gifts; and his sensitive conscience was for ever taking the alarm. Most happy was he when, in the summer months, he stole away to his cherished friends, the Stuarts of Ardgowan, to Basil Hall's family, or to the Alisons. At Ardgowan, a well-furnished library supplied him with that occupation for the mind, and a breezy moor with that relaxation for the body, which his studious disposition needed. He was, in fact, always pursuing a course of private reading—miscellaneous and extensive—whether at home or abroad. More than the intervals of business he gave to such pursuits; and his memorandum-books show that he was already an author. But his first essays were but tentative, and only a few of them, it is probable, ever saw the light. In the pages of *Blackwood*, and other magazines, he made his first modest appearance as an author.

Tytler, Patrick.

He was at this time a surprising student, as the list of the books he read in a single year shows. But he is found to have read more of Divinity than of Law; and more of History than of Divinity. Howe's *Meditations* was never for a day out of his hands. Ever a man of exemplary piety, it may be worth stating that his religious opinions acquired less and less of a sectarian character as he advanced in life. He noted in his memorandum-book, that, on the 1st January 1837, he adopted the practice of reading the Scriptures according to *the calendar* and not according to *the directory*.

Tytler's disposition was eminently social; and his talents well qualified him to shine in society. He sung delightfully, and his poetical vein found freest expression in the composition of humorous songs. Many are the playful specimens which survive of his powers. But the most amusing of his compositions of this class are connected with the Mid-Lothian Volunteer Yeomanry Corps, which numbered among its members many a name as distinguished in the aristocracy of talent as of birth, and of which he soon became the most conspicuous member. His delightful manners, his exuberant flow of spirits, his ready wit, rendered him a general favourite; while his beautiful songs made him the very soul of the mess. On one occasion, he stole away from the corps and from the prospect of duty, to enjoy a quiet afternoon with his brother at Woodhouselee; but being missed at head-quarters, a mock-warrant was sent for his seizure, and he was apprehended on his brother's threshold, after having, with much discomfort, concealed himself (as he thought) for a reasonable space in the glen. Led back in triumph to the military encampment at Musselburgh, Tytler threw the adventure into a ballad, called *The Deserter*, which was long a favourite with the mess. It should be said of his songs that they were written *to be sung*,—to be sung *by himself*,—and that he ever wrote them for amusement, not for fame. Hence, as a poet, Tytler was known only to his acquaintances; and but for his contributions to Thomson's *Select Melodies of Scotland*, published in 1824, he might be said to hold his chance of being remembered by the same tenure as the orator, the vocalist, or the wit.

A few words should be added of his early efforts of a graver character. In June 1820, he was engaged on *A Historical Essay upon the European Moors during their Government of Spain*. This will have been his earliest prose effort. In 1816, he speaks of a paper *On Gratitude;* and mentions that he had been drawing up a *Memoir of his brother Alexander*, a *Parallel between Milton and Shakspeare*, and an *Essay on Feudal Law*. Like the other essays mentioned above, these have either never been printed, or they are lying perdu where so many interesting literary productions repose in a state of suspended animation—namely, in the pages of some forgotten review or magazine. But the *Historical and Critical Essay on the Life of Crichton*, which he wrote in the beginning of 1817, was destined to appear in a more important shape, and laid the foundation of his literary celebrity. It appeared, corrected and enlarged, in 1819, under the following title: *Life of James Crichton of Cluny, commonly called the Admirable Crichton; with an Appendix of Original Papers*. A second edition was published in 1823.

Tytler, Patrick.

To *Blackwood*, at the time of its first appearance in April 1817, Mr Tytler was a considerable contributor. Only two of his contributions are, however, remembered,—*Remarks on Lacunar Strevelinense* (November 1817), and verses *To my Dog* (January 1818). A highly fanciful fragment, under the title of *A Literary Romance*, which appeared in July, August, and September 1817, seems to be the only other piece which he published at this time.

Simultaneously with the biographical sketch of Crichton, Mr Tytler was engaged on a *Memoir of Sir Thomas Craig of Riccarton*. It appeared in 1823, "including biographical sketches of the more eminent legal characters since the institution of the Court of Session by James V. till the period of the union of the crowns." This work, like the last, was published by Mr Tait, and was limited to a small impression. Together, they showed *literary* predilections which were deemed at the time incompatible with *legal* success; and it soon became apparent to the young barrister that he must decide between the Law, which he loved not and which loved not him, and History, which he loved passing well. It would not have been difficult to foresee his decision. The founding of the Bannatyne Club, in 1822, of which he was one of the original members, (and for which, jointly with Mr Hog and Mr Urquhart, he afterwards edited a volume), by drawing him yet more intimately into connexion with the literary antiquaries of that day, may have done somewhat to decide the colour of Mr Tytler's future life. His lively lyrics, sung at the yearly meetings of the society, will not be forgotten while the friends live who heard them. In the mean time, his renewed and increased intimacy with Sir Walter Scott, the president of the club, which led to a visit to Abbotsford in 1823, was productive of memorable consequences.

"It was in the month of July, soon after the rising of the Court of Session," writes Mr Alexander Pringle of Whytbank to Mr James Tytler, "when P. F. T. happened to be on a visit here for some days, that we one day went over to dine at Abbotsford .... While we were riding home at night (I remember well the place; it was just after we had forded the Tweed at Boldside), your brother told me that in the course of that evening, Sir Walter Scott had taken him aside and suggested to him the scheme of writing a history of Scotland. Sir Walter stated that some years before the booksellers had urged him to undertake such a work, and that he had at one time seriously contemplated it. The subject was very congenial to his tastes; and he thought that by interspersing the narrative with romantic anecdotes, illustrative of the manners of his countrymen, he could render such a work popular. But he soon found, while engaged in preparing his materials, that something more was wanted than a popular romance; that a right history of Scotland was yet to be written; but that there were ample materials for it in the national records, in collections of documents, both public and private, and in Scottish authors whose works had become rare, or were seldom perused." Prevented by his other avocations from bestowing the necessary labour on such a work, he had "confined his undertaking to a collection of historical anecdotes for the amusement of the rising generation, calculated to impress upon their memories the worthy deeds of Scottish heroes, and inspire them with sentiments of nationality. He also mentioned that the article on the *Culloden Papers*, published in the *Quarterly Review* for January 1816, had been originally conceived in the form of an introductory essay to the contemplated historical work, which was now likely to go no further.—He then proposed to your brother to enter on the undertaking .... offering all the aid in his power for obtaining access to the repositories of information, as well as advice in pursuing the necessary investigations.—I asked my friend if the suggestion pleased him. He replied that the undertaking appeared very formidable; .... but that the suggestion, coming from such a quarter, was not to be disregarded. You may be sure that I encouraged him to the best of my power; for though I knew how much it was likely to withdraw his attention from his professional avocations, I also knew how much more congenial a pursuit it would prove, and how much more likely he was to attain to excellence in this channel."

Tytler, Patrick.

Before Tytler set his hand in right earnest to his history, an event occurred which altered or influenced the complexion of all his after-life. On the 30th March 1826, he was united to Rachel Elizabeth, the beautiful daughter of Thomas Hog, Esq. of Newliston.

"For nearly two years before," writes Miss A. F. Tytler, "we had become aware of his attachment to this beautiful Rachel, for beautiful and accomplished she was: and her pursuits, particularly in music and painting, were most congenial to his own. She was twenty-two at the time of her marriage; but she had lived constantly in retirement, either in the country at Newliston, or during the winter months in her father's house at Lauriston, which went by the name of *the convent*. My brother, after being introduced to her, found it very difficult to penetrate those convent walls; but the old gentleman, after he had recovered from the first shock of seeing a young gentleman frequently calling, on what appeared to him very frivolous pretences, became so fond of my brother, that soon no pretence whatever was necessary, his visits appearing to give equal pleasure to all parties."

Immediately before his marriage, besides an *Essay on the Revival of Greek Literature in Italy*, which he had read before the Royal Society of Edinburgh, Tytler published his *Life of Wickliff*. It appeared anonymously in 1826, in a small volume of 207 pages. Henceforth, the desire to prosecute the necessary collections for his *History of Scotland* engaged no small share of his time and attention. But he did not abandon the Law; and while his bride was yet at Newliston, he came into the metropolis daily to attend the Exchequer Court. In the meantime, he purchased a house in Edinburgh (36 Melville Street), and before the winter established himself there. The birth of three children Mary Stewart, Alexander, and Thomas Patrick, completed his wedded happiness. It would be hard indeed to find a more perfect picture of domestic bliss than was presented by his little household.

Tytler now worked indefatigably at his history; love adding a stimulus where ambition already supplied a sufficient spur. In March 1828, he was correcting the last proof of his first volume; and before September 1829, he had finished writing his third. Sir Walter Scott reviewed the first two volumes in the *Quarterly*. It was impossible, in fact, to withhold from this work the praise of having called attention more than any which had preceded it, to the wondrous mine of historical information, yet unwrought, which exists in the State-Paper-Office; and Scott was liberal, yet discriminating in his praise. He expressed a wish that the historian would bestow an introductory volume on the dark ages preceding the accession of Alexander III. (1249); and to produce such a volume was a favourite project with Mr Tytler to the last. He had also purposed to terminate his history, not at the union of the two crowns of England and Scotland under James I., but of the two kingdoms under Queen Anne. This, however, he subsequently found, would have constituted a task equal in magnitude to all his past labours, and would have required a new lifetime for its fulfilment. The third volume of the Scottish history appeared in 1829, the fourth in 1831; the rest (vols. v.–ix.) appeared respectively in 1834, 1837, 1840, 1842, and 1843.

Very various, however, was the web of Mr Tytler's life during the many years thus indicated. Many, too, were the works in which he engaged while his History was in

Tytler, Patrick.

progress. First came the *Lives of Illustrious Statesmen*, in three volumes, which he wrote for Murray's *Family Library*; next, a *Life of Sir Walter Raleigh*; then, a *Historical Dissertation on the Progress of Discovery in America*; after that, a *Life of King Henry VIII.* These last three works were published by Messrs Oliver and Boyd in the *Edinburgh Cabinet Library*.—In the meantime, Mrs Tytler's health gave way. The winter of 1832 was spent at Torquay, that of 1833 at Bute. In the spring of 1835, while in the very pursuit of health, she breathed away her gentle spirit, overflowing with every Christian grace, and leaving her husband overwhelmed with the greatness of his loss.

He now removed from Edinburgh, and took up his residence with his sisters, first at Hampstead, then in Wimpole Street, London, devoting his time to the prosecution of his *History*, and to the education of his children. He had been disappointed in his hopes of being appointed Historiographer of Scotland, and keeper of the Records in the Chapter-House. But in the prosecution of his favourite studies in the State-Paper-Office, he forgot everything except his domestic grief. In the meanwhile, he was called upon to give his evidence before a Select Committee on the Record Commission, and the report was attended with important consequences.

In London he led a singularly quiet life, gathering round himself a small society of men engaged in kindred pursuits and studies. He was one of the projectors of the English Historical Society, which has since rendered such distinguished service to literature. For the rest of his time he sought his happiness in the bosom of his family; in the summer, to his beloved Newliston, or to Inverness-shire, where his brother William, sheriff of the county, and his sister, Mrs James Baillie Fraser, resided, never repairing for health and relaxation in vain.

One of the most interesting of Tytler's literary labours appeared in 1839, *Original Letters Illustrative of the Reigns of Edward VI. and Queen Mary*. The documents, which are connected together with a slender link of historical narrative, he met with in the course of his historical researches pursued in the State-Paper-Office. Simultaneously with this work, he wrote the article "Scotland" for the seventh edition of the *Encyclopædia Britannica*. In October 1843, he finished the ninth and last volume of his *History of Scotland*, after having expended on that work the labour of little less than eighteen years.

It was in the early part of 1843 that he was commanded to examine a singular relic in her Majesty's possession, known as "the Darnley jewel." His *Notes* were printed; and the historian was honoured by her Majesty's commands to dine at Windsor Castle in the ensuing November. This led to his being intrusted with a collection of royal miniatures, to study and report upon; and finally, in 1844, a royal pension of L.200 per annum was bestowed upon him "for literary services to the country." Many were the undertakings which he yet contemplated; of which an introductory volume to his *History of Scotland*, and a *History of the Reformation*, were the principal. But a memoir, privately printed in 1845, *On the Portraits of Mary Queen of Scots*, was the last thing that he was destined ever to see through the press.

In the August of the same year, he contracted a second marriage. The lady of his choice was Anastasia, daughter of Thomson Bonar, Esq. of Camden-Place, Kent, who had long been a friend of his family. Altogether melancholy, however, from this period, was the sudden decline of his health, the singular prostration of his mental powers, and the morbid melancholy into which the cheerful author of other years was seen to sink. True it is, that Tytler had been an excessive student, especially from the time of his first marriage, and that he had overtaxed his powers; but this does not seem sufficient to account for the sad change which, at the age of fifty-four, overtook him. He submitted to the cold-water system, as it is called; and traversed France and Germany in pursuit of that relief which he was to find only in the grave. He died at Malvern on Christmas Eve, 1849, surrounded by his family, and sustained to the last by a most blessed hope. His remains were laid in the vault of his ancestors, in the Greyfriars Churchyard, Edinburgh.

Tzetzes.

A memoir of this excellent man appeared in 1859. From his letters, and the various reminiscences of friends there preserved, a better notion will be derived than any mere sketch can convey of the playfulness of his disposition, the piety and solid worth of his character. He was learned without an atom of pedantry; of a social turn without being either frivolous or given to dissipation; religious without moroseness; witty, but never at the expense of others. He was seen to most advantage in the society of his family, surrounded by his children; and was most beloved by those who knew him the most intimately. His passion for letters was genuine; and, in the pursuit of historical truth, he instinctively apprehended whatever was noble, lofty, and good. It was impossible to be much in his society without being the better for it. His biographer endeavoured to express his character in a single sentence, when he styled his life "the portrait of *a Christian gentleman*." (J. W. B.)

TZETZES, JOANNES, a Greek grammarian of Constantinople, who flourished towards the latter end of the twelfth century, was the son of Michael Tzetzes, an unlettered man, and Eudocia, a person of Basque or Iberian extraction. This humble pair trained up their sons Joannes and Isaacus in the practice of wholesome precepts, preferring letters to riches and power to precedence. John Tzetzes, after having acquired a very good knowledge of Hebrew and Syriac, of the science of the day, and of the philosophy of his time, with which he gives signal proofs of his extensive acquaintance, took to writing his *Iliaca*, a very dull poem of 1676 hexameter lines, and the *Chiliades*, another equally flat production, consisting of 12,661 lines. Both of these poems are greatly disfigured by the immoderate self-conceit of the author, who is never done with boasting of his prodigious memory, of the "lightning" rapidity of his stylus, and of the Tzetzean method of investigation. It need not be wondered at that this swaggering braggart is now well nigh forgotten. His works bear no traces of originality, nor have they anything, except the exceeding miscellaneousness of their knowledge, to recommend them to the attention of posterity. He dedicated his Homeric Allegories to Irene Augusta, wife of Michael Comnenus, who died A.D. 1158; and from this we would infer, that she had shown him some patronage. This is all we have gathered respecting Joannes Tzetzes.

Various fragments of the *Iliaca* had been discovered, from the time that the author wrote down to the eighteenth century, yet no person had succeeded in obtaining a complete copy of the MS. of that poem until 1793, when it was published entire by F. Jacobs, with a commentary. There is, besides, a good edition by E. Bekker, Berlin, 1816. The great mass of the poem known as *Chiliades*, was obtained almost entirely at second hand. It contains, however, valuable information on subjects of the most miscellaneous character. This poem was first published by Gerbelius in 1546, but the best edition of it is that by Kiessling, 1826. With the exception of a few miscellaneous poems and fragments, and the *Commentary on Lycophron* which he seems to share with his brother Isaac, this completes the list of the published writings of Joannes Tzetzes. The best edition of the *Commentary on Lycophron* is that by J. C. Müller, 1811. Besides the *Homeric Allegories*, referred to above, seven short prose works of Tzetzes remain still unpublished.

U.

U ‖ Udall.

U, or u, the twenty-first letter and fifth vowel of the English alphabet, is formed in the voice by a round configuration of the lips, and a greater extrusion of the under one than in forming the letter o. The sound is short in *curst*, *must*, *tun*, *tub*; but is lengthened by a final *e*, as in *tune*, *tube*, &c. In some words it is rather acute than long; as in *brute*, *flute*, *lute*, &c. It is mostly long in polysyllables; as in *union*, *curious*, &c.; but in some words it is obscure, as in *nature*, *venture*, &c. See ABBREVIATIONS, under V.

UBEDA, a town of Spain, Andalusia province, and 25 miles N.E. of Jaen. It is pleasantly situated in a fertile and well watered district, on a gentle slope, near the right bank of the Guadalquivir. Ubeda was built by the Moors with the materials of the Roman Bætula, now *Ubeda la Vieja*, and has still a very Moorish appearance. Under the Moors it rose to be a place of importance, and was the scene of several sanguinary conflicts between them and the Christians. It is said at one time to have contained 70,000 inhabitants. Some of its towers and gates, and portions of its walls, still remain. It contains numerous churches, convents, and nunneries, some of which are fine buildings; in particular, the church of San Salvador, and the cathedral, originally a mosque, but transformed into a Corinthian temple. The inhabitants are chiefly employed in agriculture. Pop. 13,632.

UBIQUITARIANS, a word formed from *ubique*, everywhere, denotes a sect of Lutherans which arose and spread itself in Germany, and whose distinguishing doctrine was, that the body of Jesus Christ is everywhere, or in every place. Brentius, one of the earliest reformers, is said to have first broached this error in 1560.

UDALL, NICHOLAS, a celebrated master of Eton and Westminster schools, and author of *Ralph Royster Doyster*, the first regular English comedy known in the language, was born in Hampshire in 1506. Passing through Corpus Christi College, Oxford, he took his degrees, first of B.A. in 1524, and subsequently of M.A. in 1534. During his college life, he had given symptoms of a leaning to the Lutheranism of the day, which is said for a time to have kept him out of Eton. On being elevated to the mastership of that famous institution, he gained a celebrity for his severity. Warton tells us that Thomas Tusser, the poet, "was next sent to Eton school, where, at one chastisement, he received fifty-three stripes of the rod from the severe but celebrated master, Nicholas Udall." (Warton's *English Poetry*, viii. 248.) But Udall was busy with his pen as well as his rod. He published *Flovres for Latyne Spekynge, selected and gathered oute of Terence, and the same translated into Englysshe*, London, 1533. He wrote translations of some of the works of Erasmus; some Latin plays; and, to crown all, he is the earliest writer on record of the regular English comedy divided into acts and scenes. He seems to have executed a considerable number of dramatic compositions, or "interludes," as he calls them, which were in all probability put together for the amusement of his pupils on St Andrew's day. None of these plays have come down to us, save some thirty-five lines in Wilson's *Arte of Logike*, 1567, and the *Ralph Royster Doyster*, which was only discovered in 1818, although it must have been printed as early as 1566, and it even may have been written fifteen or twenty years before. For, in Wilson's *Rule of Reason*, printed in 1551, the earliest year assigned for the printing of *Gammer Gurton's Needle*, this play of Udall's is mentioned as being then in circulation. Udall was appointed to a canonry at Windsor in the early part of the reign of Edward VI. He died in 1564.

Udine ‖ Uist, South and North.

UDINE, a town of Austrian Italy, in a wide plain near the foot of the Carnic Alps, on the Roja, 60 miles N.E. of Venice. It is well built, and enclosed by walls four or five miles in circumference. On a hill near the centre stands the old castle, at one time the residence of the patriarchs of Aquileia, and now used as a prison. The streets are in general narrow and crooked; but some of them are lined with arcades, and there is a fine public square containing a column to commemorate the treaty of Campoformio, concluded, in 1797, at a village of that name, about two miles off. The cathedral is remarkable for its marble pillars, sculptures, and paintings; and of the numerous other churches, some are fine buildings. Udine also contains a town-hall, several palaces of the nobility, courts of law, a gymnasium, lyceum, and other schools, library, museum, theatre, and various hospitals. The Campo Santo of Udine is considered one of the finest cemeteries in Europe; and the town is adorned by many beautiful public walks, constructed by the French when they were in possession. There are here silk and leather factories, a sugar refinery, distilleries, paper and flour mills; and a considerable trade is carried on in silk produced in the neighbourhood. Pop. (1851) 23,464.

UFA, a town of European Russia, capital of the government of Orenburg, at the confluence of the Ufa and the Belaia, 200 miles N. of Orenburg. It is walled and defended by a citadel, and has many well built and regular streets. The Bishop of Orenburg and a Mohammedan mufti have their seat here; and there are six churches a number of mosques, two convents, several schools, a poor-house, and lunatic asylum. A considerable trade is carried on in corn and cattle. About half of the inhabitants are Tartars. Pop. 12,894.

UGLITCH, a town of European Russia, in the government and 60 miles W.S.W. of Jaroslav, on the right bank of the Volga. It is an irregular and ill-built town, partially enclosed with earthen ramparts; and it has twenty-five churches and two convents, a school, and several hospitals. Cloth and paper are manufactured; and there is some trade in corn and leather. Before its destruction by the Lithuanians in 1607, it is said to have contained 30,000 houses and 150 churches. Pop. 9999.

UIST, SOUTH and NORTH, two of the Outer Hebrides, included in Inverness-shire. South Uist lies between N. Lat. 57. 7. and 57. 25., W. Long. 7. 12. and 7. 28. Its length from N. to S. is 21 miles, its greatest breadth 8½, and its area estimated at 127 square miles. North Uist, separated from it by the Island of Benbecula, lies between N. Lat. 57. 30. and 57. 43., W. Long. 7. 2. and 7. 32. It is of an irregular triangular form, nearly 17 miles in length from E. to W., and about 12 in breadth, with an area of 118 square miles. The rocks of both islands are principally gneiss, and both present nearly the same physical appearance, being intersected by numerous arms of the sea, and having their surface covered by a multitude of freshwater lakes only a few feet in depth. Some of the inlets form safe and commodious harbours, such as Lochs Boisdale, Eynort, and Skipport, in the southern, and Loch Maddy in the northern island. The coasts, especially on the west, are generally low; but here and there bold rocky headlands rise from the sea. Both islands are entirely destitute of trees; and the land may be said to consist of a series of peat bogs and sandy plains, rather than of soil.

But in both the peat is gradually being ameliorated by the drifting of sand and comminuted shells from the shore of the Atlantic; and on the sides of the hills there is much good pasturage. In South Uist there are three distinct groups of hills, occupying the whole of the eastern side; and their highest summit is Hecla, upwards of 2500 feet in height. West of this lies a level tract of peat, terminating at the extreme west in sand. Bere, oats, and potatoes are raised here by the use of seaweed and other manure. North Uist also rises on its eastern side into a ridge of hills from 300 to 700 feet high, which gradually increase towards the south till they rise to a height of 2000 feet. West of this lies a flat tract, partly occupied with peat moss, and partly with pasture and arable land, the latter producing barley and potatoes. The inhabitants of North and South Uist support themselves by the rearing of cattle and sheep, and by fishing; but since the decline of the kelp trade, these sources proving quite inadequate, the population has greatly diminished by emigration. The islands each form a parish, including the smaller islands round about, that of Benbecula forming part of South Uist parish. Besides the Established churches, there is a Free Church charge in North Uist, and two Roman Catholic chapels in South Uist; as about half of the people belong to that body. There are also parochial and other schools. North Uist contains various remains of military works and other antiquities. Pop. of North Uist, 3302; of South Uist, 4006.

UKRAINE, a large district of European Russia, formerly, as it name denotes, the *frontier* territory between Russia, Poland, Turkey, and Little Tartary; and now comprising the Russian governments of KIEV, POLTAVA, KHARKOV, and PODOLIA, which see.

ULEABORG, a seaport-town of Russian Finland, capital of a laen or province of the same name, stands on a peninsula at the mouth of the Ulea, in the Gulf of Bothnia, 70 miles S.S.E. of Tornea. Since its destruction by fire in 1822, it has been rebuilt in a regular plan, and has wide and straight streets. After Abo it is the principal commercial town of Finland, and exports pitch, tar, fish, and salted provisions. Fishing and shipbuilding are also carried on. Uleaborg was founded in 1610, and belonged to the Swedes till 1809. In June 1854, the shipping and magazines were destroyed by the English. Pop. (1857) 6451. The laen of Uleaborg has an area of 63,415 square miles, and a population of (in 1857) 169,845.

ULM, a frontier and fortified town of Würtemberg, on the border of Bavaria, on the left bank of the Danube, which here receives the Blau, in a rich and beautiful region at the foot of the Swabian Alps, 45 miles S.S.E. of Stuttgart. The Danube is here about 200 feet broad and 12 deep; it is crossed by two bridges to the Bavarian village of New Ulm; and over the Blau, which traverses the town, there are five bridges. The town is oval in form; and has the usual appearance of old German towns, with narrow irregular streets, and quaint old wooden houses. The principal building is the cathedral, one of the largest and finest of German churches, begun in 1377 and completed in 1494. The spire, which was intended to be raised to 475 feet, is only 337 in height; and the interior dimensions are as follows:—length, 485 feet; breadth, 205; height of the choir, 130. It is a fine specimen of ancient Gothic art, and contains one of the finest organs in Germany, and many curious old paintings, carvings, and stained glass. From the summit of the spire a fine view is obtained over Swabia and Bavaria, and in clear weather as far as the Alps. This cathedral now belongs to the Lutherans; and there are here two other Lutheran and two Roman Catholic churches. The town-hall of Ulm is an old and spacious but by no means handsome building. In front of it, in the market-place, is a fine fountain adorned with statues. The German House, containing the chief public offices, is one of the finest buildings in the town. Ulm has also a theatre, gymnasium, library, museum, hospital, and other benevolent institutions. The manufacture of tobacco, snuff, pipe-bowls, playing-cards, porcelain, linen, and silk fabrics, &c., is carried on here; and there is a very extensive trade. The town is connected by railway with Stuttgart and Munich. Ulm was formerly an imperial free town, strongly fortified, and an important military position; but in 1805 General Mack, with a garrison of 12,000 Austrian troops, being enclosed on all sides by the enemy, capitulated to Napoleon without firing a shot, and the fortifications were then nearly all demolished. They remained in that condition till 1842; when they were restored under the direction of Prussian engineers at the expense of the German Confederation. Ulm is thus again a first-class fortress, and is garrisoned by 5000 Bavarian and Würtemberg troops, with 300 Austrian artillery. Pop. (1855) 21,076.

ULPIANUS, DOMITIUS, a celebrated Roman jurist, of whom hardly anything is known with certainty, was most probably a Tyrian who flourished during the reign of S. Severus and his son Antoninus Caracalla—that is, from A.D. 198 to A.D. 211. Although one of the most fertile writers on Roman law, almost all we know of him is contained in the *Domitii Ulpiani Fragmenta*, 1836; the *Florentine Index*, and the few excerpts in the *Digest* of Justinian. The last edition of the *Fragmenta* is that of E. Boeking, Leipzig, 1855. The style of Ulpian, though clear, is too diffuse to admit of his being classed in the highest rank of Roman jurists.

ULSTER, the most northern of the four great divisions or provinces of Ireland, comprising the counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. See IRELAND.

ULVERSTONE, a market-town of England, county of Lancaster, about a mile W. from the embouchure of the Leven, in Morecambe Bay, and 15 miles N.W. of Lancaster. The town consists principally of four well built streets, and has been greatly improved of late years. The parish church was almost entirely rebuilt in the beginning of this century, but the tower and a Norman doorway of the old edifice still remain. Trinity Church, an elegant edifice, surmounted by a handsome spire, was erected at the upper end of the town in 1832. There are also several dissenting places of worship, a grammar and other schools, a theatre, assembly-rooms, subscription library, and a savings bank. By means of a canal from the Leven, vessels of 400 tons can come up to a large basin close to the town, where they load and unload. Ulverstone, which is a sub-port to Lancaster, has a considerable trade in iron-ore, iron, slates, corn, &c. Manufactures of cotton goods, canvass, hats, &c., and shipbuilding, are carried on to some extent. Pop. (1851) 6433.

ULYSSES, ULIXES, or ULIXES, the Roman name of the Greek hero Odysseus (Ὀδυσσεύς), the person celebrated in Homer's "Odyssey." According to the Homeric account, he was the son of Laërtes and Anticleia, king of Ithaca, husband of Penelope, and father of Telemachus. While later poets and mythographers have represented Ulysses as sprung from quite a different stock, and as the incarnation of cowardice and base intrigue, he is always held up by Homer as a very prudent warrior, of extensive experience and skill, anxious to avoid or to escape difficulties, pre-eminent in eloquence and wisdom, brave in adversity, patient in suffering, and triumphant over all the accidents of life. The Greek name of this hero (Ὀδυσσεύς) is said to denote *the angry* (Hom. *Od.* xix. 406); but he was called Nanus or Nannus by the Tyrrhenians.

Ulysses was prevailed upon, with great difficulty, to accompany Agamemnon and the rest of the Greeks to the Trojan war. He set out with twelve ships, and cast

Ummerapoora ‖ Union.

anchor by the side of the Greek fleet in the port of Aulis. During the progress of the Trojan war he acted the part of a prudent, wily negotiator, often astounding his hearers by the fervour of his eloquence, and again casting them all into perplexity by the profound dissimulation which he practised. He was the inventor of the wooden-horse, and was one of those who were concealed in its belly when it was carried within the walls of Troy. On the burning of the city all his sufferings began. After being tossed about for ten dreary years in the Mediterranean, he at last found the shores of his own land. In his absence his father had gone into solitary retirement, his mother had died, his son had gone in search of his father, and his wife, Penelope, was pestered by swarms of suitors who claimed her hand, and who devoured her means. Ulysses, who was in the attire of a beggar, found a lodgment with Eumaeus the swineherd. Telemachus returned after a few days, when, with the assistance of Athena, Ulysses and his son, and a few faithful servants, set out for the town, where they slew all the suitors. The friends and relatives of the deceased rose in arms against Ulysses, but Athena, as Mentor, calmed their rage, and reconciled them to their doom. All we know of the death of Ulysses from the Homeric account is from the prophecy of Tiresias (*Od.* xi. 19), where a happy old age and a painless death are promised him. The later traditions respecting the death of Ulysses are as contradictory of Homer's account of him as the records of his life are by the same hands.

UMMERAPOORA, or AMARAPURA, "*the city of the immortals*," a town of the Burman Empire, near the left bank of the Irrawaddy, 6 miles N.E. of Ava. It was founded in 1783, and made the capital of the empire; and it increased so rapidly in size and population, that in 1810 it was estimated to contain 170,000 inhabitants. But in that year the whole of the houses were destroyed by a fire, and this disaster, together with the removal of the court to Ava in 1819, caused a great decline of the place; and in 1827 its population was estimated at only 30,000. Since then it has suffered another severe calamity from an earthquake, which in 1839 destroyed the greater part of the town. It is regularly laid out, but, with the exception of some temples, is built only of bamboos; although some of the buildings, being richly gilt, have a showy appearance. The most remarkable building is a celebrated temple, adorned with 250 lofty pillars of gilt wood, and containing a colossal bronze statue of Buddha. The remains of the ancient palace are also to be seen in the centre of the town. During the time of its prosperity, Ummerapoora was defended by a rampart and a large square citadel, with a broad moat, walls 7000 feet long and 20 feet high, and a bastion at each corner.

UNGHVAR, a town of Hungary, capital of a county of the same name, on the Ungh, 80 miles N.N.E. of Debreczin. It consists of the town proper and two suburbs, and contains a Greek cathedral, an ancient castle, in which the bishop now resides, Roman Catholic and Greek churches, an episcopal seminary, gymnasium, several breweries, and has a considerable trade in salt, cattle, and wine. Pop. 8000.

UNION, a junction, coalition, or assemblage of two or more different things in one.

UNION, or *The Union*, by way of eminence, is more particularly used to express the act by which the two separate kingdoms of Scotland and England were incorporated into one, under the title of the Kingdom of Great Britain. This union, in vain attempted by James I., was at length effected in the year 1707 6 Anne, when twenty-five articles were agreed to by the parliaments of both nations; the purport of the most considerable being as follows:—

1. That on the first of May 1707, and for ever after, the kingdoms of England and Scotland shall be united into one kingdom, by the name of *Great Britain*. 2. The succession to the monarchy of Great Britain shall be the same as was before settled with regard to that of England. 3. The United Kingdom shall be represented by one parliament. 4. There shall be a communication of all rights and privileges between the subjects of both kingdoms, except where it is otherwise agreed. 9. When England raises L.2,000,000 by a land-tax, Scotland shall raise L.48,000. 16. 17. The standards of the coin, of weights, and of measures, shall be reduced to those of England throughout the united kingdom. 18. The laws relating to trade, customs, and the excise, shall be the same in Scotland as in England. All the other laws of Scotland shall remain in force, but alterable by the parliament of Great Britain; yet with this caution, that laws relating to public policy are alterable at the discretion of the parliament; laws relating to private right are not to be altered but for the evident utility of the people of Scotland. 22. Sixteen peers are to be chosen to represent the peerage of Scotland in parliament, and forty-five members to sit in the House of Commons. 23. The sixteen peers of Scotland shall have all privileges of parliament; and all peers of Scotland shall be peers of Great Britain, and rank next after those of the same degree at the time of the union, and shall have all privileges of peers, except sitting in the House of Lords, and voting on the trial of a peer.

Unitarians

These are the principal of the twenty-five articles of union, which are ratified and confirmed by statute 5 Anne, cap. 8, in which statute there are also two acts of parliament recited—the one of Scotland, whereby the Church of Scotland, and also the four universities of that kingdom, are established for ever, and all succeeding sovereigns are to take an oath inviolably to maintain the same; the other of England, 5 Anne, c. 6, whereby the acts of uniformity of 13 Eliz. and 13 Car. II. (except as the same had been altered by parliament at that time), and all other acts then in force for the preservation of the Church of England, are declared perpetual; and it is stipulated, that every subsequent king and queen shall take an oath inviolably to maintain the same within England, Ireland, Wales, and the town of Berwick-upon-Tweed. And it is enacted, that these two acts "shall for ever be observed as fundamental and essential conditions for the union."

Upon these articles and act of union it is to be observed, 1. That the two kingdoms are so inseparably united that nothing can ever disunite them, except the mutual consent of both, or the successful resistance of either, upon apprehending an infringement of those points which, when they were separate and independent nations, it was mutually stipulated should be "fundamental and essential conditions of the union." 2. That whatever else may be deemed "fundamental and essential conditions," the preservation of the two Churches of England and Scotland in the same state that they were in at the time of the union, and the maintenance of the acts of uniformity which established the liturgy, are expressly declared so to be. See BRITAIN.

For an account of the union of Ireland with Great Britain, thus forming the United Kingdom of Great Britain and Ireland, see BRITAIN.

UNITARIANS, a name given to those who confine the glory and attribute of divinity to the One only great and supreme God. Jesus Christ they consider as a man constituted in all respects like other men; and they look upon his death, not as a sacrifice or atonement for sin, but as a martyrdom in defence of truth. They deny the essential sinfulness of human nature, and hold that a conscientious diligent discharge of moral duties will be adequate to secure for men their future happiness. Their form of government is essentially congregational, each congregation ruling itself without regard to any courts or synods. In 1851 they had in England 229 places of worship, with 68,554 sittings; and in Scotland, 5 places of worship, with 2437 sittings.

UNITED STATES OF NORTH AMERICA.

Statistics. Note.

FOR many general statements with regard to the United States, especially its geography and population, the reader is referred to the article in this Encyclopædia on America. For many details, reference may be made to articles on the separate States and Cities. The statistics in the following article relate to the nation as a whole. In the historical portion of the article, many omissions have been necessary; but some of them are supplied in other articles on individuals, as in that on Washington.

Statistics.

PART I. STATISTICS.

States and Territories

The United States now (January 1860) embrace thirty-three States, one District, and five Territories, the last being those portions of the country more recently occupied, and not yet organised as States, all of which are described in the following table:—

Section.	State.	Organization.	Sq. Miles.	Population. Free.	Population. Slave.
South	Virginia	Colonised, 1607	61,352	*1,147,036	511,154
New England	Massachusetts	„ 1620	7,800	*1,132,369	
Do.	New Hampshire	„ 1623	9,280	317,976	
Middle	New York	„ 1624	47,000	*3,466,212	
†Do.	Maryland	„ 1634	11,124	492,666	90,368
New England	Connecticut	„ 1635	4,674	370,792	
Do.	Rhode Island	„ 1636	1,306	147,545	
Middle	Delaware	„ 1638	2,120	89,242	2,290
South	South Carolina	„ 1660	29,385	283,523	384,984
Do.	North Carolina	„ 1665	50,704	580,491	288,548
Middle	New Jersey	„ 1665	8,320	489,555	
Do.	Pennsylvania	„ 1681	46,000	2,311,786	
South	Georgia	„ 1733	58,000	*571,054	443,364
New England	Vermont	Admitted to Union, 1791	10,212	314,120	
†West	Kentucky	„ 1792	37,680	771,424	210,981
†Do.	Tennessee	„ 1796	45,600	768,258	239,459
Do.	Ohio	„ 1802	39,964	1,980,329	
South	Louisiana	„ 1812	41,255	*343,171	303,800
West	Indiana	„ 1816	33,809	988,416	
South	Mississippi	„ 1817	47,156	296,648	309,878
West	Illinois	„ 1818	55,409	*1,306,576	
South	Alabama	„ 1819	50,722	*466,922	374,782
New England	Maine	„ 1820	31,766	583,169	
†West	Missouri	„ 1820	67,380	594,622	87,422
†Do.	Arkansas	„ 1836	52,198	*247,879	83,334
Do.	Michigan	„ 1837	56,243	*511,672	
South	Florida	„ 1845	59,268	*61,297	49,526
Do.	Texas	„ 1845	237,504	154,431	58,161
West	Iowa	„ 1846–48	50,914	*633,549	
Do.	Wisconsin	„ 1848	53,924	*552,451	
Do.	California	„ 1850	160,000	*507,067	
Do.	Minnesota	„ 1858	86,000	*150,042	
Do.	Oregon	„ 1859	185,030	*60,000	
Fed. District	District of Columbia	Organized, 1790	60	*60,000	3,687
Territory	New Mexico	„ 1850	207,007	61,547	
Do.	Utah	„ 1850	269,170	11,380	
Do.	Washington	„ 1853	123,022	*10,000	
Do.	Kansas	„ 1854	114,798	*75,000	
Do.	Nebraska	„ 1854	335,882	*10,716	
Do.	‡Unorganised	about	210,962		
		Uniting in Declaration of Independence, July 4, 1776.			
		Probable increase in Population, about		3,084,067	558,262
		Total, about	3,000,000	26,000,000	4,000,000

Territory: its Position.

The United States occupy the vast portion of the North American continent, which stretches from the twenty-fourth to the forty-ninth degrees of N. latitude, and from the sixty-sixth to the one hundred and twenty-fourth degrees of W. longitude; its average breadth, N. to S., being about 1300 miles, and its average length, E. to W., about 2400 miles. Its area, as appears from the preceding table, is more than five-sixths of the area of Europe, and more than ten times the area of Great Britain and France united. Of all the natural features of the country, none is more striking externally, or more connected with the pursuits and prospects of the nation, than the immense proportion of navigable waters, exterior and interior; the shore line of the eastern coast being nearly 7000 miles, that of the southern 3400, and that of the western 2200, or 12,600 miles in all; while the lake line of the N. is 1500 miles, and the extent of river navigation, N. and S., E. and W., is beyond our powers of accurate computation. Another fact to arrest attention is the relation of the eastern shore to the opposite shore of Europe, point corresponding to point, the American coast advancing where the European recedes,—a relation which suggests a pre-existing unity of the two continents. This view finds

* Numbers according to recent estimates. The others are as given in the census of 1850.
† Southern, rather than Middle or Western States.
‡ Several new territories are proposed, viz.—Arizona, Colorado, Jefferson, and others.

Statistics.

confirmation in the comparative openness of the United States on the European side, to which the narrow extent of open country on the Asiatic side presents a remarkable contrast. These, however, are but suggestions, and but a few of many that might be made to throw light upon the geographical position and features of the United States territory.

Geographical Divisions.

Its geographical divisions may be reduced to five in number, of which a brief description follows:—1. The Atlantic slope is a long belt, extending westward from the Atlantic shore, beginning at the Gulf of St. Lawrence, and stretching to the Gulf of Mexico—nowhere wider than 200 miles, and in many places, particularly towards the north-east, having hardly any width at all. It is very plainly subdivided, where wide enough to be divided, into two portions, one a plain immediately upon the coast, the other a slope proper, from 50 to 300 feet in elevation, constituting in the Middle States what has been termed "one of the most attractive and richest districts on the continent." 2. West of the Atlantic slope lies the mountainous tract, variously styled the Atlantic or the Appalachian system, which, like the slope with which it is generally parallel, begins at the St. Lawrence, and extends to the S. W. as far as Alabama, 1550 miles in length, and from 50 to 150 miles in width. The mean elevation of the various ridges composing this system is not more than 2500 feet, though some of the higher ranges attain an average altitude of 3500 or 4000 feet. The system is naturally divided into two groups, one in the N.E., consisting of the White, Green, and Adirondack Mountains, the highest peak being Mount Washington (6226 feet); the other in the S.W., consisting of the Alleghany, Blue, Cumberland, and other ranges, of which the highest point is Black or Mitchell Mountain (6470 feet). Allied with the Appalachian system, though separated from it by a great interval, is the Ozark range, between the Missouri and the Red Rivers. 3. Next, on the west, is the immense plain, partly table-lands, partly slopes, spreading westward to the Rocky Mountains, and from the Gulf of Mexico on the south to the northern boundary of the United States. This "vast continental area," as it has been well styled, consists, so far as the United States are concerned, of three subdivisions. Least of the three is the basin of the St. Lawrence and the lakes on the north. From this, southward and westward, opens the great basin of the Mississippi, partly forest, partly prairie land, with soil and climate the most favourable to material development, and promising, from the magnitude and variety of its physical resources, to become the chief district, not only of the United States, but of the entire American continent. Westward from the Mississippi basin, the table-lands of the west, consisting of two plateaus, the lower or eastern attaining a mean height of 2500 feet, the higher or western one of 4000 feet, the western extremities, however, rising to 6000 feet as they reach the base of the Rocky Mountains. Both the plateaus, but especially the western, present wide expanses, almost entirely without tree or shrub, grassy in some parts, arid and actually desert in others, the dividing line between them and the fertile basin upon which they border being about the ninety-eighth meridian. 4. Next we find the Rocky Mountain system, vast, lofty, and irregular, partly volcanic, partly desert, the highest portion of the entire United States territory. It consists of three parallel divisions: *a*. The Chippewayans, or Rocky Mountains proper, a double, and, in some parts, a treble chain, the highest of which is the Wind River range, Fremont's Peak being 13,568 feet; *b*. An area of table-land, wide and elevated, the mean height 5000 feet, with salt and desert plains; *c*. A western chain, extremely broken, consisting of three principal ranges, the Sierra Nevada, the Coast, and the Cascade, the highest peak being one of the Cascade Mountains, St. Helen's (about 15,000 feet). 5. Lastly, the Pacific Slope, an irregular and a narrow tract, about 100 miles in breadth, extends from the western chain of the Rocky Mountain system to the coast of the Pacific.

Statistics.

Geological Divisions.

The geological divisions of the United States are made according to the more ancient or the more modern formation of the different districts. Chief among the tracts of more ancient formation are, first, the Atlantic plain, as it is styled, covering nearly half the breadth of the continent, and extending from the northern border nearly to the Gulf of Mexico; and, second, the Rocky Mountain district, much subdivided and interrupted, but extending, more or less, from 105 degrees to 123 degrees W. longitude. The more modern formations, principally cretaceous and tertiary, cover the remaining territory or the Atlantic slope, the Pacific slope, and the southern portions of both the central plain and the Rocky Mountain system. The mineral productions of the country are described in another article. It is sufficient here to remark the immense extent of the carboniferous strata, especially "the great Appalachian coal field," as it is termed, extending from Pennsylvania to Alabama, over an area of 70,000 square miles, and to a depth of 2500 feet. The entire area of the coal measures is 200,000 square miles, or more than twenty times as large as the coal area of Europe. At the same time, the quality of the American coal is not yet equal to that of the English, nor are the American mines as fully worked as the English—a recent writer in the *Edinburgh Review* remarking that "the total produce of America for the thirty-five years from 1820 to 1855 did not exceed the produce of Northumberland and Durham for four years, from 1851 to 1855, while it was less than the total annual yield of the United Kingdom by seven millions of tons."

Climate.

The climate of the United States has its natural divisions. The Atlantic slope and the Mississippi basin constitute the east; the Table Lands and the Rocky Mountain system the interior; and the Pacific Slope the west, each division possessing a climate of its own. *East.*—The characteristic of that in the east is its variety of elements, at once oceanic and continental, temperate and tropical. Even the coast has what are called continental features, while the Mississippi basin has oceanic features; and the tropical or semitropical features of the climate extend further into the N., just as the temperate or semi-temperate features extend to the extreme S. As a whole, the climate is one of great extremes, low winter and high summer temperatures. The latter are particularly remarkable as occurring in temperate latitudes; and according to recent observations, the mean temperature for the three summer months is 70°, lat. 40°-45°; 75°, lat. 38°-40°, and 80° or more, from the Gulf of Mexico northward to the 34th parallel. Yet, as a late writer remarks, "This high temperature is associated with the peculiar features of the temperate climates in other respects; with equally distributed, yet abundant rains, and with the high curve of daily changes which belongs to the same districts. It is simply an excess of temperature and humidity, engrafted on, without otherwise changing the characteristic laws elsewhere belonging to much lower temperatures." There is as much variability in humidity as in temperature; moisture and drought alternating in extremes at the same seasons, and great precipitations of rain or snow preceding or following long periods of clearness. The variety which characterizes the eastern climate exhibits itself in uniform aspects. Local influences exist as a matter of course, but it is surprising how slight their

Statistics. effect may prove, as in the case of the Appalachian ranges, whose influence is merely to reduce the temperature of their own atmosphere, without disturbing the uniformity of the districts which they divide physically. The distribution of rain is singularly uniform, the rains being almost entirely continuous, and the greatest amounts falling on low levels and in the inland States, as in those of the Gulf of Mexico and the southern valley of the Mississippi. Snow is a constant feature of the winters in the north, and falls profusely in latitudes where it is utterly unknown in Europe. With regard to winds, the higher currents are all from the W., and the lower, especially on the coast, from the E.; the very hurricanes of the Gulf of Mexico being uniform in season and in character. Thus the variety of the climate, otherwise tending to try the human constitution, as well as all animal and vegetable life, to the utmost, is so modified and regulated by its uniformity, as to prove itself adapted to a much greater range of life than is common to the same latitudes in the other hemisphere. *Interior.*—The climate here is less known. It appears to be uniform, but without variety; the general character decidedly continental, or, as one of its early observers styled it, Asiatic, it being remarkably dry and rarefied. Aridity is the predominant feature of the climate as of the soil; whatever rain or snow there is, falls, as a United States officer describes it, "upon the higher peaks and ranges, and is carried down to the main streams through deep cañons (gorges) and chasms, leaving the plains parched and dry." One of the natural effects is to be observed in the soil, of which the saline and alkaline elements are in great predominance. Nor can these territories be made to support either animal or vegetable life in any proportion to their vastness, so long as their climate remains bereft of moisture. A great range of temperature through the day is remarked upon as another characteristic of the interior; the thermometer below the freezing point at sunrise, and yet rising to 80° at noon or in the afternoon. The temperature for the entire year is lower than in the east or the west, though not so much as might be expected among the mountains, where great heights are reached, without such reductions of heat as are common to elevated situations. Rains are periodic throughout the interior. Though there is little or no variety in the climate as a whole, there is a great deal of variation in parts; district differs from district, and the symmetry of the east is not reproduced in the uniformity of the interior. *West.*—The Pacific coast possesses a climate more like that of Western Europe than either of the other divisions of the United States. There are great contrasts in different localities, and sudden changes everywhere, but the general range through the country, and for the year, is more steady than in the east, the winter not being so cold nor the summer so hot; indeed, the summer is comparatively cool, the early autumn being the hottest season. The air is described as equally dry with that of the interior, but more elastic and invigorating, and both climate and soil, at least in the more favoured regions, are of such prolific influence, that grasses, grains, and fruits attain to peculiar perfection. The accounts of the old Spanish missions in California teem with statistics of live stock and agricultural productions; nor is there any reason to doubt that these will be far surpassed by the development of the country in the hands of its present possessors. The rains, like those of the interior, are periodic. *Thermals.*—The isothermal of 50° for the year runs from New York westward, on nearly the same parallel, until it reaches the interior, where it first bends deeply to the S., then turns westward, and before crossing the division, turns N.W., and reaches the Pacific at a latitude of 10° above its entering point on the E. The summer thermal of 70° tends N.W. from New York to a point in the interior, far north of the United States' frontier, whence it descends S.W. to below the southern boundary of the Pacific coast, showing much greater heat in the interior and much less in the W. than prevails in the extreme E. The winter thermal of 32° tends S.W. from New York, crossing the greater part of the E. at a lower parallel, declining somewhat in the interior, but rising on the western side of that division, and not entering the Pacific regions within the limits of the United States. As regards the different months of the year, Mr. Blodget observes, in his Climatology of the United States, "In the greater part of the country, there is a regular curve of differences in the successive months of the year, as follows:—January is coldest; February, 2° to 4° warmer; March, 8° to 10° warmer than February; April, 10° warmer than March, and nearly at the mean for the spring and also for the year; May, 9° to 12° warmer than April; June, 7° to 9° warmer than May; July, 4° to 6° warmer than June; August, 1° to 3° less than July; September, 5° to 8° less than August; October, 8° to 10° less than September, and near the mean for autumn and the year; November, 10° to 14° less than October; and December, 10° to 15° less than November. This curve diminishes at the S., and in the tropical and semi-tropical districts, and it is less on the Atlantic coast than in the interior; less sharp also about the great lakes, and increasing rapidly in its measures of difference W. and N. towards the interior." The following table is condensed from the same work:— Statistics.

Place.	Winter Minimum.	Vernal Equivalent.	Summer Maximum.	Autumnal Equivalent.
Boston	Jan. 25	April 23	July 25	Oct. 23
Philadelphia	... 21	... 18	... ...	... 21
Baltimore to Beaufort	... 18	... ...	... ...	... 18
Charleston to Pensacola	... 10	... 15	... 21	... ...
Mobile to New Orleans	... 5	... 8	... 15	... 15
Nachitoches	Dec. 23	... 10	... 18	... 10
St. Louis	Jan. 8	... 8	... 20	... 15
Cincinnati	... 10	... 15	... ...	... ...
Mackinac	... 30	... 25	... 28	... 25
Fort Snelling, Minn.	... 8	... 6	... 20	... 23
New Mexico	... 5	... 15	... 22	... 15
San Francisco	Dec. 28	... ...	Sept. 21	Nov. 10
Int. California	Jan. 1	... 20	July 18	Oct. 25
Puget's Sound	... 5	... 22	... 25	... 22

Disease.—It is difficult, in fact impossible, to obtain any general statistics of mortality. In some States a system of registration prevails, which furnishes local statements, but what is true of one part of the country, may or may not be true of another part. The following figures are from the Registration Reports of Massachusetts, for a period of nearly seventeen years, ending with 1857. Of the total deaths in that State, there were—

22·15	per cent of	Consumption,	4·42, Scarlatina.
6·49	„	Dysentery,	2·38, Dropsy.
6·23	„	Typhus,	2·35, Croup.
5·87	„	Infantile diseases,	2·32, Cholera infantum
5·64	„	Old age,	2·24, Heart disease.
4·42	„	Pneumonia,	2·14, Hydrocephalus.

No other proportion, save that of still-born, amounting to 2 per cent (2·46). Throughout the E., the prevailing diseases are of three general classes, the malarious, the epidemic, and the pulmonic. The first class comprises those fevers, principally intermittent, to which the

Statistics. settler is exposed in new districts; and if a stranger, also in the old. Wherever they abound, humidity is found to be the predominant characteristic of the climate. The second class consists of epidemics and infections, none of which are entirely regular in their appearance or effect. The yellow fever, for instance, appears every year, but not always in the same places or with the same results. It has visited the Atlantic coast as high up as New Hampshire, but of late years its ravages have been confined to the Southern cities, one of which may be most severely visited one year, and another the next. The third class of diseases is much the most prevalent in the eastern States, as the Massachusetts Reports bear witness. But Massachusetts and its neighbourhood exhibit the maximum, rather than the average, of mortality, from these diseases. While the percentage of the entire mortality in that section, arising from all pulmonary complaints, is not far from 30, that in California is but about 10. The two leading diseases of this class are consumption and pneumonia, and these exist in very different proportions, according to their districts. Consumption is five times more destructive in Massachusetts, while pneumonia is nearly three times more destructive in South Carolina. The Census of 1850 gives the following table of deaths from June 1849 to June 1850:—

Under 1	54,353,	50 to 60	17,878
From 1 to 5	68,858,	60 to 70	16,446
„ 5 to 10	21,424,	70 to 80	13,412
„ 10 to 15	13,244,	80 to 90	8,185
„ 15 to 20	15,449,	90 to 100	1,977
„ 20 to 30	37,758,	100 and over	481
„ 30 to 40	29,184,	Unknown	1,647
„ 40 to 50	22,076,		
		Total	323,272

The population in 1850 having been 23,191,876.

Population. We pass over much that would require development in this article, but for the details in other parts of the *Encyclopædia*, to some considerations touching the population of the United States. Its density is very variable; greatest in the Middle States, least in the South-western. "Taken together," says the Census of 1850, "the States [*i. e.*, excluding the Territories], have a density of about sixteen to the square mile; excluding Texas and California, their density is over twenty-one to the square mile: the Territories have one inhabitant only to every sixteen square miles." Of the free population, we must observe several classes. The free blacks and mulattoes amounted in 1850 to nearly 435,000, or more than one-seventh of the then existing slave population. The ratio per cent, at the same period, of foreign born to total white and free coloured population was 11·06. The number of foreigners arriving was 279,980 in 1850, 368,643 in 1854, 123,126 in 1858. "It appears," says the Census of 1850, "there were in 1850 within the United States 961,719 persons born in Ireland; 278,675 in England; 70,550 in Scotland; 29,868 in Wales; making a total for Great Britain and Ireland of 1,340,812, which is considerably more than half of the total foreign-born residents of the country. If British America be added (147,711), there will be a total of 1,488,523, which is two-thirds of the total foreign born." The largest proportion of the above total is, as will be remarked, from Ireland; the next largest proportion of the entire foreign born is from Germany, which is the native land of no less than 584,720, or more than one-fourth of the foreign born in the United States. The number of Indians within the national territory is now estimated at 350,000.

Religion The constitution of the United States forbids Congress to make any "law respecting an establishment of religion, or prohibiting the free exercise thereof." It also declares that "no religious test shall ever be required as a qualification to any office or public trust under the United States." We are, therefore, to inquire into the existing condition of religion in the country, as the result of popular or individual thought and action. The variety of communions or organizations strikes us at once. Not only are the leading denominations in existence, but their subdivisions are various and generally active. Thus the Baptists, who claim to be the most numerous of all religious bodies in the United States, are divided into ten separate schools—Regular, Free Will, Free Communion, Old School or Anti-Mission, Six Principle, German Brethren, German Seventh Day, English Seventh Day, River, and Christian Connection. Besides the organizations that claim the name of Christian, others like the Spiritualist, the Jewish, and the Mormon exist, each with its churches and its ministry. The following table, compiled from the latest accessible data, gives some idea of the principal bodies professing to be Christians:— Statistics.

	Clergy.	Churches.	Communicants.
Baptist (Regular)	7,590	12,163	992,851
Methodist Episcopal, North	14,032	...	956,555
Do., South	7,755	...	699,164
Presbyterian, Old School	2,577	3,487	279,630
Do., New do.	1,558	1,543	137,990
Do., Cumberland	650	630	...
Roman Catholic	2,342	2,566	...
Congregationalist	1,922	2,369	230,093
Lutheran	792	1,441	146,062
Protestant Episcopal	2,073	...	135,767

Other bodies, more or less numerous, are all comparatively inconsiderable. Most of the larger bodies are engaged in missionary, educational, and charitable labours, some separately, others in connection with other organizations. The American Board of Commissioners for Foreign Missions, under various management, report 26 missions, 127 stations, and 131 out-stations, with 896 ministers and assistants, at an annual expenditure of about £83,000. The Methodist Episcopal Missions employ about 149 missionaries and assistants in foreign, and 503 in domestic service. The Protestant Episcopal Church has missions in Greece, Africa, China, and Japan, besides a large number of domestic missions, the appropriations for which reach from 150,000 dols. to 200,000 dols. (£31,250 to £41,700). The most extensive association supported by various denominations is the American Bible Society, the total receipts of which for the year ending May 1859 were upwards of £83,000. The report of the Society shows an issue of 271,000 Bibles and 505,200 Testaments in the European, Oriental, Indian, and other languages, including volumes in raised letters for the blind, at a cost of nearly £62,500 sterling. The Roman Catholic institutions of charity are the most numerous, including more than 100 asylums, chiefly orphan, with various other agencies for the relief of the erring, the infirm, and the poor. We add a few observations from the Census of 1850:—"The average value of churches in the United States would seem to be 2357 dols. (£491); their average capacity of accommodation, 376 persons. There are about five churches to every 3000 of the total population, and every 2600 of the white and free coloured; 619 persons in every 1000 of the whole population of the United States, and 72 in every 100 of the whites and free coloured, can be accommodated at one sitting in the churches. The Methodists

Statistics. have one church for every 1739 of the total population; the Baptists, one for 2478; the Presbyterians, one for 4769; the Episcopalians, one for 15,874; the Roman Catholics, one for 18,901; and other sects, one for 2923." Of course the church accommodations are most abundant in the large cities, and most deficient in the newly-settled portions of the country. The United States government now employs, as chaplains in the army and navy, 28 Episcopalians, 6 Presbyterians, 5 Methodists, and 4 Congregationalists. This is the only trace of an establishment. The different religious organizations are entirely voluntary; whatever views of their sanctity may be entertained by their members, none claim the power of enforcing their support upon those who are not members. Churches that are free, in the sense of being open to all worshippers without rate or contribution, are very rare; but the day seems not far distant when they will be multiplied. The revival system, on the other hand, is on the wane, though it is urged by its followers with as much confidence as ever. As a general rule, the religious observances of the different Christian bodies are quiet and orderly, and the tone of their worship, though often lowered by political and other secular intrusions, is usually earnest and elevated. Externally, the great difference between religion in the United States and religion in Europe is the extreme rarity, in the former country, of any architectural beauty or vastness in the church buildings. Not a single cathedral exists except in name, nor are there more than a very few really large parish churches.

Education. So far back as 1619, the London Company instructed the governor of Virginia to take care that "each town, borough, and hundred, procured by just means a certain number of their children to be brought up in the first elements of literature;" and within two or three years the first free school was established in Charles city. Free schools are mentioned in the earliest history of Massachusetts, and the first volume of the town records of Boston, under date of 1636, contains a subscription "towards the maintenance of a free schoolmaster." The same year, the legislature of Massachusetts founded a college, afterwards Harvard College, at Cambridge. While education was thus provided for, it was not intended to be gratuitous. A subscriber to the endowment of a school had certain privileges as a subscriber, which might, and in some cases did, secure the free instruction of his children or wards; but no one else could send a child to school without paying a fee or rate, greater or less, according to the extent of the endowment. This endowment, sometimes from individual donors, sometimes from the public treasury, was not designed to make the school free in the sense of gratuitous, but free in the sense of independent—that is, independent of the fees or numbers of its pupils. Such were the beginnings; and we may trace in them that principle of public responsibility which has since been developed, until, as at the present time, instruction at least in "the elements of literature" is provided, free of charge, throughout the country, though not with equal liberality in every part. The total number of public schools in the year 1850 is reported as 80;978; of their teachers, 91,966; of their pupils, 3,354,011. At the same date, we find reported 239 colleges and 6085 academies; teachers in colleges, 1678; in academies, 12,260; pupils in colleges, 27,821; in academies, 263,096: and to these numbers large additions must be made for private schools, as well as for charitable and reformatory institutions, some of which have attained to great importance. But, to confine ourselves to the public schools, as the only sources of what can be called national education, we find them very variously organized, administered, and supported. Where the system is comparatively mature, there are various grades, as primary, grammar, high, and normal,—the last being intended to train teachers for the rest. There were, in the four normal schools of Massachusetts in 1858, 531 pupils—108 males and 423 females (113 of the 531 receiving state aid). The administration of the schools is primarily in the hands of school committees or superintendents, serving for the district or the town, above whom there is, in several States, a board of education, with a secretary or superintendent for the State. Nothing, however, like centralization is tolerated, the schools being administered, after all, by their teachers, if these are capable persons, rather than by any boards or committees. To support the schools, upwards of two millions sterling are annually required, nearly as much more being expended in academies and colleges. The amount for the schools (two-fifths of the sum being from three States alone — New York, Pennsylvania, and Massachusetts) is derived from various sources, such as lands, stocks, taxes, and rates of different kinds and degrees. "It has been uniformly a part of the land system of the United States," says an eminent American authority, "to provide for public schools;" and, on this principle, nearly forty-nine million acres were granted (to 1854) to sixteen States and two Territories by the Federal Government. These lands, as they are sold or rendered productive, constitute the greater portion of the school funds established in the several States, and amounting in 1859 to forty million dols. (£8,333,000). If now the question be asked, Of what result is all this school system? the answer is not ready. As a matter of course, the character of instruction varies according to circumstances—much better in some places than in others, much better in the same place at some times than at others—always varying, because always dependent upon the teacher rather than upon the system, which, however celebrated, is far from mature in any part. The proportion of scholars at schools to the whole population is reported, in 1850, as one scholar to every 4·9 persons, or, including slaves, one to every 5·6 persons; but the number of natives unable to read or write amounted, in the same year, to 858,306. A grave defect, as many regard it, in the school system is the almost entire absence of religious culture; and one of the questions agitated at present relates, not to the revival of religion in education, but to the retention of the little that remains—as whether the Bible shall continue or cease to be read in the schools.

Statistics.

The Press. A very important element in the national education is the press. The number of newspapers and periodicals published in 1850 is given as 2526, and the annual number of copies printed as 426,409,978; but even these aggregates fall short of the truth. The lists are not made up of publications in English alone; between forty and fifty are in German, and half as many more in other European languages. Few, comparatively, of the twenty-five hundred above mentioned exert much influence or enjoy much circulation. Some of the New York daily papers, a few weekly papers, and one or two monthlies, have a large subscription list; but the power of the press, as a whole, is scattered among local or exceedingly limited publications. The book-trade is confined chiefly to a few large cities. 730 books were published in 1853, 278 being reprints of English works, 35 translations, and 417 original productions. Successful publications attain to very large circulation, perhaps larger than is at all familiar to European publishers; but data upon these points are very uncertain. As a general rule, a book sells better in the United States than it does in Great Britain, and many British productions have a much larger circulation in the United States than in Britain:

Statistics.

but there are many exceptions, and some works which are remunerative in Europe have but a very feeble circulation in America. The largest editions by far in the United States are those of school-books, of which the copies issued are often counted by the million. Besides the books printed in the United States, great numbers of volumes are imported from abroad, as various in character as those of home publication.

Libraries.

The United States contain no single library of any magnitude. A few collections, such as the Public Library of Boston and the Astor Library of New York, have been begun with every promise of future importance; but they are mere beginnings, compared with the great libraries of Europe. Nor is the aggregate of the United States libraries at all considerable, comparatively speaking. The public libraries in Paris contain a million and a half of volumes; all the 12,000 libraries of the United States contain, or ten years ago contained, less than thrice as many. But numbers alone do not bring out the difference. The rare and costly volumes of European collections are to be found, even a few of them, in but a very small proportion of the American collections, most of which, as will appear from the statistics to be given presently, are made up of ordinary books from the current or common standard literature. But while the United States libraries must hide their heads before the European in every other point of view, there is one in which they may bear comparison with any collections, however vast or valuable. This is the use or circulation of the volumes. The Public Library of Boston, a very favourable instance, contains, in addition to its library of reference, a library of circulation, amounting in the year 1859 to 15,819 volumes; and the report for the year shows that 149,468 volumes had been taken out in ten months by the frequenters of the library, representing all ages and all classes of the population. Nor is this all that may be said in favour of the American libraries, or of those who use them. It has been found by experience that volumes of high price may be safely lent, and that in the mass of common books borrowed from the better libraries, very few, indeed the merest fraction, are injured or lost. Public and private libraries are both on the increase, and the census of 1860 will add largely to the numbers which follow here. In 1850—

		Vols.
39	State libraries contained	288,937
126	Society „ „	611,334
126	College „ „	586,912
142	Students' „ „	254,639
227	Professional and academic „ „	320,909
34	Scientific and historical „ „	138,901
9505	Public school „ „	1,552,332
1988	Sunday „ „	542,321
130	Church „ „	58,350
12,317	„ „	4,354,635

Literature, Science, and Art.

As the smiling field has taken the place of the primæval forest, and the hum of industry has filled the once silent air, though much yet remains uncultivated and unvisited in the vast expanses of America, so human culture has sprung up, and the results of thought and of intellectual energy have spread throughout the nation. The close of the colonial period witnessed some remarkable achievements in literature and science. Jonathan Edwards, of whom Dugald Stewart said, "that in logical acuteness and subtlety he does not yield to any disputant bred in the universities of Europe," wrote his essay on *Freedom of Will*; Benjamin Franklin proved the identity of lightning with electricity, and wrote various practical treatises of great influence among his countrymen; the Bartrams, father and son, published their observations and travels, by which large additions were made to the natural history of the continent. Such were the germs. The developments of the national period have been various and fruitful. No single name stands pre-eminent in theological literature; but works on the Evidences and Interpretation, translations of the Scriptures, controversial writings, sermons and periodical publications, bear witness to the general interest in theology and its connections. Political literature is quite rich; it opens with the constitutional writings of Washington, Adams, and Hamilton, and continues with the legal productions of Kent, Story, and Wheaton. Oratory has her Fisher Ames and her Webster; poetry her Hillhouse and her Percival; fiction her Cooper; history her Prescott and her Irving, the last of whom is eminent for his success in lighter literature. We pass over the living in our enumeration; were they added, it would perhaps give a better idea of American culture as it is; but the names of the dead are sufficient to suggest its character. Science has advanced with equal rapidity. Physics and the mathematics have received considerable contributions from individuals, of whom the departed Audubon, illustrator of American natural history, and Bowditch, translator of the *Mécanique Céleste*, may stand as representatives. The formation of scientific collections upon a large scale has but begun, yet there are already one or two of much more than merely national importance. Art was hardly even born when the colonial period came to an end. Its early votaries, West and Copley, made their way to England, in search of more propitious skies than those of their native land. But the United States now boast of a line of artists, whose excellence is not merely one of promise. Stuart, Allston, and Cole, all three great painters, but the second the greatest of the three; Greenough and Crawford, sculptors, the latter perhaps possessed of more creative power than any of his contemporaries,—these head the rolls on which other bright names are already inscribed. It is still early for the formation of galleries or schools of art; but there are some, though on a very small scale. Architecture is altogether in the background; the genius of the nation seems to run to works of engineering, and architectural enterprises are few and far between.

Statistics.

Occupations.

No statistical table, however carefully prepared, can be entirely accurate with regard to the occupations of any people, still less with regard to those of the American people, whose first characteristic is mobility, or constant transition from one pursuit to another. Such as they are, the following statistics may be of some service, suggesting at least the variety and the magnitude of occupations in the year 1850. It appears from the census of that year, that of the free male population of the United States, over fifteen years of age, there were employed,—

2,400,583 in agriculture, a proportion of 45·69 per cent to the whole number employed.
1,712,606 in manufactures and commerce, including mechanic arts, mining, trade, and navigation, a proportion of 31·89 per cent to the whole number employed.
993,620 in labour not of agriculture, manufactures, or commerce, a proportion of 18·50 per cent to the whole number employed.
190,329 in professional or educational pursuits.
30,336 in government service.
44,402 in domestic service and other occupations.

5,371,876 in all.

But to this total, as to the separate items entering into it, large additions should be made for women, and for boys as well as girls under fifteen years of age. Then

Statistics. there still remains the slave population, a very large proportion of whom, male and female, old and young, are actively employed. We have no data, however for making these statistics complete. Individual States may be described according to the occupations of their inhabitants, but the entire nation cannot be.

Wages. The money value of wages indicates comparatively little unless we know the money value of articles which wages may be devoted to purchase. We find on examining such statistics as exist, that the "monthly wages to a farm hand with board" averaged some years ago, throughout the United States (with the exception of the Pacific coast, where prices were wholly exceptional), about £2 : 7s. Daily wages to a labourer, without board, averaged 3s. 4d. To estimate these facts, and others connected with them, we must understand the natural standard of wages, and the character or position of those who work for wages in the United States. Speaking generally, the standard is not only that sum which will support the labourer and his family, but that which will also enable him to lay by something, every month or every year, and so raise himself, if he is not already raised, to the position of the small capitalist, or of one not entirely dependent upon his wages. What was mentioned in the preceding paragraph as the mobility of the people of the United States, has a strong tendency to keep up wages; it leads those who work for wages to new employments, and to new places of residence, and thus effectually resists the influences which constantly tend to depress the rate of wages.

Pauperism. With all these advantages, however, pauperism exists, and resists the various efforts that are made to suppress it. It is not solely, or even chiefly, on account of the immigration from abroad; on the first of June 1850, there were a little more than 50,000 paupers in the United States, and nearly 37,000 of these were natives. The returns of the whole number of paupers, partly or wholly supported, during an entire year, showed a proportion greater on the foreign side, more than half of the whole number (135,000) being foreigners. No complete returns, however, are to be had on this subject. The number of paupers in some of the States is carefully registered, but it is impossible to draw any general deductions from them. At the end of 1858, New York was supporting 13,422 paupers; Massachusetts, 4194; during the year, New York had aided 261,155, and Massachusetts, 41,986. The system of relief varies in different States; in some, the State is the principal or the sole agent; in others, the counties, or towns, or both, bear the chief responsibility. In some, a bond or commutation money is required from immigrants, to indemnify the State for the possible necessity of supporting them. One of the improvements most needed throughout the country, is a better system with regard to the whole subject of public charities.

Agriculture. The number of farms and plantations in the United States was about a million and a half in 1850. It must have increased considerably since that time. To each farm there were then estimated to belong a little more than two hundred acres on the average, less than half being improved land; the average value of each being £470, and the average value of farming implements and machinery £11. "It would seem," says the census, with reference to the amount of improved land, "that only about one-thirteenth of the whole area of the organized States and Territories is improved, and about one-eighth more is occupied and not improved. The whole number of acres occupied is nearly 300,000,000, or nearly one-sixth part of the national domain. In New England about 26 acres in the one hundred are improved, in the south 16 acres, in the north-west 12, and in the south-west 5. In the south the number of acres to the farm is largest, but the value per acre is most in the Middle States. The average value per acre, for the Union improved and unimproved, is 11·14 dols." (£2 : 6 : 4). The agricultural capacity of the country is very remarkable. Maize, or Indian corn, though of tropical origin, may be successfully cultivated as far north as the United States extend. Other tropical growths, like cotton, sugar-cane, rice, and tobacco, flourish in the same northern latitudes. The native grape, not the European, but a hardier and coarser fruit, grows abundantly throughout the country. Some of the grains, as wheat and oats, are dispersed over similar extents, but others are confined to the districts of lower temperature. The grasses have a narrower range, the summer temperature being extreme in some quarters, the winter in others, and the soil being comparatively unfavourable to their cultivation. But the making and preservation of dried grasses or hay are greatly favoured, which is the more desirable on account of the long winter of the north. We have recourse to the Census of 1850 for the value of the various agricultural products. First of all stands Indian corn, estimated at nearly £62,500,000 for the year; next, with a long interval, is wheat (£20,830,000); close upon which follow cotton (£20,625,000), and hay (£20,188,000); then, with another interval, butter (£10,415,000), potatoes (£9,375,000), and oats (£9,167,000); no other crop being estimated as high as £4,167,000. The annual product of live stock over one-year old is £36,458,000, and that of animals slaughtered, £11,450,000. Large additions must be made to all these sums, in order to appreciate the agriculture of the present day, but the relative proportions of lands or crops would be found substantially the same, though their amounts would be much increased. Improvements in agriculture are constantly attempted, and frequently made; societies, State and corporate, have their regular meetings and exhibitions; and agricultural schools and colleges are organized and developed in various parts of the country. Constant efforts are made to introduce new articles of cultivation, and within the last ten years the culture of the vine and of tobacco has attained to fresh importance in various quarters. The latest experiment is the culture of tea, which, according to apparently careful statements, may be grown to great advantage, and, as the Commissioner of Patents reports in 1858, "at an expense less than the actual cost of similar preparations in China."

Statistics.

Pre-emption Acts and Public Lands. The Pre-emption Act of 1841, by no means the first, but the most liberal in its provisions, is declared in the Agricultural Report from the U.S. Patent Office (1857) to have "probably done more towards the promotion of settlements in the vast regions of the west and north-west, and in the development of their agricultural resources and interests, than all other causes combined." Its purpose is, that every head of a family, whether a man above the age of twenty-one, or a widow, should have the right to take any number of acres, "not exceeding 160 in one body," of the public domain, before the land they thus occupy is actually offered for sale, on condition that when it is offered they pay the minimum price of the land (5s. 2½d. per acre) to the United States, and on the further condition of inhabiting the land. A vast extent of public land is constantly open to purchase or to occupancy. The gross amount of lands sold during the five quarters ending September 30, 1859, was 16,618,183 acres, concerning which we find the following information in the Report of the Secretary of the Interior:—"4,970,500 acres were sold for cash yielding £438,957; 3,617,440 acres were located with bounty land warrants; 1,712,040 acres were approved to the several States entitled to them, under the swamp grants of 1849 and 1850; and 6,318,203 acres

Statistics. certified to States, as falling to them under the grants for railroad purposes. During the same period of time, 13,817,221 acres were surveyed and prepared for market, and 16,783,553 acres proclaimed and offered at public sale." We quote further from the same report:—"Grants of a general character have heretofore been made to States for objects of public benefit—for schools, for internal improvements, for the reclamation of swamps, and the construction of railroads and public buildings; and the principle on which this policy has been inaugurated and sanctioned is, that the United States, as a proprietor, receives from the application of the grants to the prescribed uses, a compensation in the enhanced value and saleableness of the remaining lands. Congress has also, from time to time, authorized the issue of bounty land warrants for military services rendered. Adherence to this policy has strengthened the military power of the republic, and encouraged a prompt response to all calls for volunteers in time of war. Special donations of land have heretofore been made in Florida, in Oregon, and Washington, and in New Mexico, with a view to the early establishment of a population there which would strengthen the frontier and serve as a military defence of the country."

Manufactures and Patents. The census of 1850 reports the gross annual product of "Manufactures, Mining, and the Mechanic Arts," as upwards of £208,300,000; 121,855 establishments, individual and corporate, are reported employing 719,479 males and 225,512 females. Imperfect returns tend to show that the products of cotton manufactures are the most valuable, those of iron coming next, then those of wool. The tariff on imports serves but in slight measure to protect home manufactures, the earlier policy of strong protective duties having been long since invaded and abandoned. A report from the Secretary of the Treasury for the year ending June 30, 1850, gives the following summary of exports of the leading articles of manufacture:—Cotton, £1,732,544; iron, £1,146,595; tobacco, £694,666; spirits of turpentine, £272,146; oil cake, £249,702; household furniture, £222,330; no other manufactures being exported to one million dollars (£208,000). In connection with this subject we should notice the returns of the Patent Office, as throwing light not only upon the ingenuity and enterprise of the people, but also upon the favourite objects of manufacture. The report of the Commissioner of Patents gives the following items for the year 1858:—

Number of applications for patents . .	5364
,, patents granted . . .	3710
Of which number (3710),—	
For inventions relating to agricultural implements and processes . . .	561
For reaping and mowing machines . .	152
For planting machines	63
For ploughs	55
For improvements in railroads, cars, etc. .	198
,, ,, sewing machines .	116

The above-mentioned patents were all granted to citizens of the United States, with the exception of twenty to subjects of Great Britain, and twenty-two to other foreigners. "It is a fact," says the Commissioner, "as significant as it is deplorable, that of the 10,359 inventions shown to have been made abroad during the last twelve months, but forty-two have been patented in the United States. The exorbitant fees exacted of the foreigner, and the severity of the offensive discrimination established to his prejudice, afford a sufficient explanation of this result."

Statistics. Commerce and Navigation. We pass to that great branch of industry developed by the very character of the country,—its long coast lines, and its vast ramifications of navigable waters in the interior. A report from the Registrar of the Treasury gives us an account of the commerce and navigation of the United States for the year ending June 30, 1859, and from this document we derive our best statistics:—1. *Tonnage*—The total amount of registered tonnage on the above date was 2,507,402 tons, of which 185,728 tons were employed in the whale fishery, the far larger proportion, 2,321,674 tons, being employed in the foreign trade. The total amount of enrolled and licensed tonnage was 2,637,635 tons, of which we find in the coasting trade, 2,480,929 tons; in the cod-fishery, 129,636; and in the mackerel fishery, 27,070. We find employed in steam navigation, of the registered tonnage, 92,747 tons; of the enrolled, 676,005—total, 768,752. The aggregate amount of the entire tonnage was 5,145,037 tons. 2. *Shipbuilding*—89 ships and barques, 28 brigs, 297 schooners, 284 sloops and canal boats, 172 steamers—a total of 870 vessels, with a total tonnage of 156,602 tons, were built in the year. The State of Maine leads the van in shipbuilding, followed at considerable intervals by Massachusetts, New York, and Pennsylvania. 3. *Entries and Clearances*—The number of vessels entering from foreign countries was 22,567. Of these, 12,035 were American, with a tonnage of 5,265,648 tons, and with crews amounting to 155,698 men and 434 boys; 10,532 were foreign vessels, their tonnage 2,540,387 tons, their crews 109,989 men and 1123 boys. On an analysis of this foreign tonnage, it appears that much the largest single proportion belongs to Canada, 957,063 tons; the next to England, 414,470; and the next to other British North American possessions besides Canada, 411,432,—these three amounts leaving to all other countries but one-fourth of the whole foreign tonnage entering the United States. The total number of vessels clearing for foreign countries was 22,704; 12,227 were American, their tonnage 5,297,367 tons, their crews 157,094 men and 909 boys; 10,427 were foreign, their tonnage 2,618,388 tons, their crews 109,180 men and 1114 boys. Of the foreign tonnage cleared, 1,083,566 tons were of Canada, 516,646 of other British North American possessions, and 413,360 of England, these three sums amounting to nearly four-fifths of the whole. 4. *Imports*—The total value of imports, about two-thirds of which (value) were brought in American vessels, was £70,576,692. One-third of this amount was in miscellaneous articles, none ranging above 5,000,000 dols. (£1,041,700); the other two-thirds may be enumerated as follows:—Wool, chiefly manufactures, £687,500; silks, £586,300; cotton manufactures, £541,700; linens, £208,300; hides and skins, £270,800; leather and manufactures of leather, £135,400; iron and steel and manufactures of the same, £354,200; sugar, £635,400; coffee, £520,800; wines and spirits, £166,700; tea, £145,800; tobacco, £125,000; molasses, £104,200. As to the countries from which these imports are drawn, England supplies merchandise to the value of £24,583,300; Scotland, £145,800; Canada, £291,600; other British North American possessions, £125,000; British West Indies, £41,600; East Indies, £181,200; other British possessions, £35,400—a total for Great Britain and her dependencies, of £25,403,900, or nearly one-half of the whole value of imports. France sends merchandise to the value of £854,200; Spain and her colonies (Cuba, £708,300) £916,600; Brazil, £457,300; Germany, £384,100; and China, £229,100. 5. *Exports*—The total value of exports was £74,331,136 Part of this, or £4,353,138, was the value of merchandise of foreign countries exported from the United States. The

Statistics. exports of the growth, produce, and manufacture of the United States amounted to £69,977,998 (more than two-thirds in American vessels) which was made of the following items :—

Product of the Sea: fish, oil, etc.		£929,785
„ „ Forest: wood, stores, furs, etc.		3,018,625
„ Agriculture: animals	£3,239,545	
„ vegetable food	5,009,840	
„ cotton	33,632,275	
„ tobacco	4,489,824	
„ seed, etc.	167,538	
		46,539,022
Coal		136,152
Ice		34,287
Raw produce, various		387,124
Manufactures (see preceding paragraph)		7,053,790
Gold and silver coin		5,035,925
„ „ bullion		6,943,720

Nearly two-thirds of the entire value of exports went to Great Britain and her dependencies; thus, to England, £22,267,500; Scotland, £625,000; Ireland, £625,000; Canada, £3,958,000; other British North American possessions, £2,088,000; British West Indies, £228,300; East Indies, £1,041,600; Australia, £625,000; other possessions, £416,600—a total of £44,791,500. To France went £9,160,000; to Spain and her colonies (Cuba £2,500,000), £4,582,000; to Germany, £3,220,000; to China, £1,458,300; to Brazil, £1,250,000.

Railroads, Canals and Telegraphs. The length of the railroads in operation in the United States in 1859 is variously estimated, at nearly 27,000, and at nearly 28,000 miles, the longest road being the New York Central, 556 miles. The cost of these roads is not far from £208,000,000, about one-half of which is still a debt from the different companies. As a general rule, the system of constructing and managing these roads is far from complete; they are built with little preparation, comparatively speaking, and usually require more or less reconstruction. If they are built merely upon speculation or credit, as is frequently the case, they are apt to involve their originators in large losses, in the course of which much of their nominal value disappears. Vast grants of land have been made by the Federal Government to many railroads in the Southern and Western States, amounting to nearly twelve millions of acres in all. A railroad is now projected from the Mississippi or its tributaries to the Pacific Ocean. For this, several routes have been surveyed, each about 2000 miles in length, and likely to cost at least £32,000,000 sterling. Nature has facilitated the communication between the Atlantic and the Pacific, vast as is the intervening barrier of the Rocky Mountain system; for in the Chippewayans, the chief rivers or streams pass around the terminations of ridges, rather than force a way through their centres, and in the Western or Pacific ranges, the mountains are "breeched to their bases," in opening a way to the streams which flow westward from the centre of the system. The length of the canals in the United States is computed (1858) at a little more than 5000 miles. The length of the telegraphic lines is computed (1858) at 35,000 miles, the cost of which has been about £850,000.

Post Offices and Roads. The constitution gives Congress the power "to establish post offices and post roads." The number of post offices in June 30, 1859, was 28,539; that of post roads 8723, extending in all 260,052 miles, of which 26,010 miles were travelled by rail, 19,209 by steamboat, 63,041 by coach, and the much larger proportion of 151,792 by what are called "inferior modes." The following figures from the Postmaster-General's Report, give the annual transportation of mails, their mode, their extent, and their cost :— Statistics.

Railroad	27,268,384 miles,	at £675,825,	about 5.9	d. a mile.
Steamboat	4,569,962 „	241,214,	„ 12.6	„
Coach	23,448,398 „	652,934,	„ 6.68	„
Inferior Modes	27,021,658 „	402,674,	„ 3.57	„
Total,	82,308,402 „	£1,972,647		

The amount of receipts for the year ending June 30, 1859, was £1,660,100; that of expenditures and liabilities, £3,117,600. To account for this large deficit, there are many reasons—one, that some of the mail routes, as those to and from the Pacific States, involve an annual loss of nearly £420,000; another, that the franking privilege of members of Congress and other officers of government, costs the post office department more than £420,000 annually. The rates of postage within the United States, as established by the Act of 1855, are for a letter sent under 3000 miles three halfpence; over 3000 miles fivepence; for a newspaper or printed matter, not exceeding three ounces in weight, one halfpenny; and for every additional ounce, one halfpenny; for books not weighing over four pounds, under 3000 miles, one halfpenny per ounce; over 3000 miles, one penny. The Postmaster-General reports the whole number of dead letters for the year at 2,500,000, or, with certain deductions, about 2,000,000 letters "actually conveyed in the mails and failing to reach the persons addressed;" and he remarks that, "in the large majority of cases, the fault is with the writers themselves, either in misdirecting or illegibly directing their communications." He adds that "the migratory habits of the people must also be considered among the prominent causes of the accumulation of dead letters, more particularly in the western or newer portions of the country." The number of dead letters returned to foreign countries during the year was 133,981, of which nearly one half went to England. The amount of letter postage on mails exchanged with Great Britain during the year was £160,433.

Banks and the Mint. There being no Bank of the United States, and no general law regulating banking in the different States, there is no such thing as a common banking system. Returns made about the beginning of 1859 exhibit nearly 1500 banks, with a capital of more than eighty-five millions; but much of this must be fictitious. The "specie funds," so styled, and the specie in the banks, amount together to twenty-seven millions sterling; the specie itself to little more than twenty millions; and the deposits reach nearly fifty-four millions. The circulation is upwards of forty millions; loans and discounts, one hundred and thirty-seven millions. The Mint of the United States is national; its chief office is at Philadelphia, with branches at New York and in parts of the country where gold is found. Any person may bring gold and silver bullion to the Mint to be coined, free of charge, except that one-half of one per cent is charged upon gold. The total gold coinage for the year ending June 30, 1859, was £6,250,000; the total silver, nearly £1,458,300; the total copper, £62,500. The whole number of pieces coined was 53,500,000. The deposits of gold and silver, during the same year, were of about the same amount as the coinage. The entire deposit of domestic gold, from the establishment of the Mint to 1859, was £97,900,000, of which more than £93,750,000 came from California.

Taxation. The constitution gives Congress the power "to lay and collect taxes, duties, imposts, and excises." It limits this power, in one respect, by the provision that "no capitation or other direct tax shall be laid unless in proportion to the census," or "apportioned among the several States according to their respective numbers." The only taxes levied by the general government at present,

Statistics.

as for a long course of years, are duties upon imports, the amount of which will be mentioned hereafter. State, county, and town taxes are levied by the local authorities in various ways and to very various amounts. As a general rule, the State lays taxes of its own, besides assessing its counties or its towns for a portion of its revenue; the county taxes and makes a demand upon the towns within its limits; and the town taxes its inhabitants to meet the drafts upon it from above, as well as its own expenditures. Town taxes are generally upon polls, personal estate, and real estate. State taxes are laid upon stocks; insurance, manufacturing, and other companies; banks; roads, turnpike and rail; canals; lotteries and auctions; licenses; inspections; alien passengers; stamps; and a few other objects of taxation. Taken throughout the country, taxation may be said to be light; but in some places, especially in the larger cities, it is exceedingly burdensome, and the more burdensome it is, the less productive it appears to be—that is, the less productive of security or comfort to those from whom it is exacted. The taxes in the city of New York are about as large as the taxes in Paris; but one looks in vain for the public works or decorations of the French city in the American. It is difficult to obtain statistics which throw light upon the actual character of taxation. The national taxes being all indirect, affect different parts of the nation very differently, while the local taxes are modified by State Funds, State Debts, and other circumstances of varying nature and influence. Such as they are, however, the following figures exhibit the amounts of taxation in the largest, and also in one of the more recently organized States, for the year 1858-9:—

	Population.	Share of National Taxation.	Amount of Local Taxation.	Tax per Head.	Tax in proportion to Taxable Property.
				s. d.	
New York	3,500,000	£1,354,000	£3,021,000	25 0	1·49
Wisconsin	550,000	177,000	49,500	8 4	0·59

Debt, National and State.

The public or national debt consists of two parts—one the debt proper, amounting (July 1859) to £9,083,584; the other, the amount of Treasury notes, £3,157,110; total, £12,240,694. But, in addition to these national obligations, the States, with six exceptions (Connecticut, Delaware, New Hampshire, Oregon, Texas, and Vermont), have each a debt of its own, as appears from the following list, made up to January 1, 1859:—

Alabama,	£1,062,082	Mississippi,	£1,514,936
Arkansas,	621,066	Missouri,	3,966,249
California,	842,391	New Jersey,	19,790
Florida,	329,166	New York,	6,758,735
Georgia,	698,904	North Carolina,	1,496,232
Illinois,	2,320,508	Ohio,	3,569,000
Indiana,	1,532,721	Pennsylvania,	8,180,854
Iowa,	26,667	Rhode Island,	80,480
Kentucky,	1,161,297	South Carolina,	1,290,152
Louisiana,	2,229,507	Tennessee,	3,467,930
Maine,	215,472	Virginia,	6,876,072
Maryland,	3,094,622	Wisconsin,	20,833
Massachusetts,	1,315,302		
Michigan,	487,005		
Minesota,	52,082	Total,	£53,230,055

The annual interest on that part of this debt which is absolute (£40,237,895) is £2,306,687. Part of the State debts is due only to the States themselves—that is, to certain funds or accounts (*e. g.*, school funds) of their own; but the larger part is due to the holders of their stocks, bonds, or obligations of any kind. The debts of many of the States are nominally covered by securities; the State credit has been lent for a public work, or to enable associations or individuals to execute works of public importance; and these works, or mortgages upon them, or notes of individuals, are retained as securities; but these securities are often comparatively valueless.

Statistics.

The following table gives some idea of the revenues and expenditures of the national government for the year ending June 30, 1859:—

Revenues and expenditures of the National Government.

1. Receipts.

From customs[1]	£10,326,210
From public lands	365,974
From miscellaneous sources	433,864
	£11,126,048
Balance in Treasury, July 1, 1858	1,332,981
Treasury notes	2,014,041
Loan	3,879,188
	£18,352,258

2. Expenditures.

Civil List	£1,242,455
Foreign intercourse	215,802
Miscellaneous, including expenses on customs, and lands, light-houses, public buildings, &c.	3,465,866
Department of the Interior, including Indians (see paragraph below) and pensions[2]	990,408
War department	4,842,460
Navy do.	3,065,125
	£13,822,116
For public debt	3,626,098
	£17,448,214
Balance in Treasury, July 1, 1859	£904,044

Government: its Nature.

The nature of the United States' government is differently regarded according to the different interpretations of the constitution under which it is established. One school of jurists maintain the doctrine that the constitution is a contract to which the States are parties, and that the government created by it is that of a confederacy, each member or State of which retains its independent sovereignty. The other great school take a larger view; they assert that the constitution is, as its name denotes, and as its own terms declare, "the supreme law of the land," and that the government established by it is supreme, not without qualifications in favour of the State governments, but certainly without any that transfer the sovereignty, nationally speaking, from it to them. Both views are consonant with the clauses in the constitution which place restrictions, some qualified, others unqualified, upon the States; with those which provide that the United States shall guarantee a republican form of government to each State, and protect each against inva-

[1] The total value of imported merchandise paying duty was £53,968,125; of merchandise free of duty, £16,608,573.

[2] The total number of pensioners was 11,585; 10,667 from the army, and 918 from the navy. There remain only 165 pensioners of the war of independence. The total amount of pensions for 1859 was £215,605.

Statistics.

sion and domestic violence; and with that which declares that the "powers not delegated to the United States by the constitution, nor prohibited by it to the States, are reserved to the States respectively or to the people." For the difference between the two interpretations of the constitution lies behind its own clauses, at least to a great degree; it springs from the opposite theories which are entertained with regard to the grounds upon which the constitution was framed, as well as the parties by whom it was framed; one theory attributing the impulse, the purpose, and the result of the transaction to the States separately, the other to the people collectively. Thus, therefore, the government is maintained on one side to be a government of States, that is, a compact; on the other, a government of the people, that is, an actual Union.

Legislature.

The constitution begins by defining the legislative powers of the general government, and the body by which they are exercised, "A Congress of the United States which shall consist of a Senate and House of Representatives." Something more than the so-called bi-cameral principle was at the bottom of this division; the Senate being organized as a federal house, in which each State has two senators and an equal vote, while the House of Representatives is a national House, or one in which the people rather than the States are represented according to their numbers, the senators, moreover, being chosen for six years by the State legislatures, the representatives for two years by the popular vote. The Senate has sixty-six members at present; the House of Representatives two hundred and thirty-seven, besides five delegates, one from each of the territories, who may speak, but not vote with the representatives. The number of representatives is determined by apportionment among the States on the present basis of one member for every 90,000 inhabitants. The powers of Congress are those of a sovereign legislature, checked by the co-ordinate branches of government, as well as by the State authorities; but for details on this point, we must refer to the constitution. Members of Congress receive a regular salary of £1250 for each session, or, as the session is of two years' length, £625 per annum, in addition to which they are entitled to mileage at the rate of 1s. 8d. per mile travelled on the usual route in going to and returning from the seat of government at Washington. The President of the Senate is the Vice-President of the United States, in whose absence a President *pro tempore* is chosen from and by the senators themselves. The presiding officer of the House of Representatives is a Speaker elected from and by the representatives. Both these officers, the President *pro tempore* and the Speaker, receive a salary of £1250 per annum.

Executive.

The executive power is vested in a President, elected for four years by electors who are chosen by popular vote in each State, the number of electors being equal to that of the senators and representatives to which the State is entitled. The theory of this mode of election, that an intermediate body between the people and the person or persons proposed for the chief magistracy, would secure greater prudence in selection and greater calmness in decision, was soon proved to be merely a theory. The President of the United States is virtually elected neither by the electors nor by the people, but by a party convention which, assembling a few months before the time of election, makes a nomination, and if the party has a majority, effects the choice of electors, who throw their votes for the designated candidate. If the electors fail to choose a President, the choice is made by the House of Representatives voting by States. A Vice-President, chosen for the same term, and in the same manner as the President, succeeds the President in case of disability or death. The authority of the President, both military and civil, is very large, but his power to veto the acts of the legislative body is limited, unless his party have the majority in Congress, a two-thirds' vote being sufficient to pass a law notwithstanding his objections. His salary is £5200, the Vice-President's £1660.

Statistics.

Cabinet or Departments.

The executive is aided by a cabinet or ministry, of his own appointment, who preside over the various departments of government, but without seats in either House of Congress. The Secretary of State has the charge of foreign affairs; the Secretary of the Treasury of the finances; the Secretary of War of the army; the Secretary of the Navy of the navy; the Secretary of the Interior of the public lands, of patents, of pensions, and of the Indians; the Postmaster-General of the Post-Office; the Attorney-General of the legal relations of the government. Every year the heads of the departments present a report of their proceedings to the President, who submits them with a message of his own to Congress; special reports and messages being communicated as the public business may require.

Charge of the Indians

The only point in the preceding enumeration of affairs that seems to require explanation is the charge of the Indians committed to the Secretary of the Interior. This is a very important responsibility of the government. The number of Indians within the territory of the United States has already been stated as 350,000. A Commissioner of Indian Affairs, aided by about 100 superintendents and agents, conducts the complicated relations between the government and the Indians. The department of the Interior holds in trust for various Indian tribes stocks to the amount of £730,000 sterling, and the United States are liable for annuities to the Indians, in return for lands ceded by them, to the amount of four and a half millions as principal, all permanent annuities being funded at five per cent interest. The average annual expenditure of the government on Indian account is upwards of £625,000, to which must be added a large proportion of the four odd millions expended by the War Department. The Indians are neither citizens nor subjects, but rather dependants, with large reservations of territory upon which they dwell beneath such institutions as they possess, but under the oversight of the government, and in constant relations, pacific or hostile, with missionaries, adventurers, or traders, from among the citizens. "At present," says the Secretary of the Interior, in his Report for 1859, "the policy of the government is to gather the Indians upon small tribal reservations, within the well-defined exterior boundaries of which small tracts of land are assigned in severalty to the individual members of the tribe, with all the rights incident to an estate in fee-simple, except the power of alienation. This system, wherever it has been tried, has worked well, and the reports of the superintendents and agents give a most gratifying account of the great improvement which it has effected in the character and habits of those tribes which have been brought under its operation. The internal struggle which the red man necessarily undergoes in adopting the resolution to throw away the blanket, the scalping-knife, and the implements of the chase, and, in lieu thereof, to wear a dress, and devote himself to pursuits which he has been taught to consider degrading, is terrible; and if he emerges from it victorious, he becomes a new man. Wherever separate farms have been assigned, within the limits of a tribal reservation, to individual Indians, and the owners have entered into possession, a new life is apparent; comparative plenty is found on every hand, contentment reigns at every fireside, and peace and order have succeeded to turbulence and strife."

Judiciary.

Returning to the branches of government, we find the judicial power vested in a Supreme Court established by

Statistics.

the constitution, with various inferior courts established by Congress. The independence of the judiciary is secured by a clause in the constitution that "the judges, both of the Supreme and Inferior Courts, shall hold their offices during good behaviour, and shall, at stated times, receive for their services a compensation which shall not be diminished during their continuance in office." The general extent of the judicial power is, as described in the constitution, "to all cases in law and equity arising under this constitution, the laws of the United States, and treaties made under their authority." The Supreme Court meets annually in Washington; it consists of a chief justice and eight associate justices, appointed by the President. The members of the Supreme Court hold circuit courts twice a year for each State within the circuit, there being nine circuits, with one additional for the extreme west. There are also fifty districts, with forty-three district judges to hold district courts from time to time throughout the country. A Court of Claims, consisting of three judges, sits at Washington to adjudicate in cases of claims against the government.

Army and Navy.

The military divisions of the United States are the seven departments of the East, the West, Texas, New Mexico, Utah, Oregon, and California, the head quarters of the army being in the city of New York. The army-list (1859) shews (exclusive of brevets), one major-general, four brigadier-generals, two inspector-generals, a quartermaster general, a commissary-general, a paymaster-general, a surgeon-general, a chief engineer, a chief topographical engineer, and a chief of ordnance, as general officers; a corps of engineers, a corps of topographical engineers, a corps of ordnance, two regiments of dragoons, two of cavalry, one of mounted riflemen, four of artillery, and ten of infantry; the whole number of commissioned officers being 1084; of non-commissioned officers, musicians, artificers, and privates, 11,859—total, 12,943. The military academy of the United States, at West Point, supplies most of the officers of the army, who obtain their rank without purchase. The non-commissioned officers and privates are from various classes of the population, generally from the least industrious and capable. But the insignificant numbers of the army are far from comprising the military strength of the nation. The regular force is universally regarded merely as a nucleus, around which large additional forces, volunteer and militia, are to gather in the hour of need. The larger proportion of the troops engaged in the war with Mexico, the last foreign war of the United States, consisted of volunteers from all parts of the nation; many of whose officers were graduates from West Point, who had left the army for civil life in time of peace, but who returned to it in time of war. The Army Register for 1859 gives the total of the militia force as 2,727,486. Congress has power, under the constitution, "to provide for calling forth . . . for organizing, arming, and disciplining the militia." The Navy List shews six squadrons in service, the Home, the Brazilian coast, the Pacific, the Mediterranean, the African coast, and the East Indian. There are 10 ships of the line, 10 frigates, 21 sloops of war, 3 brigs, 1 schooner, 8 screw steamers, 1st class; 6 screw steamers, 2d class; 14 screw steamers, 3d class; 2 screw tenders, 3 sidewheel steamers, 1st class; 1, 2d class; 3, 3d class; 2 side-wheel tenders, and 3 store-vessels. To support this shadow of a navy, the United States have always relied upon privateers in time of war. The number of naval officers is as follows: captains in active list, 80; on reserved list, 20; commanders active, 114, reserved, 16; with lieutenants, surgeons, chaplains, professors, pursers, masters, midshipmen, and others. A marine corps numbers about 1200 rank and file. The Naval Academy of the United States is at Annapolis, the Naval Asylum at Philadelphia.

Statistics.

Diplomatic Establishment.

There are ten foreign countries to which the United States send envoys extraordinary and ministers plenipotentiary—Great Britain, France, Russia, Prussia, Spain, Mexico, Brazil, Peru, Chile, and China; nineteen to which ministers resident are accredited; one to which a commissioner is appointed; and besides these representatives, there are none but consuls and commercial agents. The whole diplomatic establishment is upon a small scale; its salaries very inconsiderable, the minister to Great Britain being paid only 17,500 dols.; its members chosen without reference, as a general rule, to their training or their capacity; while there is an entire absence of all system in promotion as well as in appointment.

Citizenship.

The citizens of any State at the time of the adoption of the constitution at once became citizens under the national government or of the United States. It would appear from the language of the constitution, as well as from the practice under it, that it remains with the States to decide what natives shall be their citizens and consequently citizens of the United States. But with regard to aliens, Congress received the power to establish a uniform rule of naturalization, according to which any free white alien can be naturalized after a residence of five years; but he cannot be a representative until seven years, or a senator until nine years have passed, and he never can be President. With this uniform rule, as adopted by Congress, many of the States have interfered by rules of their own, sometimes to extend and sometimes to reduce the term prescribed as necessary for naturalization; but their action on this point cannot legally affect the possession of national citizenship. A question that rose at an early time has recently acquired new importance; it is whether free negroes can be considered as citizens of the United States. No one urges that they can be naturalized so long as the present law of naturalization is in force; but it is urged that if they are natives of the United States they are citizens, for the simple reason that they were citizens in some of the States when the constitution was adopted. They are still allowed to vote at State elections in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and (if freeholders) in New York. An opposite view has been taken by the Supreme Court, or rather by some of its members, who insist that the intent of the constitution, according to the most authoritative interpretations, was to exclude negroes from citizenship. Another point to consider is the value set upon the electoral franchise by the citizen. If the numbers of the census of 1850 are correct, there were then about 4,700,000 "white males, 21 and over;" about 380,000 being naturalized, and about the same number foreigners not naturalized, so that the total entitled to vote was about 4,300,000. Two years after, in 1852, the vote at the presidential election reached a little beyond 3,000,000, but we must remember that by this time the number of those entitled to vote must have been much larger than in 1850. The vote at the election of 1856 was more than 4,000,000.

Slavery under the constitution.

The constitution follows the great principle that slavery exists only by municipal or local law. It recognizes what the States or any of them recognize, leaving it entirely to them to create the status of servitude. The historical portion of this article touches upon the adoption of those clauses in the constitution by which slavery is recognized; in one, the existence in the States of "other persons" than "free persons" is acknowledged; in another, "the migration or importation of such persons as any of the States now existing shall think proper to admit," referring to the slave trade, is authorized until a certain date; in a third, "persons held to service or labour in one state, under the laws thereof, escaping into another," are prohibited from being discharged, such

Statistics.

persons being bound apprentices and slaves. Here the constitution leaves the whole matter, saying nothing of the right or wrong of slavery, neither establishing it, nor opposing it, but considering it as entirely at the discretion of the respective States.

State constitutions.

Our survey of the United States government will not be complete without a glance at the State constitutions which are of the utmost importance to the nation as well as to the States themselves. The electoral franchise is confined by most of the State constitutions to free white males of twenty-one (paupers, persons under guardianship, imbeciles, and criminals excepted), who, being native or naturalized, have resided in the State for a certain time, from ten days to six months. The payment of a State, county, or town tax is implied in the condition of residence, or formally expressed as a condition by itself. There are other conditions of an exceptional nature, such as quiet and peaceable behaviour (Vermont), good moral character (Connecticut), or freehold property; this last being required of naturalized citizens in Rhode Island, of voters for senators (the upper house) in North Carolina, and, in the improbable event of non-compliance with other conditions, of voters generally in Connecticut and South Carolina. The right of suffrage in several States, instead of being confined to whites, is extended to Indians, if taxed, and to free negroes, as has been observed; but these are exceptions to the more general rule. As to the manner of voting, the rule is by ballot, the exception is *viva voce*. In a very few States a majority of the votes thrown is required to effect an election; but, throughout the country, the principle of plurality prevails, it may be said necessarily. The government of the States is always divided into three branches: an Executive, consisting sometimes of a governor, lieutenant-governor, and council; a Legislature, always of two houses, the members of which are elected by districts or by towns, and the sessions of which are annual or biennial; and a Judiciary of two or more courts, the judges in which are variously appointed, as will be mentioned presently. To these various offices there are some general qualifications, such as age, residence, citizenship, property; and some special, such as not being a minister of the gospel (in eleven States), or, on the other hand, not being an Atheist (in Tennessee). Salaries of course vary, but all officers, executive, legislative, and judicial, are paid either by fees or by stated rates. Terms of office are not uniform; governors are chosen for one, two, three, or four years; legislators for the same, but the two houses are generally elected for different terms (senators for the longer term), thus, for two years and one year, for three and one, for four and two. Judges are appointed by the governors (with or without council) of Delaware, Maine, Massachusetts, New Hampshire, and New Jersey (five States); by the Legislatures of Alabama, Arkansas, Connecticut, Georgia, North and South Carolina, Rhode Island, Tennessee, and Vermont (nine States); Alabama, Arkansas, Georgia, and Vermont, having also some judges elected by the people, who elect in all the remaining States. The judicial tenure is "for good behaviour" in the two Carolinas, Delaware, Massachusetts, and New Hampshire, with some limitations of age; until removal by resolutions of the legislature in Rhode Island; and from various periods from one year (Vermont) to fifteen years (Pennsylvania Supreme Court) in the other States. With regard to public credit, the constitutions of some States, especially those more recently formed, forbid the Government to loan the credit of the State, or to incur a debt sometimes with, sometimes without, discretionary power. The later constitutions generally provide that banks and other corporations must be organized under general and not special acts. Slavery, forbidden in the majority of the States, is expressly retained in others, and in some the legislatures are prohibited from passing laws to abolish it or to emancipate slaves, while they may exclude free negroes from the State. No religious test is recognized except in the constitution of New Hampshire, which provides that the executive and legislative must be of the Protestant faith; nor is any religious establishment provided for, except that the legislature of New Hampshire may authorize, and that of Massachusetts must require, the parishes, or towns, or districts in the State to support Protestant teachers or ministers of the Gospel.

Statistics.

"The Congress," says the constitution, "shall have power to dispose of, and make all needful rules and regulations respecting the territory or other property belonging to the United States;" under which clause all the Territorial governments from the foundation have been formed. An Act of Congress organizes the Territory; the President then appoints a governor, three judges, and other officers, leaving it to the inhabitants of the Territory to elect their own legislature. The vexed question of the day with regard to the Territories, is in relation to the power of Congress over them. It is urged, on one side, that this power is entire, covering all the municipal relations of the inhabitants; on the other, that the power is limited, and that all local institutions and interests must be left to the inhabitants of the Territories. When a Territory, having sufficient population, adopts "a constitution of State Government which is republican in form, and in conformity with the constitution of the United States," and applies for admission into the Union, it is for Congress to grant or to refuse admission.

Territorial Governments.

The city of Washington, on the Potomac river, built upon a site selected by him whose name it bears, has been the seat of the national government since the year 1800. Planned upon a large scale, it has never reached its intended proportions, but remains as it was long since described, "a city of magnificent distances," with a population of not more than 55,000. We do not advert to it for the sake of entering into a topographical description, but that the mention of some prominent points may give an idea, not so much of the city itself, as of the government, its public offices and institutions. By far the most conspicuous feature of Washington is the Capitol, which, when its present extension is completed, will be over three hundred feet in height, nearly seven hundred and fifty in length, while it will cover 62,000 square feet of ground. The architecture of this building is imposing, though by no means faultless: its centre is surmounted by a dome of large proportions, on which a colossal statue of America crowns the entire structure. In the Capitol, the Senators have their chamber, the Representatives theirs, and the Supreme Court of the United States theirs. The Executive has his residence on the opposite side of the city, in the so-called White House. In the same neighbourhood are most of the Department Offices, some of which are exceedingly insignificant, while others, especially the Treasury and Patent Offices, are of a higher architectural character. The Patent Office is a striking testimony to the inventive tendencies of the nation; its museum, overrunning with models and plans, to which the yearly additions are constantly on the increase. There are other offices; an arsenal; a navy yard; an observatory, to which science, as well as the United States marine, is largely indebted; an office of the Coast Survey, a work of more than naticnal importance, started half a century ago, and prosecuted with increased activity and breadth during the last fifteen years, involving great skill and energy in the survey, as well as great expense to the government; a building called the Smithsonian Institution from James Smithson of England, who bequeathed

Seat of National Government. Public Works.

History. to the United States, for the purpose of promoting knowledge, the sum of half a million dollars, but the effect of the institution is thus far very inconsiderable. Such are the chief objects to arrest attention in the national capital, and they illustrate perhaps better than any general summary, the varied character of the national Government, its vast material resources, and its rising interest in intellectual and scientific operations. It need not be said that the sketch embraces but a small proportion of the public works of Government; to enumerate them we should have to follow the coast and traverse the interior, to count the forts, arsenals, and navy-yards, the custom-houses and other national offices, the lighthouses, breakwaters, and other improvements, external and internal, many of which may be compared with the public works of any nation.

Part II.—History.

Periods: I. Colonial; II. National. To understand the present position of the United States, we now return to the past, tracing the history of the nation according to the successive steps by which it has advanced. The most natural division is into two periods; the first, Colonial, from about 1500 A.D. to 1776; the second, National, from 1776 downwards. Of these periods, we have at least space enough to sketch the outlines.

1. Colonial, Sec. 1, 1500–1689. The first portion of the Colonial period extends to the year 1689, distinguished in European as well as American annals, and in the latter for the beginning of the great colonial wars between England and France.

Spanish Colonies. It opens with the efforts of the Spaniards to colonize the territory. Ponce de Leon led the way to Florida, a name stretching from the Gulf of Mexico to the Gulf of St. Lawrence (1512). But no settlement was made until the year 1565, when Melendez de Avilez founded St. Augustine, the oldest town in the United States. The next oldest is Santa Fe in New Mexico, founded by De Espejio in 1581, the name of New Mexico covering the entire country of the interior. More than a century elapsed before Pensacola was built and fortified upon the Gulf of Mexico (1696), so slowly did the Spanish colonies extend themselves. A few towns, a few forts, a few missionary stations, were all that supported the claim of Spain to the United States territory.

French Colonies. The colonies of France were far more widely spread. The early settlements of her Huguenots in the present South Carolina and Florida, were abandoned almost so soon as formed (1562–5). Other attempts in the North were not more successful. But the name of New France, bestowed upon the Continent in 1524, was not forgotten, and when the French obtained a foothold in Acadie and Canada, to the north of the present United States frontier, they crossed it towards the south, and occupied with missions, trading posts or forts, many places now comprehended in the limits of Maine, New York, Michigan, Wisconsin, Illinois, and Texas, and were still spreading at the close of the period in review (1689). Father Marquette, of the Michigan mission, reached the Mississippi (1673); La Salle, once a Jesuit, afterwards an adventurer, descended the river to its mouth, and claimed possession of the neighbouring territory under the name of Louisiana (1682). But though the French colonies thus stretched from the Gulf of St. Lawrence, far round by the Western waters to the Gulf of Mexico, they were everywhere feeble and transitory, except in parts of Acadie and Canada.

English Colonies. The centre of colonization upon United States territory was held by England. First of all to reach the continent, the Cabots having discovered it at Labrador (1497), a year before Columbus beheld it on the South American coast, near the island of Trinidad, the English were not the first to occupy their discovery, nor were their efforts, made under Sir Walter Raleigh and others, at all successful. Raleigh gave the name of Virginia to the territory of which he had obtained a grant, but it was only a name, when, discouraged by the loss of life and of capital, he abandoned his enterprise (1584–9). The name was preserved in the patent of Virginia, issued by James I., and conveying the territory from the present Maine to the present North Carolina to two colonies or companies, the northern called the Plymouth Company, the southern the London Company (1606). History.

Virginia. Under the latter, the first permanent settlement of the English was made at Jamestown, in Virginia (May 13, 1607). The adventurous spirit of both company and colony has its representative in the famous John Smith; their religious spirit, proved by self-sacrifice and by devotion to the wants of natives as well as colonists, is represented by Robert Hunt, the chaplain, first of a line of faithful men by whom the Gospel was preached in America as in the Church of England. A college was designed, partly for the Indian youth, but though large subscriptions were made in the mother country, the plan fell through. Politically and physically the colony was very feeble; but some seeds were sown to bear fruit in later times; a representative assembly was established; and when the London Company came to an end (1624), the sole colony which it had planted continued as a royal province, sometimes thriving, sometimes failing, but strong enough to live through the revolutions of both England and America.

Plymouth Massachusetts. The next permanent settlement was made by a band of Puritans at Plymouth, in the part of America which John Smith had called New England. It was not made under the Plymouth Company, now changed to the Council of Plymouth for New England; but a grant was obtained from the council to establish the colony after it was founded. The day on which the one hundred and two passengers of the Mayflower, Pilgrims or Forefathers as they are generally styled in New England, December 11 O.S. (21 or 22 N.S.), has been made as much of as if it had begun the colonization of the country. But the Puritans were not the first colonists, or the first believers, to come from England; nor can they be allowed by the historical inquirer to be distinguished above other settlers, except by their comparative independence, politically and individually. Another settlement, or group of settlements, soon followed, but under a separate organization, as the colony of Massachusetts Bay, Boston being the principal town (1629-30). This colony possessed a charter, granted to an English company, but transferred, on a bold venture, to the colony itself; under which a colonial government was formed, its offices all filled by the colonists, and independent save of a general allegiance to the government of England. Massachusetts took the leading position among the early colonies. Her provision for education, the foundation of Harvard College (1636), the establishment of primary and grammar schools (1645-7), the printing press at Cambridge (1639), a great advantage, though much diminished by restrictions: all these developments were, for a long period, peculiar to Massachusetts. As a state, Massachusetts headed the united colonies of New England, an inefficient confederacy, of which the other members were Plymouth and the Connecticut colonies (1643). New Hampshire and Maine, both in New England, were both generally dependent upon Massachusetts, if not actually annexed to it, and even Plymouth was at length incorporated with the stronger colony (1691). At the same time, however, the Massachusetts charter, concerning which there had long been

History. a controversy between the Crown and the colony, was altered in such a manner as to curtail the previous privileges of the colonists, though they still continued far in advance of most of their neighbours. But the weak point with them had appeared long before; bitter Puritans, they persecuted Churchmen, Baptists, Quakers, and witches, notwithstanding the remonstrances of their own friends; they contended even with the Crown against the toleration of the Book of Common Prayer, and yielded, only under royal command, the simplest religious liberty to those who differed from them. But religious liberty had a very insecure foothold throughout the colonies, and Massachusetts, though prominent in persecution, was far from being alone in it. On the other hand, we are to take into account such movements in Massachusetts as those of Thomas Mayhew and John Eliot, who devoted themselves to missionary labours among the Indians, supported chiefly from the mother country, but not without some countenance from the colony (1643-90).

New Hampshire. New Hampshire, a private grant, was settled first at Portsmouth and Dover (1623), afterwards at other places, but not extensively or vigorously. Sometimes a royal province, sometimes, as has been stated, a mere dependency of Massachusetts, it was never distinguished among the colonies.

New York. New York was not an English colony until after being wrested from the Dutch in 1664-74. The earliest Dutch post was on Manhattan Island (1613), but the earliest colony was on the western end of Long Island, where a band of Protestant Walloons made a feeble settlement (1624). New Amsterdam, now New York, was begun two years later, and other positions were occupied, some by colonies, some by trading or military posts, from the Connecticut to the Schuylkill rivers, that is, through the present Connecticut, New Jersey, Pennsylvania, and Delaware, as well as New York. But though thus and otherwise extended, the Dutch domain, called New Netherland, governed by a company in Holland, and settled chiefly by colonists intent on trade, was held so insecurely as to fall without resistance into the hands of the English. It was then called New York from the Duke of York (afterwards James II.), to whom it had been granted by Charles II., and by whom it was organized as a proprietary province.

Maryland. An earlier form of the proprietary organization occurs in Maryland, a tract upon the Potomac, of which Sir George Calvert, Lord Baltimore, was declared "lord and proprietor" by the Crown (1632), and in which the first settlement was made at St. Mary's (1634). In this government the proprieter took the place of the company under which other colonies, as Virginia, had been founded, or, to a certain extent, of the Crown, to which, when Virginia became a royal province, she was directly subordinate. Under the proprietor, as under other authorities, the colonists had their local rights, their assembly, in which they could give or refuse "advice, consent, and approbation." A common error that the Maryland charter secured liberty of religion has been more than once effectually refuted. The colony increased slowly and amid various conflicts, some of them with the proprietor whose rule was at one time formally cast off (1689), to be restored, however, at a later day.

Connecticut. There were at first three Connecticut colonies—Connecticut, centering at Hartford (1635), Saybrook (1635), and New Haven (1638), all of English settlers, but some coming from Massachusetts, and others from England, some independently, and others under English proprietors. Saybrook was united with Connecticut in a few years (1644); New Haven not until 1665, when a charter, previously procured, came into operation throughout Connecticut, investing its freemen with large political liberties.

Rhode Island and the Providence Plantations, originally (1636-38), two colonies, were united by their founder Roger Williams, under a charter (1644). Even when united, they occupied less territory than any other English colony; but Rhode Island possesses a higher title to eminence than territory can give, in being the only colony to recognize even an imperfect liberty in religion. History. Rhode Island.

The land lying west of Delaware Bay, though claimed by the Dutch, was not actually colonized until the arrival of a handful of Swedes, who built a fort near the present town of Wilmington, and gave the name of New Sweden to the adjoining territory (1638). Their effort at colonization was of the most transitory nature, and New Sweden, seized first by the Dutch (1655), then by the English (1664-74), became a dependency of New York, afterwards of Pennsylvania, finally attaining to some share of independence as the colony of Delaware. Delaware.

Within the later limits of North Carolina, a Virginian settlement was the first to be made (1665); the first in South Carolina was a Massachusetts settlement (1660). Carolina as a whole, extending between Albemarle Sound and St. John's River, was granted to the Earl of Clarendon, then prime minister, and seven associates, as a proprietary province (1663). It was for these proprietors that Locke drew up his "grand model," or "fundamental constitution," a singular proof of the impossibility of manufacturing a constitution of any practical value. The province was variously settled, its best colonists being the Huguenots, emigrating from France after the Revocation of the edict of Nantes. But troubles abounded, and at length North and South Carolina were organized as royal provinces (1729). Carolina, North and South.

The Duke of York conveyed away that portion of his domain which lay between the Hudson and Delaware Rivers, where some scattered settlements of Dutch and English already existed. The name of New Jersey was given to the province, and Elizabethtown was founded (1665). A few years later, the province was divided into East and West Jersey, both of which were purchased by companies consisting chiefly of Quakers, by whom they were finally surrendered to the Crown, whereupon they were reunited as a royal province (1702), at times dependent upon New York. New Jersey.

One of the Quaker proprietors of the Jerseys, William Penn, obtained a grant of the territory lying beyond them in the interior, under the name of Pennsylvania (1681). To the few settlements already there, Penn soon made large additions, chief of which was Philadelphia (1683). The usual troubles of a proprietary government arose; Penn was deprived of his province, and when restored to it, was so wearied by its cares, as to propose to surrender it to the Crown. The proprietorship remained, however, with him and his heirs. Pennsylvania.

We pass entirely beyond the limits of our period (to 1689) in taking account of the last of the thirteen English colonies, and one not settled until more than half a century after Pennsylvania. A grant of the land between the Savannah and Altamaha rivers, under the royal name of Georgia, was made to certain trustees, much the same as the proprietors of earlier colonies. All England was stirred by the project of a settlement designed, partly to protect the southern frontier of her American colonies, and partly to provide a place to which the inmates of her crowded and ill-managed prisons could be transported with some hope of their reformation. James Edward Oglethorpe, member of Parliament, a military man, and a philanthropist, led the expedition by which Savannah was founded (1733). Twenty years later, the colony having disappointed almost every idea of its projectors, became a royal province. Georgia.

History.

The English Colonies in progress.

Any view of the English colonies taken together, will embrace the most striking point in relation to them all, that, though weak and far from mature in any respect, they are in a state of progress, not falling back, but pressing forward. Numerically less than 250,000 in the year 1689, the colonists are made up of what may be styled the best stock of Europe. Politically, they occupy no post of magnitude or conspicuousness, and yet, in all their forms of government, charter, provincial and even proprietary, the germs of a national liberty may be detected without an effort. Such general governments as were devised in order to restrain them, like that of Andros over New England, New York, and New Jersey, they were strong enough to throw off when the news of the Great Revolution in the mother land inspired them with the determination to prove themselves worthy of her liberties (1689).

Indian Wars.

To this point the colonies had made their way amid many difficulties, both external and internal, but none greater than the wars with the Indians, a race with whom few of the English sought to be on other than hostile terms. Beginning in Virginia (1622), and continuing with much greater violence in New England, where the Pequot war (1637) was followed by King Philip's war, which spread from the tribes of the Connecticut Valley on the west, to those of the Atlantic coast on the east, so serious as to have "drained the Massachusetts towns of men" (1675-6), these hostilities would have been fatal to the colonists, but for the divisions, and the want of arms and discipline by which their foes were paralyzed.

Sec. 2. 1689-1763. French Wars.

The second portion of the colonial period is distinguished by the wars between the French and the English in America. Both nations were extending their possessions; the English generally concentrated along the seaboard, the French scattering their colonies, or rather posts, wherever the fancy of discovery or settlement happened to direct their steps. The wars with the French were not the only conflicts in which the English were involved; the Spaniards on the Southern border, and the Indians throughout the interior, being repeatedly arrayed in arms. But the French wars were far the most serious, and the issue of them was far the most influential upon the destiny of the English colonies.

King William's War.

After various encounters of no abiding importance, the great war which William III. led against Louis XIV. in Europe, extended to the colonies of England and France in America. It lasted eight years (1689-97), and though involving both sides in losses, and what was worse than losses, the employment of Indian allies, and Indian butcheries, it resulted in nothing decisive as to the difficulties between the contending colonies. Throughout its continuance, the colonies of England had relied upon themselves, the colonies of France upon the mother country, comparatively speaking.

Queen Anne's War.

King William's war, as the English colonists termed it, was soon followed by Queen Anne's. Its origin was European; England, with numerous allies, arming to prevent the attempt of Louis XIV. upon the Spanish crown. Its character was less Indian and more European than that of the previous war; New England alone sending two considerable expeditions into Acadie. After twelve years (1702-13) of war, the treaty of Utrecht, deciding for America that the French and the Spanish colonies should not be united against the English, also decided the cession of Acadie to England. It was a turning point in the colonial strife.

King George's War.

After more than thirty years, during which peace was frequently threatened, King George's war, so styled in America, broke out (1774). In the second year, Massachusetts, with the aid of six other colonies, organized the most important colonial operation as yet attempted, and sent a force which, supported by an English fleet, succeeded in reducing Louisburg, the great fortress of the French on the ocean side of their American dominions. On the termination of the war, however, the treaty of Aix-la-Chapelle restored Louisburg to France (1748). But it could not restore confidence to the French colonists, or deprive the English of their natural sense of superiority. History.

Last French War.

A brief interval ensued, and a fresh struggle began on the isthmus of Nova Scotia (1750), and in the west of Pennsylvania, where George Washington first appears in war, the leader of a Virginian force, sent to protect the claims of the English against the French (1754). The following year (1755), a year before the formal declaration of war (the seven years' war in Europe), America was resounding with arms. The efforts of the English were not at first successful; Braddock was defeated in Pennsylvania, Lyman and Johnson won a barren victory at Lake George (1755), the forts at Oswego and Lake George were taken by Montcalm (1756-7), and not until a vigorous effort was made both by England and by her colonies, did the fortunes of the conflict turn. Then (1758) Louisburg and the Gulf of St. Lawrence were seized; and the next year Wolfe defeated Montcalm on the plains of Abraham, and Quebec fell into the possession of the English (1759). This decided the war, and peace soon followed. The treaty of Paris (1763) surrendered all the French possessions in America save the islands of St. Pierre and Miquelon off Newfoundland. New Orleans and the territory west of the Mississippi were transferred to Spain, who had been the ally of France in the last year of the war. All east of the Mississippi was ceded to England.

Effect on the English Colonies.

A large share of the victories achieved in America was due to the exertions of the English colonists. They gave their fortunes and their lives to a cause that was as much theirs as it was the mother land's; and when they conquered, they felt that it was for the colonies as well as for England to profit by the victory. Not so thought many Englishmen, especially among those in power. They considered that the war had been waged for England and at the expense of England, and that the colonists owed a debt to the mother-country, both pecuniary and political, which they must be led, or if necessary, forced to discharge. Meanwhile, the colonies had increased in many ways; their physical and intellectual resources were enlarged, and if they were able to contribute more to the mother country, they were also able to resist any undue demands of hers more effectually. The effect of the late wars was thus enhanced by the previous developments of times of peace.

Sec. 3. 1763-76. Conflicts between the Colonies and the Mother Country.

It was not now for the first time that the colonies and the mother country came into collision. From very early years, the authority of the English Government had been called into question. "Appeals to your authority," says the Massachusetts legislature to Parliament, "cannot stand with the liberty and power granted us by our charter" (1646). To the power which Parliament, on the other hand, asserted and exercised in such measures as the Navigation Acts (1651-60-63), the laying of duties upon exports and imports from colony to colony (1672), as well as to the various administrative bodies acting under Parliament, as the Board of Trade (1696) and the Royal African Company, the colonists never hesitated to oppose a steady resistance. Governor after governor, official after official, representing the authority of the English rulers, were met face to face, baffled, and actually turned back by those whom they were sent to reduce to submission. Parliament, roused by this course of things, asserted its supremacy, especially in the Molasses Act, by which

History. duties were laid on molasses and other articles, and "the colonists," as one of their agents in England declared, "were divested of their rights as the king's natural-born subjects" (1733). Advantage was taken of the French war to appoint a commander-in-chief for the colonies, upon which the demand was made to provide for his expenses (1755). Writs of assistance, to authorize search after merchandise imported contrary to parliamentary enactment, were demanded by the Custom-house officers, and though vigorously opposed, were granted by the royal authorities in Massachusetts (1761). New York received a still more serious blow in the appointment of a Chief Justice, whose commission was to continue "at the king's pleasure" (1761).

Point involved. It will appear from the foregoing enumeration of facts how erroneous is the common idea, that the single point at issue between England and her colonies was taxation. A great deal of stress was laid upon taxation; it was divided into two parts, taxation for the regulation of trade, and taxation for revenue; and the controversy was sustained with regard to both, though the colonists were willing to allow, as a general rule, that they might be taxed for the regulation of trade. The key-note with regard to this single question may be found in the words of James Otis, a Massachusetts lawyer and public man, who wrote a pamphlet to prove that "by the British constitution every man in the dominions is a free man, and that no part of his Majesty's dominions can be taxed without their consent." But these very words shew how far the matter in dispute extended beyond mere taxation. "Every man in the dominions is a free man," that is, every English colonist was still an Englishman, vested with the rights and liberties of the Englishman, and among these, with that cardinal privilege of the English constitution, that the Englishman can be governed only by a body in which he is represented. "If the Parliament of England," said Edward Winslow, agent for Massachusetts in England more than a century before (1646 or 7), "should impose laws upon us, having no burgesses in the House of Commons, nor capable of a summons by reason of the vast distance, we should lose the liberties and freedom of Englishmen indeed."

Acts of Parliament. So in the eleven years (1764-74 inclusive) during which one Act of Parliament succeeded another in the attempt to reduce the colonists, taxation was the subject of but three Acts, while nearly thrice that number related to altogether different matters. The Sugar Act, laying duties on sugar and other articles, was expressly designed to raise a revenue in the colonies (1764); the Stamp Act required a stamp upon business and newspapers (1765); the Tea Act laid duties on tea and other articles (1767). Of these three Acts, the Stamp Act naturally produced the greatest sensation, leading to measures of resistance to which we shall presently revert. Acts relating to other subjects than taxation were the Quartering Act, demanding quarters and other supplies from the colonies for the British troops; the Admiralty Act, as it may be styled, a portion of the Stamp Act, extending the Admiralty jurisdiction over many cases heretofore tried by jury (1765); an Act suspending the New York Assembly until that body conformed to the Quartering Act (1767); two Acts concerning trials, one, that cases of treason should be tried in the mother country (1769), the other, that incendiaries of royal stores or ships should be tried there likewise (1772); three Acts intended to chastise Massachusetts and its chief town, Boston, for their prominent parts in the general opposition,—first, the Boston Port Bill, closing the harbour; second, the Massachusetts Government Bill, depriving the colony of many of its political liberties; and third, the Murder Bill, as it may be called, providing that persons accused of murder in supporting the authority of the mother country should be tried in another colony or in England; finally, in the same year (1774), the Quebec Act, organizing the Northern provinces, lately French, in such a way as to keep them distinct from the old English colonies. One other subject of difference added greatly to the dissension between the mother country and the colonies, the former opposing all efforts of the latter to repress the growing slave trade. History.

Measures of the Colonies. Against grievances so various as these, the colonists, divided among themselves in principle, and differently affected by different Acts of Parliament, opposed the most various measures. Some men were for giving way altogether; others for remonstrating merely, or doing whatever they could as faithful subjects of Great Britain: these were the loyalists. Others were for organized effort, for conventions and congresses, for decisive though peaceful and constitutional action: these were the patriots, or the firm adherents of colonial rights and liberties. A third class went to an extreme, and professing the loudest devotion to the American cause, supported it by riot, violence, and bloodshed: these were the lower classes, as a general rule, with some leaders from the higher. The course resulting from these varying and conflicting views was by no means, as may be supposed, a consistent or an effective one, compared with what it might have been, had the colonists been united. But, interrupted as it was, it led to great results for the colonists, delivering them from at least a portion of the pressure upon them at the time, and preparing them for bolder measures in the future.

Congress of 1765. No action of theirs was more striking than that of their first Congress, which met at New York in October 1765. Nine colonies were represented; two more promised adhesion to the measures of the Congress; and the remaining two, though silent, were known to be full of sympathy. A petition to the King, addresses to the Lords and to the Commons of Great Britain, were adopted by the Congress; but a far more important document was a "Declaration of Rights and Liberties," the leading clause of which was this—"That his Majesty's liege subjects in these colonies are entitled to all the inherent rights and liberties of his natural born subjects within the kingdom of Great Britain." The violations of this principle by the British authorities are then set forth in moderate but weighty terms, and the declaration concludes with asserting it to be "the indispensable duty of these colonies . . . . . to endeavour to procure the repeal of . . . . . the late Acts."

Continental Congress of 1774. Nine years after, another Congress, now called the Continental, assembled at Philadelphia in September 1774. Most of the great patriot leaders were there,—John Adams from Massachusetts, John Jay from New York, George Washington (already described as "unquestionably the greatest man on that floor, if you speak of solid information and judgment") from Virginia, with others of various powers and various purposes. A body of Articles, styled the American Association, was drawn up, the chief object being to put an end to all commercial intercourse with Great Britain, until Parliament saw fit to repeal its obnoxious statutes, much more obnoxious now, as must be remembered, than when the previous Congress had altered its remonstrance. A declaration of rights, a petition to the King, and addresses to Great Britain and her other colonies were adopted, and the Congress separated to meet in the spring, if affairs demanded further action. It seems to have been generally thought that the mother country would give way to the demonstrations that had been made throughout the colonies as well as in the Congress at Philadelphia.

Views in England. But of the comparatively small body of Englishmen

History. that took any concern in American matters, the majority, especially in Parliament, was decidedly against the claims of the colonists. The petition of the Congress to the King was refused a hearing; the New England Restraining Act was levelled at the commerce of New England, and then extended against other colonies; and rebellion was declared to exist in Massachusetts, whose people had now armed themselves in preparation for the impending conflict. Dean Tucker of Gloucester made a proposal which excited little attention at the time, but provokes reflection now, that Parliament should declare the colonies separated from the mother country until they were ready to acknowledge her authority.

First Conflicts in Arms. The first collision between the British troops and the American troops took place at Salem in Massachusetts, February 1775. Within a few weeks thereafter the first actual conflict in arms occurred at Lexington and Concord, Massachusetts (April 19). The next month (May), Ticonderoga and Crown Point, on Lake Champlain, were taken by a party from Connecticut and Vermont; the next (June 17), the battle of Bunker Hill, near Boston, was fought to the nominal advantage of the British, but to the real advantage of the Americans. Two days before this battle George Washington was commissioned by the Continental Congress, then sitting at Philadelphia, as commander-in-chief of the Continental army, consisting of the militia gathered from different parts of New England to the neighbourhood of Boston. Washington issued his first order to "the troops of the United Provinces of North America" on July 14th.

Further Military Operations. A year was still to pass before the Americans declared their independence. During this interval war was constantly waged,—Washington besieging and recovering Boston,—an American force taking Montreal, but failing before Quebec; while various operations were attempted or executed upon the seaboard, from Maine to Carolina. At the close of the twelvemonth Washington was in New York, fortifying it against an expected attack from the enemy.

Civil Operations. Meanwhile the accession of Georgia, hitherto delaying, had completed the line of the thirteen united colonies (Aug. 1775). Congress took the reins of government, organized an army and a so-called navy, created a treasury department, issued Continental bills, appointed a Committee of Secret Correspondence with Europe, and sent forth addresses to Great Britain, with one last petition to the king. It urged the colonies to set up local governments for themselves, and finally (May 15, 1776), voted "that the exercise of every kind of authority under the Crown should be totally suppressed." It must not be supposed that these steps were simple or easily taken. On the contrary, divisions existed; the colonies felt their want of material resources, their insecurity of position in a political point of view, and shrank, even with arms in their hands, and blood upon their garments, from measures that were irrevocable.

Declaration of Independence. It was clear, however, to what point they were hastening. As early as May 1775, a convention of Mecklenburg county, North Carolina, declared their independence of British authority; but the assertion found little favour and no support beyond the limits of the county. For it was not until after the last petition of Congress to the king had been rejected, that any general movement in favour of independence began. In May 1776, the Virginia delegates were directed to propose a declaration of independence to Congress; in June, Richard Henry Lee of Virginia, seconded by John Adams of Massachusetts, moved a resolution—"That these United Colonies are, and of a right ought to be, free and independent States; that they are absolved from all allegiance to the British Crown; and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved." The resolution was at once opposed on the ground of its prematureness; but when it was brought up a few weeks later, it was passed, though not without signs of a want of unanimity. A committee, previously appointed to frame a declaration in accordance with the resolution, had already reported a document drawn up by Thomas Jefferson; it was now brought forward, amended, and formally adopted. The date of the resolution is July 2, that of the declaration July 4, 1776. History.

II. National Period. With this the colonial period of United States history closes, and the national period begins. "As free and independent States," thus ran the declaration, "they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent States may of right do." No longer colonies, but States, and United States, the new nation took its place among the powers of the earth.

Sec. 1. 1776-83. War of Independence. The first portion of the national period is occupied by the war of independence. Beginning in the year 1775, as has appeared, the war was already of a year and a quarter's duration, when the declaration of independence was adopted. It lasted, nominally, seven years; but actually, little more than five years longer, or about six years and a half in all, from April 1775 to October 1781. To facilitate the understanding of events, it is well to divide the war into two separate parts; one, from the beginning to July 1778, during which the Americans were without allies, while the chief operations were in the North; the other from July 1778 to the close, during which the more important campaigns were in the South, and the French were in alliance with the Americans.

To July 1778. The conflict, renewed on Long Island (August 1776), was marked by American losses. New York, its neighbourhood, the Lower Hudson, Lake Champlain, as well as Newport in Rhode Island, were taken by the British, and the American army, reduced to a handful, was in full retreat, when Washington turned the tide by the most brilliant feat of arms that had yet been attempted, crossing the Delaware amid the ice, and capturing a large detachment of Hessians at Trenton. The next year (1777), New Jersey was evacuated by the British, and a British army under Burgoyne, after attempting to conquer the Upper Hudson, was compelled to surrender near Saratoga. Lower down the Hudson, the Highlands were lost, while farther south, Philadelphia and the Delaware fell into the hands of the British, after various unsuccessful attempts of Washington to defend them. At the beginning of the following year (1778), an alliance was formed between the United States and France, the first fruit of which was the evacuation of Philadelphia by the British. Thus, at the close of this portion of the war, the British retained no other conquests than New York and Newport, with the neighbouring country.

To October 1781. On the arrival of a French force, land and naval, an attempt to recover Newport was made without success. The main operations were then transferred to the South. Georgia was invaded by two British forces, one from New York, the other from Florida, at the close of 1778, and the State was soon in the possession of the invaders. Charleston, in S. Carolina, was defended against the victorious British, but an attempt to recover Savannah in Georgia, though supported by the French, was totally unsuccessful (1779). The next year (1780) Charleston was again attacked and lost; the greater part of S. Carolina falling at the same time into the power of the British, and when the Americans rallied, it was only to sustain further disaster. But as the conquerors were pressing on against N. Carolina, a detachment encountered a signal

History. defeat at King's Mountain, near the border of that State, and the British advance was instantly checked. At nearly the same time, Washington appointed his best general officer, Nathanael Greene, of Rhode Island, to the command of the Southern army. The wisdom of the appointment was proved in the following year (1781), when Greene, aided by his admirable officers, gave battle at Guilford in N. Carolina, and after various reverses as well as successes, the British being generally the nominal victors, he recovered the interior, not only of both the Carolinas, but of Georgia likewise. Meanwhile the British were engaged in executing an able design of seizing the Central States, and thus separating the Southern from their confederates. "Our affairs" wrote Washington, as troops from both North and South were concentrating in Virginia, "are brought to an awful crisis." He did not shrink from meeting it; but leaving the neighbourhood of New York, where he had long kept his head quarters while watching the main army of the British, and directing various movements of the Americans, he marched to Virginia with all his available troops, supported by an effective force, land and naval, of the French. Cornwallis, the British commander in the South, lay strongly fortified at Yorktown and Gloucester. It was impossible for him to resist the much larger numbers brought against him, and after a three weeks' siege, he surrendered (October 19). "It is all over," said the prime minister of Great Britain on hearing the intelligence.

American Embarrassments and Supports. It is difficult, in a few words, to convey any idea of the embarrassments amidst which the Americans and their great leader had forced their way to this decisive victory. The magnitude of the result, the humiliation of Great Britain, or of her ruling men, by a few colonies, is apt to conceal the scanty means and feeble resources by which it was attained. Without a thoroughly organized army; without any real harmony between it and Congress; without efficiency in the government, in fact without any government at all except a Volunteer Congress, until the adoption of "Articles of Confederation and Perpetual Union between the States," a few months only before the surrender of Cornwallis; without money and almost without credit; things being so desperate at times, that even Washington could say, "we are at the end of our tether;" thus it was that the Americans fought their war of Independence. But they did not fight it, they could not have fought it alone. When Lafayette came to their aid (1777), he found them so beset with difficulties, that nothing but aid from abroad could carry them through; and when the treaty with France was made, it depended upon the execution of the treaty whether they were really to succeed at the last,—"Send us troops, ships, and money," wrote the French commander Rochambeau to his government, "but do not depend upon this people or upon their means." The entrance of other nations into the war with Great Britain, Spain in 1779, and Holland in 1780, though neither was an ally of the United States, was of course greatly favourable to the struggling nation. After all, however, that can be said of the weakness of the Americans, or of the assistance which they received, it must be confessed that the strength of their cause, the devotedness and the varied ability of their unparalleled Washington, proved to be, under the guidance of Providence, their best supports through the dark valley which they had been obliged to cross in arms.

Peace. A change of ministry led to the instructions from England that the United States territory should be evacuated by the British troops. This was slowly done, partly in 1782, partly in 1783; hostilities being declared terminated in the spring (April 8-19) of the latter year. The preliminaries of peace between Great Britain and the United States were signed in November 1782, and followed up by formal treaty in September 1783, confirmed by Congress in January 1784. It need scarcely be said that there were serious differences to be overcome before the final step was reached, or that it would not have been reached as it was, had Great Britain been able to deal with the United States alone, instead of being encumbered by her negotiations with other European powers. The war with the United States, like the peace concluding it, had been but a small part of the general conflict in which so much of Europe was interested, and of which Europe, Asia, and Africa, as well as North and South America, were the battle grounds. Nowhere was peace more welcome than in the United States, where new difficulties in the government and the army had arisen since the suspension of conflict. A few troops alone remained in arms, when Washington resigned his commission into the hands of Congress (December 23, 1783).

History.

Sec. 2, 1783-97, Organisation of the Nation.

A new division in the national history of the United States opens with the peace of 1783. Its earlier years are occupied with the formation of a constitution, its later with the setting the constitution in operation. No more important movements than these are touched upon in the present article, and if they are treated summarily, it is not because they are depreciated.

Feebleness of Existing Governments.

The pressure of a perilous war had kept the governments of the United States in some sort of form and of activity; its withdrawal seemed to leave them tottering and crumbling in every part. We speak of the governments rather than the government, for, though there was a national authority, under the Articles of Confederation, it depended upon the separate States, whose consent to any measure was indispensable, and whose power, so far from being confined to local concerns, was continually exerted over national affairs. This would have been fatal to the nation, as a nation, in any circumstances; it was especially threatening in the existing condition of things, the States being excessively burdened, enfeebled, and convulsed. A rebellion, for instance, and it is but an instance of occurrences elsewhere, broke out in Massachusetts; its object was to prevent the collection of taxes and debts of any kind; its supporters were two thousand men in arms, backed, as was understood, by many thousands more, and, though it was suppressed, it shook not only Massachusetts, but other States to their very foundations. Various disputes among the States, differences between the United States and foreign powers, especially with Great Britain—these and other disturbing causes reduced the various governments to a still lower degree of feebleness.

Preliminaries to the formation of a Constitution.

As early as 1780, Alexander Hamilton, aide-de-camp to Washington, suggested "a convention of all the States, with full authority to conclude finally upon a general confederation." The idea was warmly received in private and in public, the legislature of New York supporting it in 1782, and that of Massachusetts in 1785. That same year commissioners appointed by Maryland and Virginia, to devise some rules concerning the navigation of the Chesapeake and the Potomac, assembled at Alexandria, and their report, acted upon by the Virginia legislature, led to a second convention of commissioners from five States, at Annapolis, in the following year (1786), their subject being the trade of the United States. This Annapolis convention, adopting a proposal of Alexander Hamilton, united in recommending a national convention to be held at Philadelphia, "to take into consideration the situation of the United States, to devise such further provisions as shall appear necessary to render the constitution of the Federal Government adequate to the exigencies of the Union." This recommendation, first adopted by Virginia, was followed by other States, and

History. by Congress, though Congress gave a different turn to the proposal by limiting the Convention to "the sole and express purpose of revising the Articles of Confederation."

Convention of 1787. The Convention assembled, after some delay, and choosing Washington President, proceeded to the momentous work before them. They were the best men of the country, the well-known Franklin among the older members, the almost equally well-known Hamilton among the younger ones, men of experience and judgment, generally speaking, whose great object was to frame a government under which they could possess the peace for which they had struggled through conflict and calamity. Differences arose at once, especially upon the powers possessed by the Convention; one side maintaining that they could do nothing beyond revising the Articles of Confederation, the other insisting on their being able to set aside the Articles, and organize an entirely new government. The question was decided in favour of the latter view, but other questions, some of theory, others upon practical points, and all involving more or less excitement and danger of separation, were already before the Convention. The great compromises, as they are commonly styled, of the constitution, are three in number; the first gives an equal vote to the States in the national Senate, but retains an unequal vote, or in proportion to population, in the national House of Representatives; the second allows three-fifths of the slave population to be included in the apportionment of representation; the third, allowing the slave-trade to continue for twenty years, forbids it from the expiration of that period (1808). These great difficulties being removed, it was comparatively simple to deal with others, and at last to adopt the constitution as it stands. But it had been a constant struggle between opposing views and conflicting interests, and when the members were signing the instrument which they had agreed upon, the venerable Franklin remarked, pointing to a sun painted on the chair occupied by the President, "I have often, and often, in the course of the session, and the vicissitudes of my hopes and fears as to its issue, looked at that sun, without being able to tell whether it was rising or setting." We refer the reader to another part of this article, for a sketch of the government created by the constitution.

Adoption by the Nation. But the battle was not yet won. Many members of the Convention went home dissatisfied, to find themselves surrounded by others still more dissatisfied, because they knew nothing of the complications in which their delegates had been involved. The chief point in the controversy now spreading throughout the nation, was the strength of the government proposed; the Federalists, so styled, insisting that it was no more than what was absolutely essential, while the Anti-Federalists denounced it as excessive, and resolved to defend themselves from threatened oppression. Calm and comprehensive arguments were brought to bear in favour of the constitution; Dickinson of Pennsylvania wrote under the signature of Fabius; Hamilton and Jay, with Madison of Virginia, published the more thorough essays of The Federalist; while Washington and his correspondents were all alive to the importance and the solemnity of the crisis. At length, Delaware gave her assent to the constitution (December 1787), and, following her, State after State, some by a large, some by a small majority, gave way, till, with the exception of Rhode Island and North Carolina, all were ready for the first elections under the new system.

Other movements of Organization. The sense of the necessity of organization appears in other movements. Congress, for example, inert upon almost every subject of national consequence, adopted an ordinance under which the vast lands beyond the Ohio were organized as the North-west Territory (1787). The various ecclesiastical bodies were taking measures to defend and to establish themselves; conspicuous among which were the successive proceedings of the Protestant Episcopal Church, the history of whose early bishops and conventions runs side by side with that of the political events here described. History.

The new Government in operation. Washington consented to what he termed his "last great sacrifice," and accepted the presidency of the United States, to which he was unanimously called. John Adams was elected vice-president; a large number of able men sat in the two houses of Congress; the judiciary was organized with John Jay as chief justice; and the cabinet offices, or secretaryships of the different departments, were filled by Jefferson, Hamilton, and other eminent persons. Thus far the government was organized and in operation at New York by the autumn of 1789. But the real difficulties of the movement were not yet overcome, and long debates, occasionally very much embittered by local or political differences, preceded the decision of such essential questions as the revenue and the debt. The latter point was perhaps the most vital of all; for upon it, or upon the manner in which it was determined, all parties saw that not only the strength of the government, but its fidelity to public obligations, at home and abroad, especially depended. Yet it was not till the summer of 1790, or nearly a year and a half after the nominal commencement of the new government (March 4, 1789), that the funding of the domestic and foreign debt was completed, and the government put in full operation.

Washington's Administration. Washington's administration was eight years in length, as he was re-elected to the Presidency at the close of his first term of four years. During the earlier part of this period, he was generally sustained by other members of the government, as well as by the nation at large; but during the later part, owing to foreign rather than domestic causes to which we will revert, a violent opposition in Congress and out of Congress, in the State Legislatures, and among the people everywhere, was directed against his leading measures, and indeed against his motives and principles. Even at the very close, when his approaching retirement from public life might have softened the feelings excited against him, he has to write: "To the weary traveller, who sees a resting-place, and is bending his body to lean thereon, I now compare myself; but to be suffered to do this in peace, is too much to be endured by some." The Farewell Address to the people of the United States, dated some months before, was prepared and published amid abuse of which it is very hard to conceive, now that the character of Washington is almost universally regarded as a sacred possession of his countrymen. But so it was; and reference to any detailed history will shew the fact that Washington's administration was marked by great dissensions throughout the nation.

Domestic Policy. We can present only the salient points in the policy which, it is not too much to say, secured the establishment of the United States government. The opening question alluded to having been disposed of, it remained for Washington to carry out the general work of strengthening the government, and insuring its impartial administration. He was no party man, but he did not conceal his prepossessions in favour of the Federalists, or the supporters of a central system, comparatively speaking in contrast with the Anti-Federalists, Republicans, and Democrates, who maintained what may be called a local system, reserving as much power as possible for the States, and yielding as little as possible to the federal or national authority. Such was the prevalence of the local theories, at least in some parts of the country, that an armed convention, seven thousand in number met in

History. Western Pennsylvania, in order to resist the excise laid by the general government upon domestic distillation (1794). Washington instantly issued a proclamation against the insurgents, called out a large force of militia, or State troops, and took the field himself, but finding that the Pennsylvanians had dispersed, returned to the seat of government, then at Philadelphia. He had met the doubts of friends and the sneers of foes with regard to the efficiency of the national power. It was a part of his domestic rather than his foreign policy which we have to notice in his treatment of the Indian tribes. Obliged to send troops against such of them as were in arms, he made favourable treaties with them, while for those who were at peace he instituted various measures designed to promote their civilization. The United States were now (1796) sixteen in number—North Carolina and Rhode Island having acceded, and Vermont, Kentucky, and Tennessee having been admitted to the Union. The total population was not far from five millions.

Foreign Policy. Washington's foreign policy was much more complicated, not in consequence of its own nature, but through the convulsive passions which rose around it. The French Revolution, beginning at the same time that Washington assumed the Presidency, led to new points of controversy, the Republican party devoting itself and the country to the support of the Revolution, while the Federalists took the opposite ground, and denounced the French excesses in unmeasured terms. On the declaration of war by France against Great Britain, a large number of the Americans were ready to join in the strife, very few if any, however, on the British side. Washington instantly issued his proclamation of neutrality (April 1793), to the effect, "that the duty and interest of the United States require that they should with sincerity and good faith, adopt and pursue a conduct friendly and impartial towards the belligerent powers." He explained his purpose at a later time in these words: —"I want an American character, that the powers of Europe may be convinced we act for ourselves, and not for others. This, in my judgment, is the only way to be respected abroad, and happy at home; and not, by becoming the partizans of Great Britain or France, create dissensions, disturb the public tranquillity, and destroy, perhaps for ever, the cement which binds the Union." In the execution of this system, Washington opposed the proceedings of the French envoy, who undertook to commission privateers, and to establish prize courts in the ports of the United States. He had then to deal with the greater difficulties arising from the invasion of American neutrality by both France and Great Britain, in consequence of which war with the latter power was openly talked of and prepared. To avert this great calamity, Washington sent Chief Justice Jay on a special mission to London, where, after much trouble, he succeeded in negotiating a treaty, by which some of the sharper points in controversy were smoothed down (1794). But it was not until a year and a half later that the treaty, though ratified by the President and the Senate, was fully accepted by the government of the United States; nor would it have been accepted then but for the subsidence of the popular commotions that had been roused against it. When the treaty was confirmed, and not before then, Washington felt that his great principle of neutrality had prevailed. But though the threatened war with Great Britain was averted, relations with France continued in a disturbed state, and led to fresh menaces of conflict under the next administration.

Sec. 3, 1797-1815. Contention with France and Great Britain. What Washington was able to check, broke out with renewed violence under his successors. John Adams, president for four years (1797-1801), Thomas Jefferson, president for eight years (1801-9), and James Madison, president also for eight years (1809-17), were all absorbed in contention with either France or Great Britain during the greater part of the period formed by their administrations. But for the excitement between the two parties, federalist and republican, the former of which declining towards the close of Washington's presidency, sank under Adams, while the latter rose to power with Jefferson and Madison—but for these parties and their strifes, the questions involved in foreign relations would have been less embittered. The federalists, however, were strong against France, the republicans equally strong against Great Britain, and upon these prejudices and animosities, points of domestic, as well as of foreign policy, were made to depend; and to such a degree, that constitutional theories, territorial acquisitions, and other matters of the greatest importance to the nation, were debated and decided in the light, or rather in the shadow of merely European relations. It is not one of the bright pages of United States history that we are turning. History.

Domesti Questions. Slavery. Louisiana. We can but advert to some of the domestic questions belonging to the period. One was, with regard to slavery, particularly in the Territories formed out of hitherto unoccupied parts of the country. Before the government was organized under the constitution, and at the very time that the constitution itself was in process of formation (July 13, 1787), the ordinance for the North-west Territory already alluded to, prohibited the introduction of slavery there. In Washington's time, Congress organized the Territory S. of the Ohio, according to the terms on which N. Carolina had ceded her western lands, namely, that nothing should be done by Congress "tending to the emancipation of slaves," (1790). Eight years later, the Mississippi Territory was organized upon the same terms, but as there was no stipulation from a state in this case, an attempt was made in Congress to prohibit slavery, but in vain. Another question, arousing much greater vehemence on both sides, sprang from the acquisition of Louisiana, a name then extending over an indefinite tract to the W. of the Mississippi, purchased by Jefferson's administration from France, to which power the territory had been restored by Spain (1803). Jefferson allowed that he had performed "an act beyond the constitution," and the party in opposition made the most of it against him; but the importance of possessing the mouth of the Mississippi was so great as to outweigh all appeals to the letter of the constitution, especially when made by a party hitherto urging the most liberal interpretation. The new domain was organized as two Territories, one of Orleans, the other of Louisiana, but for the successive additions to the Union we refer, once for all, to the table at the beginning of this article.

War with France. The missions to France under both Washington and Adams having utterly miscarried, in consequence of the French demands, Adams recommended Congress to put the country in a proper state of defence (March 1798). The federalist majority responded by organizing a provisional army, of which Washington was appointed Commander-in-Chief, and by establishing a department for the navy; the President being authorized to employ the national vessels in capturing any armed vessels of the French. American privateers were soon swarming the seas, and the few ships of the navy cruised in various directions, but without any actual engagement except between the Constellation and L'Insurgente (Feb. 1799). A new mission was then sent to France, despite all party clamours, and the war, if war it can be called, came to an end. It left its traces upon the Americans, especially from the lengths to which their parties had gone, the administration adopting extreme measures in support of the war, the opposition proceeding even to nullification of the acts of government.

History.

Wars with Tripoli, Algiers, and the Indians.

It is worth while, in order to understand the strain upon the United States during these years, simply to mention that the Bey of Tripoli, from whom, as from the Dey of Algiers, peace had been purchased, declared war, and kept it up for four years (1801-5); that the Dey of Algiers did the same for three years (1812-15), though actual hostilities were confined to the last of the three; and that the Indian tribes of the N.W., before (1811), as well as during the war with Great Britain, to be presently mentioned, were in arms, to the great peril of the frontier.

Approach of War with Great Britain.

All other contentions, however, sank into insignificance compared with the growing dissensions with Great Britain. That power, interfering with the neutral trade, and claiming the right of impressment from American national vessels as well as from merchantmen, was first addressed by a mission, attempting the negotiation of a treaty on these disputed points (1806). The negotiations failing, and a collision on the subject of impressment having taken place between the American frigate Chesapeake and the British frigate Leopold (1807), the American government made a faint effort to assert its prerogatives. But from Great Britain there had already opened that series of attacks upon neutral rights, known as the Orders in Council (1806-8), in retaliation for which Napoleon issued his equally aggressive decrees (1806-10). An embargo was declared (1807), then revoked (1809) by the United States government; non-intercourse, or non-importation acts with regard to Great Britain and France, sometimes suspended, never effective, were tried; until, in the spring of 1812, a new embargo was laid as a measure preparatory to war. It was attempted to treat France exactly as Great Britain; but as some negotiations were then on foot at Paris, the actual declaration of war was made against Great Britain alone (June 1812).

War: Divisions and Wants of the Americans.

No nation professedly united was ever more divided on any point than the United States on this war with Great Britain. It was considered by the opposition to be a mere administration measure, resistance to which argued no want of patriotism, but quite the contrary; and so, from the beginning to the close of the hostilities, the federalists, especially in New England, did all they could to stay the course on which they thought the government was driving to destruction. The Hartford Convention, a prominent body in the political history of the United States, yet little known even in its own country, met at the very end of the conflict, to express the sense of New England, and to attempt redress of existing abuses as well as preparation for future reforms. The legislatures of Massachusetts and Connecticut, the leading States in the Convention of Hartford, went so far as to nullify an act of Congress regarding enlistments. Meantime the nation had suffered for the want of resources, which nothing but unanimity could supply, even if they were to be supplied at all. The army was but a handful, and the militia, instead of coming forward in large numbers, stayed to attend party meetings, and discuss the right of Government to call them out; the navy was inconsiderable; the supply of war material very scanty, and the treasury reduced almost to its last dollar, despite direct taxation and repeated loans. But for the fact that Great Britain was absorbed in her war with Napoleon, the war with the United States would have soon terminated.

Events of the War.

As it was, the war lasted two years and a half. Its principal scene of operations was the Canada frontier, from Michigan to New York, where a series of actions, inconsiderable in proportions and results, took place; the only engagements of more than local importance being a victory won by the American commander, Perry, over a British squadron on Lake Erie (1813), and another naval conflict in which the American captain, M'Donough, came off conqueror on Lake Champlain (1814). On the line of the Atlantic coast, blockaded and frequently invaded by the British, no event of any general moment occurred until the capture of Washington and Alexandria (1814), immediately after which Baltimore was successfully defended. A few months later, General Jackson conducted the defence of Louisiana against a large force, the decisive defeat of which occurred at New Orleans. On the sea, the few vessels of the American navy began by achieving remarkable successes (1812), but reverses followed (1813), nor was it till the close of the war that the British again suffered defeat on what their historian calls "their own element."

History.

Peace.

At length, Great Britain offered to enter into negotiations for peace, which resulted in a treaty restoring the conquests made by either belligerent, and providing for commissioners to confer upon some disputed points; but the great questions for which the United States had professed to take up arms, the British claims of impressment and of the control of neutral trade, were not determined, though they had been modified in some respects by other action on the part of the contending nations. The issue of the conflict was as undecisive, as might have been expected from the insignificant scale upon which it had been waged. The treaty was signed by the negotiators in December 1814, and ratified by the United States in February 1815.

Sec. 4, 1815-55, Forty years of Growth.

From the year 1815, when the total population amounted to about eight millions, and the total area of the nation to about one million seven hundred thousand square miles, the United States have passed through a period of forty years and more, at the close of which the national proportions are, as the table at the beginning of this article indicates, of much greater magnitude. We propose to touch upon the more important occurrences of the period.

Acquisitions of Territory.

The purchase of Florida from Spain, between whom and the United States there had been many difficulties, chiefly on the score of this very territory, was made in 1819. The annexation of Texas in 1844, the treaty with Great Britain concerning the Pacific boundary between her possessions and the United States in 1846, the treaty in which Mexico ceded New Mexico and California in 1848, and the purchase of 23,000,000 acres in Northern Mexico in 1854, were much larger territorial acquisitions. They were not made without controversy with foreign powers, nor have they been occupied without domestic dissensions of a far more serious character.

Missouri Compromise.

When Missouri Territory, a part of the Louisiana acquisition, was seeking admission into the Union, it was urged in Congress that slavery should be prohibited in the proposed State, either at once or at some definite day in the future. The question was argued, or rather fought over, for many months both in and out of Congress,—the Northern States generally insisting that Missouri must be free, the Southern that she must remain exactly what she then was, slaveholding. Finally, a plan was brought forward in Congress, by which the North yielded its claim upon Missouri, at the same time that the South gave up that vast portion of the Louisiana territory as yet unorganized; a line being drawn across it at the latitude of 36 deg. 30 min., south of which were the State of Louisiana and Arkansas Territory, both slaveholding, while north of it, Missouri only excepted, extended the track now to be devoted to freemen. This was the Missouri compromise, an act variously interpreted and regarded both then and since, but always prominent in the history of that slavery question which divides the American Union. It was passed in 1820.

Monroe Doctrine.

James Monroe succeeded Madison in the presidency,

History. and retained it for eight years (1817-25). Towards the close of his administration (1823), in compliance with the suggestion of his Secretary of State, John Quincy Adams, he introduced into his message to Congress—adverting to the purpose of the European allies of Spain to assist her in subduing her revolted colonies in Central and South America—the assertion of "a principle in which the rights and interests of the United States are involved, that the American continents, by the free and independent position which they have assumed and maintained, are henceforth not to be considered as subjects for future colonization by any European powers. . . . With the existing colonies or dependencies of any European power," continues the message, "we have not interfered, and shall not interfere. But with the governments who have declared their independence, and maintained it, and whose independence we have, on great consideration and on just principles, acknowledged, we could not view any interposition for the purpose of oppressing them, or controlling in any other manner their destiny by any European power, in any other light than as the manifestation of an unfriendly disposition towards the United States." Congress took no action upon the communication, but the spirit of that body, as of the nation, was favourable to the so-called Monroe doctrine. It has been much misunderstood, but the extract just given shews precisely what was intended, first, placing the American continent in the same position as Europe; and secondly, protecting the Spanish colonies against the violence with which they were threatened.

Georgia and South Carolina against the Union. During the administration of John Quincy Adams, who succeeded Monroe (1825-29), a very serious controversy arose between the national government and the State of Georgia. The State authorities demanded that the government should hasten the execution of a compact, according to which it had bound itself to extinguish all Indian titles to Georgian territory, and on the government's continuing to consult the Indian as well as the Georgian interest in the matter, the governor called upon the adjoining states "to stand by their arms," and warned the national authorities that they might be "treated as a public enemy" (1827). This storm having slowly blown over, another arose in the succeeding administration of Andrew Jackson (1829-37), when, after much previous altercation on the subject, South Carolina pronounced the national tariff, by which protective duties were laid, to be "unauthorized by the constitution, . . . null and void, and no law, nor binding upon the State of South Carolina, its officers and citizens." These words were followed up in the same assembly by others, declaring that the people of South Carolina would never submit to the national government, and that any attempt to enforce the tariff would be "inconsistent with the longer continuance of South Carolina in the Union" (1832). But, as the insurgent State found none to join her, and as the national government, though firm in its determination to uphold the laws, consented to modify the tariff (1833), South Carolina returned to her allegiance. It still remained, and it remains to the present day, an open question in many parts of the United States, how far the State, and how far the National Government, is sovereign; in other words, whether the State is subordinate to the Nation, or the Nation to the State. The greatest interpreters of the United States constitution insist upon the supremacy of the nation, but it is by no means the prevailing doctrine in times of sectional difference or strife.

United States Bank. At the very time that President Jackson was dealing with South Carolina, he was creating another cause of general altercation in pressing the removal of the Treasury deposits from the United States Bank. Congress declining to decide, he took the decision upon himself, and ordered the deposits to be removed, on the ground, History. first, that the bank officers had been intriguing against him, and then, that as the bank charter was about to expire, some new place of deposit and management must be provided for the public funds (1833). Old parties had long since disappeared, and the dividing line between those now in existence was but ill defined, when Jackson suffered this opportunity to present itself to the opposition. They used it freely, and laid such stress upon executive usurpations, as to stir the whole nation to side with the attack or with the defence, according to their different relations and inclinations.

Abolitionism. A movement, very variously estimated, both in and out of the United States, began under Jackson's administration. The abolition of slavery was no new question; it had been brought before Congress during Washington's presidency, and often revived in subsequent years. At this time, however, a more systematic attempt was made to promote it; and though those who engaged in the enterprize were of little influence, and though they professed, with few exceptions, to be full of moderation, a great excitement arose at the North as well as at the South, and many acts of positive riot ensued (1835). Whatever view may be taken of abolitionism, in its earlier or its later days, two things are to be mentioned in this brief narrative as historical; one that it checked every movement in slaveholding States towards the removal of slavery; the other, that it widened the division between the free and the slave States, to a degree that has never since been repaired.

Insolvency and Repudiation. We pass over many transactions that would require to be dwelt upon in a more extended article, and arrive at a dark era in this history. Just after Martin Van Buren succeeded Jackson in the presidency (1837), a financial tempest, long gathering from many quarters, broke upon the country involving some sections in losses from which there was no immediate recovery. Its effects were most severe among the State governments, many of which had been running into debts far beyond their existing means to meet, and they now failed to pay even the interest upon the stocks which they had issued. One State, Mississippi, took advantage of an alleged illegality in the sale of one million sterling of her bonds, and, led by her governor, repudiated the entire debt (1841-2). Florida Territory followed her example; indeed, it may be said to have been approved of by the nation, or by the national authorities, who, three years afterwards, admitted Florida, still repudiating her debt, into the Union (1845).

Treaties with Great Britain. Before some of the last-mentioned transactions took place, the interests of political affairs began to centre in the relations of the United States with Great Britain. An insurrection in Canada, to which some United States citizens gave their sympathy and aid (1837), led to disturbances in the intercourse of the two nations, which were enhanced by the British exercise of the right of visit, as well as by conflicting claims on the subject of the boundary between the north-east of the United States and the British possessions. These various differences were happily allayed by the treaty of Washington, negotiated by Webster, secretary of state under President Tyler (succeeding Harrison, who had followed Van Buren in 1841), and Lord Ashburton, special envoy from Great Britain (1842). A few years later, another negotiation concerning the boundary between Oregon on the north-west, and the British possessions, was peacefully terminated (1846). May all succeeding questions between the two nations, whether of boundaries or of more intricate relations, be brought to equally peaceful issues!

Annexation of Texas. The inhabitants of the Mexican province of Texas, chiefly emigrants from the United States, had declared and maintained their independence of Mexico in the year

History. 1836. The next year they presented their State as a candidate for admission into the American Union, but in consideration of Mexico and her claims, the offer was declined. It was only deferred; the desire of the Texans being no stronger than that of many Americans, particularly in the Southern States, that the annexation should be consummated. An additional motive was brought forward in the report that Texas, if kept at a distance by the Union, would turn to Great Britain or to France for the purpose of placing herself under foreign protection. As far as the United States were concerned, however, the question turned chiefly upon slavery; the south advocating and the north resisting the admission of Texas as a slave-holding State. Finally, a compromise was hit upon; whatever territory Texas contained north of the Missouri compromise line of 36° 30′, was closed to the introduction of slavery, while the territory south of the same line might be open to slavery, or not open to it, exactly as its inhabitants should determine at a later day. Resolutions to this effect having passed both houses of Congress, Texas assented, and was soon afterwards admitted to the Union (1845).

War with Mexico. The inevitable result, a war with Mexico, soon followed, James K. Polk being President of the United States. The Mexican government declared it their "only recourse;" the United States government, adverting to Mexican spoliations long unredressed, and claiming for the newly acquired territory a boundary against which Mexico particularly protested, ordered the advance of the American troops to the Rio Grande, where battles on a small scale were won by the American General Taylor (May 1846). The conflict extended at different points along the Mexican frontier; California was conquered on the western coast, while the eastern was partially blockaded. In the spring of 1847, the Americans took Vera Cruz, and thence marched, under the command of General Scott, fighting as they went, until they entered the city of Mexico in the early autumn. This remarkable campaign decided the war, though peace was not made until some months afterwards, when the treaty of Guadalupe Hidalgo ceded the whole of Texas, New Mexico, and Upper California to the United States (1848). The war had been significant chiefly in its development of the military element in the victorious nation. Apart from the army and its operations, but very little interest had been felt in the war—that is, as a war; the large majority of the people regarding the cause as trifling, and the issue unimportant.

Compromise of 1850. The people of the United States were soon engaged in fighting other battles, as passionate, if not as bloody as those that had occurred in Mexico. The enormous addition of territory on the Southern frontier had given new impetus to the altercations on slavery. As early as the summer following the outbreak of the Mexican war, the Wilmot proviso, so called, had been urged and partially sustained in Congress, to the effect that slavery should be prohibited in any territory that might be conquered (1846). As soon as the war was over, domestic strife set in, the North attempting to restrict, the South to extend the area of slavery, amid criminations and recriminations on both sides. General Taylor, becoming President (1849), issued instructions that the people in the new territories should make some political organization for themselves, whereupon California adopted a State constitution, by which slavery was formally prohibited. Her application for admission was a sort of turning point in the struggle with regard to the character of the newly conquered territory. It was at length assented to, New Mexico and Utah being at the same time constituted Territories without any provision for or against slavery, while an indemnity was paid to Texas for part of the region included in New Mexico. Other measures, suppressing the slave trade in the District of Columbia, and securing the rendition of fugitive slaves by the Northern States, completed the compromise of 1850, as it was styled, in which two of the chief American statesmen, Clay and Webster, had been prominently engaged. History.

Kansas Nebraska Act. The strife regarding slavery did not subside. Millard Fillmore had succeeded Taylor (1850), and Franklin Pierce followed Fillmore in the Presidency (1853), when a new Act was passed by Congress, repealing the Missouri compromise of thirty years before, and throwing open the whole territory not included in the States already organized, to slave-holders as well as to non-slave-holders (1854). The principle of this measure, as stated in the Act itself, was that "of non-intervention by Congress with slavery in the States and Territories," and its object, as the Act farther declares, was "not to legislate slavery into any Territory or State, nor to exclude it therefrom, but to leave the people thereof perfectly free to form and regulate their domestic institutions their own way, subject only to the constitution of the United States." It immediately became a matter of life and death with the more extreme parties at the North and South, to secure on the former side the prevention, on the latter the introduction of slavery into the Territory of Kansas, the southern portion of that vast region to which the Act applied. But instead of accomplishing their purpose by legal means, both parties resorted to violence and bloodshed, the consequences of which are still felt, though the centre of contention is no longer Kansas. Over these later events, it is fortunate that the chronological limits of our article compel us to draw a veil.

General Growth. Our narrative has been confined to civil and political occurrences, but it ought not to be terminated without a glance at the general growth of the nation during the period under review. The statistical portion of this article, shewing the physical and intellectual condition of the country, as it is at present, suggests the rapidity and the extent of the national development; the various results that have sprung from it, and the various points to which it appears to tend. We need not repeat the commonplace reflections upon facts which, however remarkable, are not wholly unparalleled; other nations besides this have grown from small beginnings, possessed themselves of immense resources, and looked forward to unending achievements of wealth, power, and prosperity; but when all proper comparisons and qualifications have been made, the United States will present a spectacle so striking, that it may be called one of the phenomena of history. To no single race belongs the praise; if the English planted, others planted likewise; and if the growth has been English in its general character, there has been constant and copious admixture. Hence may be traced not only the helps to the national advancement, but also the hindrances to it, the different interests and passions to be reconciled, the controversies of the past and the present to be stilled, before the future is secure.

(S. E.)

UNIVERSITIES.

Introduction.

Universitas, of which *University* is the English exponent, is often used by the best Latin writers to denote the whole of anything in contradistinction to its component parts, and is applied equally to persons and things. Thus Cicero employs the expression *universitas generis humani*, to denote the human race or mankind as a whole; while he denominates the units forming this aggregate *singuli*, *individuals*. In like manner he uses *universitas rerum* for the whole of things—for all things viewed as making one whole (*totus mundus*). In the technical language of the civil law, it was likewise applied both to persons and things: in the former signification (convertible with *collegium*) it denoted a plurality of persons associated for a continued purpose, and may be inadequately rendered by *society*, *company*, *corporation*; in the latter, it denoted a certain totality of individual things, constituted either by their mutual relation to a certain common end, or by a mere legal fiction. The *universities*, or corporate bodies at Rome were very numerous. Thus we find incorporations of priests, of farmers of the public revenue, bakers, carpenters, musicians, &c. In the language of the middle ages, *universitas* was applied either loosely to any understood class of persons, or strictly to the members of a municipal incorporation, or to the members of a *general study*.[1] In this application, it was used to denote either the whole body of teachers and learners, or the whole body of learners, or the whole body of teachers and learners divided either by faculty, or by country, or by both together; its specific meaning being determined by the words with which it was connected. In the fourteenth century, the terms *magistrorum et scholarium* and the like, which had hitherto been joined with *universitas*, were discontinued, and the word came to be used simply by itself, or in combination with *studium* or *studium generale*; as *universitas studii Oxoniensis*, *Parisiensis*, &c. The term in ecclesiastical language was frequently applied to a number of churches united under the superintendence of one archdeacon, and to the college of canons in a cathedral. It is thus used to denote the body of canons of the church of Pisa, in a papal Rescript of the year 688; and from such a body the transition was easy to the masters and scholars of a seminary of education.[2]

Meaning of the term.

University, in its academical signification, has been defined "a universal school, in which are taught all branches of learning, or the four faculties of Theology, Law, Medicine, and the Arts, and in which degrees are conferred in these faculties." This we believe to be the meaning most commonly attached to the word university; and as it arises from inattention to the original application of the term, it will be necessary for us to endeavour to point out its true signification. Like many other terms of extensive application, it has undergone various modifications of meaning, till its origin and primary use seem to have been utterly forgotten. By the nations of modern Europe, it has been applied to the highest seminaries of learning in their respective countries, whether these embraced "the whole circle of the sciences," or were limited to one or two faculties; and we accordingly find that the idea attached to the word varies in extent and comprehensiveness with the institution to which it is applied. Those who have formed their notion of the word merely from the English universities, commonly suppose that a university "necessarily means a collection and union of colleges; that it is a great corporation, embodying in one the smaller and subordinate collegiate bodies." The author of *A Reply to the Calumnies of the Edinburgh Review*,[3] asserts that "the university of Oxford is not a national foundation. It is a congeries of foundations, originating, some in royal munificence, but more in private piety and bounty. They are moulded, indeed, into one corporation; but each one of our twenty colleges is a corporation by itself." The inaccuracy of this opinion will appear from our account of that distinguished seminary. It is indeed sufficiently refuted by the fact, that many universities exist in which there are no colleges. This is the case with most of the German universities; and in the Scottish universities there are now no foundations which bear any resemblance to the English colleges. Edinburgh, though called a college, is a university, and has nothing in common with the English meaning of the term college; and the colleges at St Andrews, Glasgow, and Aberdeen, are corporations chiefly endowed for the principals and professors, and, but to a small extent, for the students. Trinity College, Dublin, is a college with the privileges of a university, possessing however a munificent endowment for the provost, fellows, and scholars. It is important, besides, to bear in mind, that the universities of Oxford and Cambridge existed before a single college was endowed; and that the universities would continue to exist, with all their rights and privileges unimpaired, even if the property of all the colleges were confiscated, and their buildings levelled with the ground. Another error—that universities were so called because they professed to teach *universal* learning—though maintained by men of such erudition as Mosheim, Tiraboschi, and Dr Waddington, and assented to by Hallam, is a mere quibble upon the word. The University of Paris, as well as Oxford and Cambridge, existed at first only in the faculty of arts; Salerno and Montpellier originally contained the single faculty of medicine; and even Bologna was celebrated for 200 years, as a school of law, before it contained any provision for lectures in theology. The teaching of the civil law was prohibited in Paris from 1220 till 1679; and other instances might easily be adduced in which the study of particular faculties was forbidden in particular universities. It is true that most of the modern universities embrace the "whole circle of learning," as contained in the four faculties of arts, theology, law, and medicine; but this was not the case in the thirteenth century, when the term *universities* was first applied to academical institutions. University may therefore be defined "the whole members of an incorporated body of persons, teaching and learning one or more departments of knowledge, and empowered by the constituted authorities to confer degrees in one or more faculties."

Introduction.

Origin.

It is impossible to fix the period when universities, in the modern acceptation of the term, were first established. Previously to the age of Charlemagne, Europe had sunk into the grossest barbarism, in consequence of the migrations of the northern and eastern tribes, and the devastating

[1] The oldest word for an unexclusive institution of higher education was *studium* and *studium generale*; terms employed in the twelfth and thirteenth centuries, and retained in those which followed. The term *studium generale*, like *universitas*, did not mean originally that *all was taught*, but that *what was taught was taught to all*; "generalitas ad *universitatem* non pertinet *scientiarum*, sed ad *publicam causam docendi*." (Petri Gregorii Tholosani *De Republica*, lib. xviii., c. i., sect. 87.)

[2] The substance of this account of the word *university* is taken chiefly from Sir William Hamilton's *Discussions on Education*, No. vi. To this *Discussion*, and to two others by Sir William, we have been largely indebted in compiling the following article.

[3] Dr Copleston, late bishop of Llandaff. Oxford, 1810, 8vo.

Introduction.

wars which followed in their train. This monarch is entitled to the praise of having zealously endeavoured to promote the cultivation of literature and science throughout his vast empire. At his accession, we are assured that no means of education existed in his dominions; and in order to restore in some degree the spirit of letters, he was compelled to invite strangers from other countries where learning was not so thoroughly extinguished. Among those who repaired to his court, were Alcuin of England, Clement of Ireland, and Theodulf of Germany, men whose zeal was not inferior to that of their munificent patron. With the help of these, he established schools in different cities of his empire; and all the power and influence of the court were employed in forwarding his endeavours to diffuse some portion of education among his subjects.

Schools.

By an imperial enactment, it was ordained that the bishops should erect schools contiguous to their churches, while the monks were enjoined to establish them in their monasteries; and the imperial court, as it moved from place to place, watched and rewarded the progress of learning in all the seminaries of the empire. The impulse thus given to literature, though checked by the sloth and ignorance of the monks and canons of the tenth century, was never altogether destroyed: the cathedral and monastic schools afforded the means of education, such as it was, to the young men who were destined for the church; and during the two succeeding centuries, "what learning there was, and what scientific men there were, were contained in and proceeded from their walls." By degrees the light of science, which had been so long obscured, began to shine more brightly: teachers, whose genius and erudition enabled them to overstep the narrow circle to which they had themselves been restricted, arose in various places; and wherever an Anselm or an Abelard opened his school, his lectures were attended by crowds of admiring listeners. The success of one teacher invited others to the same field of labour, and the large number of scholars who frequented the auditory of an admired expounder of some new or favourite question of scholastic logic or divinity, afforded ample room for the exertion of his talents and ingenuity. It was in this manner that particular schools obtained a permanent celebrity, and that those associations of teachers were formed which were afterwards recognised by the civil and ecclesiastical power, and ultimately dignified with the name of "Universities."

"The oldest universities of Europe," says Mr Malden, "sprung up in the twelfth century, and were formed by the zeal and enterprise of learned men, who undertook to deliver public instruction to all who were desirous of hearing them. The first teachers soon found assistants and rivals: students resorted in great numbers to the sources of knowledge thus opened to them; and from this voluntary concourse of teachers and learners the schools arose, which were afterwards recognised as public bodies, and entitled 'Universities;' and which served as models for those which, in later times, were founded and established by public authority. Some of the oldest universities had traditions of their foundation at a more remote period by royal or imperial authority, and these traditions might be nominally true; but as far as their real life, and power, and distinctive character are concerned, their origin was in fact spontaneous, and is to be ascribed to the general excitement of the intellect which pervaded Europe in the twelfth century."

Paris.

The oldest of the European universities were those of Paris and Bologna; the former for several centuries so celebrated as a school of theology as to be designated the "first school of the church," and the latter equally famous for the study of Roman jurisprudence. Of these two seminaries, as forming the models on which the other universities which subsequently sprung up in various parts of Europe were established, it will be necessary for us to give a somewhat detailed account. Omitting altogether the question of priority, we shall begin with the University of Paris, because we believe its claim to precedence, on the ground of antiquity, to be equally well-founded with that of its rival, and because its form and constitution were in a great measure adopted by the founders of the two great English universities.

UNIVERSITY OF PARIS.

History.

The commencement of this famous university is not recorded. Tradition has assigned its origin to Charlemagne, and it is consequently referred to the beginning of the ninth century; but this opinion rests on no distinct evidence, and has been rejected by all recent writers who have examined the subject. Among the schools which the great emperor of the west established, it is doubtful whether we can reckon that of Paris; and though there are some traces of public instruction being given in that city about the end of the ninth century, it is not certain that we can assume it to be more ancient. For two hundred years more, it can only be said that some persons appear to have come to Paris for the purposes of study; but the history of the school is very obscure, and, according to Hallam, "it would be hard to prove an unbroken continuity, or at least a dependence and connection of its professors." From the beginning of the twelfth century, Paris became the resort of learned men, who attached themselves in some degree to the existing schools, and infused new life into them by delivering public lectures on scholastic theology. One of these was William of Champeaux, who opened a school of logic in 1109, which is remarkable as the era from which alone the university can deduce the regular succession of its teachers. This celebrated dialectitian, whose fame attracted crowds of pupils, was eclipsed by his disciple, afterwards his rival and adversary, Peter Abelard, to whose brilliant and hardy genius the university appears to be indebted for its rapid advancement as a seminary of school-divinity. One of Abelard's pupils was Peter Lombard, afterwards archbishop of Paris, whose *Liber Sententiarum*, a digest of propositions extracted from the fathers, obtained the highest authority among the scholastic disputants. These and some other less distinguished preceptors first gave permanency to the future university.

The learning communicated in this ancient school, as in others of the same age, was comprised in two courses, called the *Trivium* and *Quadrivium*, terms employed from a very early age[1] to denote the seven liberal arts or sciences; of which the objects are enumerated in the following line:

Trivium and *Quadrivium*.

"Lingua, tropus, ratio, numerus, tonus, angulus, astra."

The first course comprehended grammar, logic, and rhetoric; the second, music, arithmetic, geometry, and astronomy. It may easily be imagined, that in the tenth and eleventh centuries the extent of learning comprehended under these seven heads was not very great; but small as

[1] This division of the sciences is ascribed to St Augustin, and was certainly established early in the sixth century. (Hallam's *Middle Ages*, iii. 521.) The enumeration answered to the seven cardinal virtues, seven deadly sins, seven sacraments, &c., and was comprehended in these memorial lines,—

GRAMM. loquitur; DIA. vera docet; RHET. verba colorat;
MUS. canit; AR. numerat; GEO. ponderat; AST. colit astra.

But most of these sciences were scarcely taught at all. The arithmetic, for instance, of Cassiodorus or Capella is nothing but a few definitions mingled with superstitious absurdities about the virtues of certain numbers and figures.

Paris. it was, not many scholars proceeded beyond the *Trivium*, and the student who mastered both courses was looked upon as a person of profound erudition,

"Qui tria, qui septem, qui totum scibile scivit."[1]

The university, as a corporate body, had as yet no existence; and the teachers, on whom its reputation rested, delivered their lectures in Paris and its neighbourhood, or wherever the prospect of success invited them. It consisted of a congeries of schools, partly in connection with the churches and monasteries, and partly formed by the celebrity of literary adventurers. The number of these schools in the middle of the twelfth century was great; encouragement produced masters, and able masters increased the number of scholars. The continually increasing number of teachers and students rendered it expedient to establish in the university some form of government to maintain the regularity and discipline necessary to its permanent success; and it accordingly appears to have been incorporated into a society towards the end of the twelfth century. Matthew Paris informs us that John de la Celle, elected abbot of St Albans in 1195, had studied at Paris, and had been elected into the company or body of established teachers.

The antiquity of the different component parts of the university is involved in great uncertainty. The faculty of arts appears to have existed at a very early period, and had assumed a regular form of self-government before the year 1169. In this year Henry II. of England offered to refer the adjustment of his dispute with Becket to the peers of France, the Gallican Church, or the *provinces* (nations) of the school of Paris. The head or rector of the university is named in an ordinance of Philip Augustus in 1200; the procurators of the nations (*procuratores nationum*) in 1218; the faculty of theology existed as a separate body in 1267; the faculties of the canon law and medicine in 1281; the rights of the chancellor of Nôtre Dame were exercised in 1169. The oldest public documents extant which have reference to the Parisian school are two decretals of Pope Alexander III., the first in 1180, directed against the practice, which had been introduced by the chancellor, of exacting fees for licenses to teach; and the second, of nearly the same date, relieving Peter Comestor, who was then chancellor, from this prohibition. The practice of receiving fees seems to have been revived; for when Innocent III., in 1215, by his legate Robert de Courçon, regulated the institutions of the university, he found it necessary to renew the ordinance that nothing should be given to the chancellor for granting licenses. This ordinance, according to Savigny,[2] is remarkable as being the first in which the term university (*universitas*) is applied to the school of Paris; thereby implying the recognition and sanction of the university by the papal see, a sanction which was especially valuable, and even indispensable to its continued existence, when theology had become its leading study and its distinguishing characteristic. Pope Nicholas IV., towards the end of the thirteenth century, conferred upon the university the additional privilege that the doctors who were there approved should everywhere have the power of teaching, lecturing, and directing schools (*docendi, legendi, regendi*), and should enjoy the privileges and rank of doctors throughout Christendom. Philip Augustus, by his ordinance of 1200,[3] granted to the university exemption from the ordinary tribunals, even from those of the church; prohibited the citizens, under the severest penalties, from molesting the students; and in the few cases in which the magistrates of the city were allowed to interfere, they were obliged to deliver over the culprit to his academical superiors. The person of the rector of the schools was declared to be sacred; and the provost of the city, immediately after his instalment, was required to wait on the masters and scholars in full assembly, and in their presence solemnly to swear that he would carefully observe and fulfil the designs of the ordinance. This ceremony continued to be observed till 1592. The example of Philip was followed by the kings of France during the two succeeding centuries, and by them the privileges and immunities of the university were still further increased. By various regal enactments, the masters and scholars were exempted from all taxes imposed to defray the expenses of war, the king's court, family, representatives, or officers; from all customs, taxes, or personal burdens; were declared not liable to arrest, or to seizure or sequestration of goods; and were specially exempted from being summoned out of Paris in any legal process. The popes were not less active in its support. By a letter of Innocent IV., it was provided that no one should promulgate a sentence of excommunication, suspension, or interdict, against the university, or any of its members, without the special license of the apostolic see; and that, if promulgated, it should be null and void. Paris.

The University of Paris, thus recognised by the pope, and encouraged by the fostering care of the kings of France, soon became the most distinguished seminary of learning in Europe, and students resorted to it with an eagerness for instruction which may well excite surprise when we reflect how little of what is now deemed useful could be there obtained. A more systematic course of study was introduced; theology and the arts ceased to be the only subjects taught; medicine began to assume the form of a science; and the canon law, under the special patronage of the church, took its place as a new branch of jurisprudence. The study of the civil law was introduced in the twelfth century, soon after its revival at Bologna, but was prohibited by Pope Honorius III. in 1220—a prohibition which Innocent IV. endeavoured to extend to the whole of France, England, Scotland, and Hungary. Some attempts were made to revive it under the authority of the Parliament of Paris in 1568; but the prohibition was renewed, and the university was not finally relieved from it till the year 1679.[4] The number of students in the twelfth century nearly equalled that of the citizens, and included individuals from every part of Christendom. At the death of Charles VII., in 1453, it amounted to 25,000; and, when Joseph Scaliger was a student, it had reached 30,000. Students.

Having thus traced the University of Paris from its origin to its full establishment, we shall now give a short analysis of its constitution in the thirteenth and fourteenth centuries. The most ancient part of the university was the faculty[5] of arts or philosophy, which is believed to have Constitution.

[1] This barbarous verse was written in commendation of the learning of Alanus de Insulis, who was one of the most famous scholars of his time, and who, according to Du Boulay, taught theology in Paris in the latter part of the twelfth century. (Conringius, Suppl. xlvi.) The reading here adopted, though different from that in the work referred to, is believed to be the correct one.

[2] Geschichte, iii. 318. It is addressed *Scholaribus Parisiensibus*. The same name is given to it by Rigord, in his history of that period, and is assumed by that learned body in a public deed, A.D. 1221. (Rigordi, *Hist.*, p. 208.) "Nos universitas magistrorum et scholarium," &c. (Bulæi, *Hist. Un. Par.* iii., pp. 25, 52, 60, 105.)

[3] This ordinance was published in consequence of a quarrel between the students and the citizens headed by their provost, in which some foreign students of eminence were killed. The masters presented their complaint to the king, demanded justice against the provost and his accomplices, and even threatened, with their scholars, to leave the city. The provost was condemned to perpetual imprisonment, and provision was made for the future protection and safety of the students. (Bulæi, *Hist. Un. Par.* iii., pp. 2 and 3.)

[4] M'Crie's *Life of Melville*, i., pp. 419, 420. To the cause of this prohibition it is unnecessary to advert. The popes were too quick-sighted, and too much alive to their own interests, not to perceive that the authority delegated to the civil magistrate by the civil law militated against their own absolute ecclesiastical claims.

[5] The term *Faculty*, in all the older universities, denoted the body of teachers or graduates who, besides the privilege of lecturing on

Paris. had a special connection with the church of St Geneviève, and probably originated in the school attached to that church. In all the ancient continental universities the members were divided into *nations;* these varying in number according to the will of the respective founders. In Paris the faculty of arts, which, for this purpose, included all members who were not doctors, was divided into four

Nations. nations:—1. The French nation, including the French, Italian, Spaniards, Greeks, &c.; 2. The nation of Picardy, which included the students from the north-east of France, and also the Netherlands; 3. The nation of Normandy, comprehending those from the west; 4. The English nation (after 1430, called the German nation), which, besides the students from the provinces subject to the English, as Poictou, Guienne, &c., included the English, Scottish, Irish, Poles, Germans, &c. In these nations were enrolled the professors and students from the respective districts, without any distinction arising from the departments of learning to which they were devoted. This division, as we have already seen, existed in 1169; and there is a concordat of the four nations respecting the election of a rector in the year 1206, which proves that, at that time, their privileges were recognised and acted upon. Each nation formed an independent body, had its own patron, church, place of meeting, academical buildings, great and small seal, &c., and managed exclusively its own affairs. At the head of

Procurators. each was a procurator, elected from their own number, whose duty it was to defend the rights and privileges of the nation, to convene and preside in its meetings, swear in new office-bearers and new members, and to see that all the acts and statutes were duly observed. The four procurators, with the rector, originally constituted the ordinary council of the university, in which its general government and legislation were vested. Their power extended even to the infliction of corporal punishment, some examples of which are mentioned as early as 1200, and in the fifteenth century they were not infrequent. They had a common seal, and as a corporate body were represented by the rector.[1] Each nation was divided into provinces, and each province into dioceses. The names of the members of each province were enrolled in a register; and at their head was a dean, chosen by themselves. The deans formed the ordinary council of the procurator, and their assent was necessary in every undertaking of importance.

Chancellor. In all the old universities, the chancellor was the fountain of honour, the officer by whose authority degrees were conferred; and this dignity brought along with it considerable power. The office appears to have arisen out of that of the chancellors appointed by the bishops in their respective dioceses, to preside in their courts, and maintain discipline within the limits of the episcopal jurisdiction. After the full establishment of monasteries, the abbots claimed the same power, and created chancellors with similar authority. It belonged to the bishop and his chancellor to grant licenses to teach within his own diocese; and the same power was claimed and exercised by the abbot and his chancellor within the territory of the abbey.[2] When the university was placed in an episcopal city, the bishop of the diocese was very often the chancellor; and if not the bishop, some other ecclesiastical dignitary appointed by him. The University of Paris being situate partly within the diocese of Paris, and partly within the abbey lands of St Geneviève, the power of granting license to students and masters was claimed and exercised by both. These chancellors were appointed, the one by his bishop, and the other by his abbot: the right of the latter extended to granting degrees in the arts only; that of the former to degrees in theology, law, and medicine. The chancellor of the church of St Geneviève was always the chancellor of the faculty of arts, though the bishop of Paris was the chancellor of the other three faculties, and was considered as the chancellor of the university at large. They chose their own deputies or vice-chancellors, appointed annual examiners of candidates for degrees, but had no power to interfere in the internal government of the university.

Paris.

Rector. The rector, who has been already mentioned as the head of the university, and who continued to be so in everything except the conferring of degrees, appears to have been originally chosen by the four nations voting collectively; but the number of students belonging to the French nation gave it so decided a superiority, that the other three became dissatisfied, and at last seceding, elected a rector for themselves. To put an end to this difference, which threatened the prosperity of the university, and to restore unity and peace, delegates were appointed, by whose mediation it was agreed, and confirmed by the seals of the four nations, A.D. 1249, that the election should in future be vested in the four procurators, with certain provisions if they were not unanimous. After the year 1280, the rector was chosen by electors specially appointed for the purpose. He was eligible from the faculty of arts only, and continued in office for three months, when he might be re-elected, or another chosen in his room. He presided in the general meetings of the university, took charge of the registers and public money, and administered generally the government of the university. Within the city he took precedence, not only of all the officers and members of the university, but also of bishops, papal nuncios, and legates.

Such was the constitution of the University of Paris till the middle of the thirteenth century. About this time the Dominican and Franciscan friars, supported by the pope and the bishop of Paris, succeeded in establishing the faculty of theology, which, Faculties. after a strenuous opposition on the part of the heads of the university, was recognised in the year 1259. Faculties of medicine and the canon law very soon modelled themselves upon that of theology. The three faculties are separately mentioned in a deliberation which took place in the year 1277, and, four years after, were confirmed in all the rights and privileges of the university. At the head of each faculty was a dean, chosen in the same manner as Deans. the procurators of the nations, who presided in its meetings, and represented the body. From this period, therefore, the school of Paris, which had hitherto consisted of four bodies, was composed of seven, namely, of four nations and three faculties, represented respectively in the general council by four procurators and three deans. To the three new faculties belonged doctors only. The bachelors and scholars of theology, law, and medicine, were still included in the four nations of the faculty of arts. The general government of the university was vested in the council of seven, with the rector as president. The general assembly or convocation, comprehending all the masters, scholars, and officers (*omnes magistri, tam regentes, quam non-regentes*), was convened on great and

a certain department of knowledge, of examining and admitting candidates for degrees into their body, had also the right of making statutes, choosing officers, employing a seal, and performing all the offices of a privileged corporation. In the French universities, the faculty consisted of the teachers alone, but in the Italian universities it was composed of the teachers and students together. (Hamilton, *Discussions*, &c., 481–2.)

[1] They issued the decree which shut up the schools till redress was obtained from the king for the insults and injuries sustained by their body from the provost and citizens of Paris. According to Du Boulay, they formed the only governing body till 1260. (*Hist. Un. Par.* iii. 563.)

[2] The power thus vested in the heads of ecclesiastical establishments to which schools were attached was sometimes used, through personal motives, for the exclusion of fit and able teachers, as well as for the purpose of extorting a high price for license to teach. In the pontificate of Alexander III., A.D. 1179, a Lateran council enacted, "that every competent person ought to be admitted to teach;" and in the following year the pope himself issued a decree, containing the following clause:—"Ut quicunque viri idonei et literati voluerint regere studia literarum, sine molestia et exactione qualibet scholas regere permittantur." (Conringius, *Dissert.* iv., sect. 24.)

Paris. interesting occasions only; and general meetings of all the regents were sometimes held for literary business, for framing statutes respecting discipline, privileges, and order. The meetings of faculties took cognizance each of its own members, in matters chiefly of a literary nature.

Subordinate officers. The subordinate officers were, the syndic; the general procurator or agent of the university, who appears to have been an occasional rather than a permanent officer; and the greffier or recorder, who was the clerk and assessor. Each nation and faculty had its own clerk and assessor. There were also two classes of messengers, who were employed in transacting business of various kinds for the students.

The university, as a corporation, was always very poor, and never possessed any public building; but was obliged to hold its meetings in the houses of the religious orders who were willing to grant the requisite accommodation. The teachers originally delivered their lectures in such rooms as they could for hire or otherwiss obtain the use of. Afterwards, however, halls or schools for the use of their teachers were provided by the several faculties. Those of the faculty of arts and philosophy, which appear to have been very numerous, were in the *Rue de la Fouarre* (*vicus Stramineus*), and were apportioned among the nations of the faculty.

Lodgings. The great concourse of students to the early universities, rendered it difficult for them to obtain lodgings, and gave rise to exorbitant demands on the part of the townsmen in whose houses they were forced to reside. To remedy this inconvenience, various expedients were adopted, but with inadequate effect. Frederick II. when he founded the University of Naples, in 1224, fixed a *maximum* price for lodgings, and enacted that they should be let according to a joint valuation of two citizens and two scholars. A similar regulation was adopted at Bologna, and established about 1237, by Gregory IX. in the University of Paris. The taxers were two masters of the university, and two burgesses elected with the consent of the masters. It was also provided that, when lodgings had once been hired, the student should not be disturbed in the possession of them, so long as he paid his rent, and conducted himself properly. Notwithstanding these regulations, the hardships to which the poorer students were exposed induced charitable individuals to provide houses, in which a certain number of indigent scholars might be accommodated with free lodgings during the progress of their studies. The example was first set by the religious orders, who established in several of the university towns *hostels* (*hospitia*) for those of their members who resorted thither, either as teachers or learners. Free board was soon added to free lodging, and in many cases small exhibitions or stipends to defray the necessary expenses of the scholars. For the sake of discipline, these foundations were placed under the superintendence of one or more graduates, who assisted and instructed their pupils, but only in subservience to the public lectures and exercises of the university. Such establishments were called *inns*, *hostels*, *halls*, or *colleges*; the last term being generally restricted to foundations which provided for the support of several graduates. These institutions, at first established on a small scale, led to the foundation of the colleges, which afterwards formed one of the most important and essential branches of the university.

Taxers.

Colleges. Paris was the university in which collegiate establishments were first founded. Du Boulay avers that colleges may be dated as far back as the university itself; and Crevier enumerates fifteen which were founded during the thirteenth century, besides one or two of a still earlier date. Savigny considers the famous college of the Sorbonne, which was founded by Robert de Sorbonne, confessor of St Louis, in 1250, as the most ancient in Paris. Crevier probably included in his enumeration the *hospitia* established by the religious orders, which cannot properly be considered as colleges. During the fourteenth century many new colleges were founded, the most celebrated of which were those of Navarre and Du Plessis. The former, which is said sometimes to have contained 700 pupils, was founded by Joanna, queen of Philip the Fair, in 1304; and the latter by Geoffroi du Plessis, apostolical secretary to Philip V., in 1322. The *Collegium Trilingue*, or Royal Trilingual College, was founded by Francis I. in 1529.[1]

Paris. The following account of the Parisian colleges is given by Mr Malden:—"The great colleges of Paris stood on a footing very different from the colleges of the English universities. They soon became appropriated to particular faculties, or to particular departments of a faculty. Sometimes, but rarely, they included more than one faculty. Thus the theological faculty was collected at an early period in the college of the Sorbonne; and all its lectures and public disputations took place there, with the exception of two courses delivered in the college of Navarre. Regent masters were nominated by the faculties as lecturers in the colleges. These lecturers remained subject to their several faculties, and were liable to be controlled or removed by them. Consequently, attendance on their courses was considered as equivalent to attendance on the public courses delivered in the schools of the university. The colleges speedily began to admit within their walls scholars who were not supported by their foundations; and the college lectures were ultimately thrown open to the members of other colleges, and to those scholars of the university who belonged to no college at all. This took place in the course of the fifteenth century. The lectures in the public schools were thus almost entirely superseded, at least in the faculties of theology and arts; and the colleges became the instruments of the public instruction of the university. During the latter half of the fifteenth century, the great colleges of the faculty of arts, or, as they were called, the colleges 'de plein exercise,' amounted to eighteen; although by the middle of the seventeenth century they had fallen to ten. There were about eighty smaller colleges, of which more than half still survived in the eighteenth century, which provided their scholars with lodging and board, and sometimes with small stipends, but taught them only the elements of philology, sending them for all higher learning to the lecturers of the great colleges. The college of Navarre alone appears to have confined its instruction to its own scholars. In this age of the university it became usual for all the scholars to belong to some college. Those students of the university who were not attached to any college, were known by the name of *Martinets*. As they were less amenable to discipline than the students of the colleges, the legislation of the university was directed against them; and at length it was made imperative on all scholars of the faculty of arts to be members of some college. The rule was not enforced on students of the higher faculties."

Academical degrees. The origin of academical degrees, like many other points connected with the early history of universities, is involved in obscurity. According to Du Boulay, degrees were conferred, after a regular examination, from the very foundation of the university; while others assert that they were first introduced by Irnerius into the University of Bologna about the year 1150, and thence transferred to the Parisian school. That such distinctions existed at a very early period is unquestionable, but there is not sufficient evidence to justify us in believing that they were coeval with the earliest universities. The oldest degrees were those in arts. The term *bachelor*,[2] used as the designation of the lowest degree in each faculty, which term is said to have been peculiar to the feudal or military law of France, seems to warrant the inference that the whole system of academical honours has been borrowed from the university of Paris. The terms master and doctor, were originally synonymous, and were designations given in their common meaning to persons engaged in teaching, and not titles conferred by authority after a prescribed course of study or a formal examination. In process of time the name master was restricted to teachers of the liberal arts, and the title of doctor was assumed by the teachers of theology, law, and medicine. The term professor, though less frequent in early times, had originally the same signification, and denoted a person who professed to teach a particular subject. In the English universities the Latin designation of a doctor of divinity still is "sanctæ theologiæ professor." Professor is now, in academical language, applied to a salaried graduate, either actually employed in teaching, or at least whose duty it is to teach. When the masters of particular schools adopted regulations, which were afterwards confirmed by public authority, to prevent unqualified persons from assuming their office, the terms master, doctor, professor, became titles indicating a certain rank, and conveying certain powers in the scholastic body. They were still, however,

[1] Previously to the erection of this college, there was no provision in the university for instructing young men in the learned languages. It was originally intended, as its name imports, for teaching Latin, Greek, and Hebrew; although it was some time before a teacher of Latin was appointed, owing to the opposition made by the members of the university, which led Erasmus, in one of his letters, to call them *bilingual* pedants. (M'Crie's *Life of Melville*, i., pp. 19, 20.)

[2] The inferior degree of *Bachelor* is said to have been first instituted by Gregory IX., whose pontificate continued from 1227 to 1241. They probably derived their name from *bacilla* (little staves), either because they were admitted by receiving a little wand, or because they adopted the titles of the novices of the soldiery, who exercised with sticks in order to learn to fight with arms. The word *bachelor* is commonly derived from *bas chevalier*, the humblest species of knight, in opposition to the knight bannaret, but for this expression no authority has been produced. *Bachelor* is a very old word, and is used in early French poetry for a young man, as *bachelette* is for a girl.

Paris.

confined to persons admitted by competent authority to the office of teachers. When the titles of doctor and master were distinguished, and more especially when an initiatory stage was marked by the name of *bachelor*, these successive designations were called *steps* or *degrees* (gradus). Every graduate had an equal right of teaching publicly in the university the subjects competent to his faculty, and to the rank of his degree; and he even incurred an obligation to teach as the condition on which the degree was granted. The bachelor or imperfect graduate was bound to read, under a master or doctor of his faculty, a course of lectures; and the master, doctor, or perfect graduate was, in like manner, after his promotion, obliged to commence (*incipere*), and to continue for a certain period publicly to teach (*regere*),[1] some at least of the subjects pertaining to his faculty. The students were allowed to choose their regent, but were expected to attach themselves to some one in particular. A period of *necessary regency*, different in different universities, was generally fixed, during which the graduates were bound to teach, and after which they might, if they chose, become *non-regents*. The regents were allowed to exact from their pupils a certain regulated fee (*pastus, collectum*). The large number of graduates who were willing to devote themselves to teaching as a profession, led to the shortening of the period of *necessary regency*, and enabled those to whom teaching was irksome to obtain a dispensation from its duties. The regents alone, except on rare and extraordinary occasions, were allowed to take part in the legislation and government of the university. The regents were ultimately superseded by the institution of salaried lecturers (*professores*), who delivered their instructions gratuitously. From the period of this innovation, which took place in 1719, the vigour of the university was gradually impaired. So long as the emoluments of the lecturers depended chiefly on the fees of their pupils, an honourable and beneficial competition was kept up; but the graduates, finding their pupils attracted by the gratuitous lectures of the endowed professors, ceased to teach, and the most powerful motive to exertion was thus withdrawn.

Regents.

Professors.

Course of study.

The process of graduation was the following. After two years' study of grammar and philosophy, the scholar became a *determiner*; that is, he proposed himself, if *twelve* years of age at least, to be taken on trials, in order, after further preparation, to his obtaining the degree of *bachelor*. The object of this proposal being made so early was to subject the candidate to certain examinations, and to excite attention to his general conduct. In the middle of the fifteenth century, the course of study necessary for obtaining the degree of bachelor of arts was three years and a half. After passing the ordeal of the academical examiners, the student was conducted by the rector to the chancellor, who crowned and blessed him. In consequence of passing as a *bachelor*, he wore a round cap, attended the holy mass, and became a candidate for the degree of master of arts. He was now required to devote an equal portion of time, three years and a half, to the study of philosophy, and, if found qualified, after frequent and severe examinations, was presented to the chancellor as worthy to receive license to teach the seven liberal arts. He was then invested with the *bonnet*, was publicly and solemnly declared a master of arts, and was at liberty to commence his career of teaching. But his magisterial character was not yet complete. He next offered himself a candidate for becoming a *socius*, or fellow of the masters in the university, an honour which was in the gift of the masters themselves, and by which he was admitted to the full enjoyment of their society, and of all their privileges.

Degrees in divinity and law.

To obtain the degree of doctor in divinity, it was necessary for the student to be twenty-five years of age when proposed, and to have studied philosophy for seven, or, if he belonged to a religious body, for six years. A further probation of nine years was requisite before he could attain that sacred degree. Two of these years were spent in the study of the Bible, and two in the study of the system of theology contained in the Book of Sentences. Sixteen years were thus spent at the university in order to become a doctor in divinity. The degree of doctor was conferred jointly by the chancellor and by the faculty, who admitted the candidate, with the solemnity of an oath, as a member of their body, and thus entitled to their privileges. The time necessary for acquiring the degree of doctor in law and medicine was shorter, and the rules were not so strictly observed. On conferring each of these degrees certain fees were exigible.

Dress.

The students were required to wear a cap and gown of a particular form, varying with their standing or degree in the university. The determiners wore a short black gown with a hood and sleeves; the bachelors a round cap and long gown of the best black cloth or silk, and the masters a gown which reached down to their heels.

Bologna.

Revenue.

The revenue of the university seems to have arisen at first entirely from the fees of the scholars, and from contributions which were occasionally levied from them. Some of the colleges, however, were richly endowed from the beginning, for the maintenance both of the scholars and the masters. Their weekly provision appears to have been very small. In the college of Navarre, the students of grammar received each *four sous* a week, the students of philosophy *six sous*, and the theologians *eight sous*. The teachers respectively received a double allowance.

Of the other early French universities, the most celebrated was that of Montpellier, which was founded in 1180, and constituted by a bull of Pope Nicholas IV. in 1289, and placed under the superintendence of the bishop of the diocese. Montpellier was at first only a school of medicine, but subsequently embraced also the other faculties. The university was divided into three nations, and was governed by a rector, elected annually, with the assistance of twelve counsellors, of whom four were selected from each nation. The University of Toulouse was founded by Pope Gregory IX. in 1228, on the model of that of Paris, and was not much inferior to the pattern institution in success and celebrity. It early acquired fame as a school of law. The University of Orleans was established in 1305, and was occupied chiefly in the study of law. The students were at first divided into ten nations. The following are the other French universities founded before 1500:—Lyon, before A.D. 1290; Vienne, uncertain; Perpignan, 1340; Angers, 1364; Aix, 1409; Dole, 1426; Caen (founded by the English government under Henry VI.), 1433; Bourdeaux, 1441; Valence, 1452; Nantes, 1463, Bourges, 1465.

UNIVERSITY OF BOLOGNA.

History.

The antiquity of this famous school is at least equal to that of Paris; and were it necessary to construe the word university in the strict sense of a legal incorporation, it might lay claim to still higher antiquity, inasmuch as its teachers obtained some important privileges before any such concession was made to those at Paris. It is alleged, and apparently on documentary evidence, that the Emperor Theodosius established a school at Bologna in 433,[2] which, after it had fallen into decay, was restored by Charlemagne. It is probable that the school continued in existence from the period last mentioned; but there is no evidence that it was entitled to the name *university*, as that word was understood in the thirteenth century. According to Hallam, there are few vestiges of studies pursued in that city in the eleventh century; and there was also, in the same century, a school of the liberal arts at Ravenna, and a college of *judges* and *advocates*, who, besides administering and practising law, taught its principles in a public school. Masters and scholars are mentioned in documents of that age; and a certain individual, who was probably the head, is called *legis doctor*. A lawyer, named Pepo, who is designated by this appellation, delivered lectures on law about 1075, but without attracting much notice.

We may safely assume that, like the other early universities, the progress of Bologna was gradual, and that its origin cannot be traced to any definite period of arbitrary establishment. The fame of successful teachers attracted pupils to their schools; and these, settling in the city, gradually claimed for themselves rights and privileges, which the citizens found it to be their interest to recognise, and which, in process of time, obtained the sanction of the emperor.

Roman law.

The university started suddenly into celebrity in the early part of the twelfth century, when Irnerius began to teach the Roman law. (See CIVIL LAW.) This great

[1] The technical term signifying to teach in the public schools, was *regere*; and the master of arts, or doctor of any faculty, upon his creation, necessarily became a *regent*, that is, a teacher in the schools. In Paris, the masters who were desirous of exercising this privilege, petitioned their faculty *pro regentia et scholis*; and schools, as they fell vacant, were granted to them by their nations according to seniority.

[2] Middendorp (lib. iv., p. 3) confesses himself unable to fix the year, but says that it took place during the reign of Theodosius, which began A.D. 425 and continued twenty-seven years. The date here given is that of Savigny, who appears however to doubt the genuineness of the documents. (Savigny, iii. 147.)

Bologna. civilian is to be regarded, not only as the founder of the University of Bologna, but as the author of a grand revolution in the jurisprudence of Europe. While engaged in teaching the liberal arts at Ravenna, he accepted an invitation from the civic authorities of Bologna, and opened a school in that city. He was employed as a lecturer in arts when copies of some of the books of the code of Justinian, which were beginning to excite attention and to be circulated through Italy, reached Bologna. Irnerius applied himself diligently to the study of them, and, after making himself master of their contents, undertook to expound them in the public schools. According to Conringius, he engaged in this course of lectures with the sanction of the republic of Bologna, and was rewarded for his labours at the public expense. His zeal and energy collected large crowds of pupils, and gave an effectual impulse to the study of Roman law throughout Italy, while they raised the reputation of the lecturer to a pre-eminent height. The precise time at which Irnerius commenced his lectures has not been ascertained, nor are the events of the latter part of his life known. His name is mentioned in the records of public business and judicial proceedings between the years 1113 and 1118, when he appears to have relinquished his scholastic labours, and to have entered the service of the imperial court. By some he is supposed to have returned to his academical labours after the death of his patron Henry V. Sigonius, in his History of Bologna, fixes the time of his death in the year 1150.

The study of law being thus revived, made surprising progress, and its fame spread rapidly from Italy over other parts of Europe. Students flocked from all parts to Bologna, and some eminent masters of that school repeated its lessons in distant countries. Throughout this and several succeeding centuries, the schools of Bologna continued to be pre-eminent for legal learning. About the year 1220 they contained 10,000 students, and in the middle of the fourteenth century the number had increased to 13,000.

Canon law. "Not very long after the revival of the civil law, another subject of study, of much less intrinsic worth, was brought into public notice at Bologna. In the early ages of the church, the public letters of bishops were known by the name of decretals (*epistolæ decretales*)," the influence of which, at first feeble, kept pace with the increase of the papal power, till the decretals of the apostolic see came to be regarded as of equal authority with the canons of councils. In 1151, Gratian, a monk of St Felix in Bologna, published a collection of these epistles, which was known simply by the title of *Decretum;* a compilation which was immediately received with great favour, and was made the subject of public lectures in Bologna in the pontificate of Eugenius III., who died in the year 1153; and many scholars were attracted to the study of it. (See CANON LAW.) Such was the origin of pontifical or canon law, a branch of jurisprudence which was long regarded by the church with peculiar favour. Of the school of arts and

Philosophy. philosophy, in which the university originated, nothing is known during the twelfth century. Though obscured by the splendour of the rising school of law, it appears nevertheless to have maintained a certain degree of celebrity. The emperor, Frederick II., deemed it worthy of his patronage, and about the year 1220 transmitted to it certain works of Aristotle and other philosophers, which he had caused to be translated into Latin, partly from the original Greek, and partly from Arabic versions—a gift which gave a new

Medicine. impulse to the study of philosophy. The origin of the medical school is probably to be ascribed to the same emperor. Though the precise date of its establishment cannot be fixed, yet the intimate connection which, under Frederick, existed between Lombardy and the kingdom of Naples, renders it not improbable that he instituted at Bologna a school similar to that which had proved so eminently successful at Salerno. Conringius states (*Diss.* Bologna. iii.), that in the thirteenth century, Bologna possessed several celebrated professors of medicine, who were in possession of some few books of Hippocrates and Galen, and of a good many translations of the Arabic physicians; and that their prelections attracted a large concourse of auditors.

The earliest historical document connected with the Privileges university is the charter of privileges granted by the Emperor Frederick I. at Roncaglia, in November 1158. In this authentic or rescript, which is entitled *Habita*, it is provided, first, that foreign scholars travelling to any seminary of learning should be allowed to pass without molestation; and that no obstruction should be offered to them, nor claim made upon them, under pretence of any public offence, or debt of the province or city to which they belonged; and, secondly, that all scholars, if any lawsuit were brought against them, should have the option of having it determined either by the *lord* or *master* under whom they studied, or by the bishop of the diocese.

By these singular privileges, which were afterwards the Immunities. envy of other academical institutions, the students were exempted from the ordinary tribunals, while the professors were invested with important powers. It is true that Bologna is not expressly mentioned in the authentic; but that it was intended for the benefit of Bolognese scholars is apparent, because Bologna was by much the most celebrated school in the emperor's dominions, and probably the only one which was at that time frequented by foreign students. Teachers of law are specially mentioned, and Bologna was then the only school of law; and the permission granted to the student to bring his cause before his "lord and master," seems to assume that his judge was a legal character. An additional reason for applying the edict peculiarly to Bologna, is found in the fact stated by Conringius, that the principal professors in the university were at the time in attendance upon the emperor, having been invited by him to assist in deciding certain matters at issue between him and the cities of Lombardy. It can scarcely be doubted, therefore, that the edict was drawn up by them for the special benefit of their own university, though the language was purposely made general. The professors at first interpreted its provisions as conferring upon them criminal as well as civil jurisdiction; but, finding themselves unable to repress the violence of the students, they allowed the former to remain in the hands of the magistrates of the city, and assumed to themselves only the power of determining civil suits. This edict of Frederick I. is the earliest example of exemption or privilege granted to a university, and may be regarded as the source of the exclusive privileges which were afterwards conferred upon collegiate institutions. The increasing power of the university excited the jealousy of the inhabitants of the city, and led to frequent collisions, which, on more than one occasion, threatened the existence of the school; but which generally ended in extending and strengthening its privileges. In the year 1226, the Emperor Frederick II. threatened to remove the school of law, but in the following year recalled his decree.

Bologna was at an early period chiefly a school of law, and in this therefore the university mainly consisted. The scholars were divided into two bodies, or *universities*, as they were called—the *citramontanes* or natives of Italy, and the *ultramontanes* or foreigners; the former including the Italians, and the latter all foreigners. These were subdivided into nations; the citramontanes into seventeen, and the ultramontanes into eighteen. Each nation had its presiding officer, called its *counsellor*, except the nation of the Germans, which had two, under the name of *procurators*. At an early period the professors and scholars of arts and medicine endeavoured to form themselves into a separate university; but being opposed by the

Bologna. jurists and prohibited by the city, they were compelled to rank themselves with the scholars of law. A few years after, they renewed their efforts, and their right as a distinct university was formally recognised by the city in 1316. After the middle of the fourteenth century, a theological school was established by Innocent VI. It was placed under the bishop of Bologna, as chancellor, and, like the theological faculty at Paris, consisted of doctors only, the scholars being considered as belonging to the *artistæ*. Bologna had thus existed for more than two hundred years, as one of the most celebrated schools of learning, before theology formed a regular branch of study. Lectures in this faculty had been occasionally delivered, but the teachers were not authorised or sanctioned by the university. From the year 1362, when the university of theology was founded, Bologna contained four universities—two of law; one of medicine and the arts, in which were included also the scholars of theology; and one of the doctors of theology. The two schools of law, however, formed together one whole, and are therefore frequently designated as one university.

Colleges. "There were also formed," says Mr Malden, "in course of time, five colleges of doctors, which (with the exception of the theological college) were established upon quite a different principle. The theological college may have differed only in the number of its members from the university of theology; but there were two colleges of law, one of doctors of the civil law, the other of doctors of the canon law; and two separate colleges of doctors of philosophy and medicine. These colleges seem to have been corporations, in which a limited number of doctors of the several faculties were united, and monopolised the power of promotion and admission to degrees, to the exclusion of other doctors, who, according to the earlier constitution of the university, had an equal right to exercise it. They were confirmed, however, by the statutes of the year 1397. The first origin of the legal colleges runs back to the twelfth century: probably they were then open to all doctors. The legal colleges were each under a prior; how the others were governed, Savigny does not state. By these colleges or faculties the candidates for degrees were examined. They had a building for their common use, in which they met, near the cathedral; because the public examinations were held in the cathedral, and degrees solemnly conferred there. Savigny warns his readers that these colleges of civil and canon law are not to be confounded with the *College of Doctors, Advocates, and Judges*, which was an institution of the city of Bologna for civic purposes. It may not be superfluous to warn the English reader not to confound these colleges, which were merely corporate faculties, with the English notion of the word college. There were some colleges in our sense of the word, which were restricted to the relief of really indigent scholars; but these foundations never had any weight or influence in any Italian university."

Constitution. The constitution of the university was based on certain statutes which were promulgated at various times, and confirmed by Innocent IV. in 1253; but of these, and of the privileges conferred by them, our limited space will not permit us to give any account. The statutes were revised and corrected every twenty years, by eight scholars appointed for the purpose, and called *statutarii*. They were again confirmed in 1544 by the pope, who had then become sovereign of the city, and were made binding on the whole community.

Savigny mentions as the leading distinction between the universities of Paris and Bologna, from the earliest period, that in the former the masters or teachers constituted the corporation considered as a privileged body, to the exclusion of the scholars; while, in the latter, the students formed the university, and had the power of selecting from their own body the academical officers, whom the professors were bound to obey. At the head of the universities of law was the rector, who took precedence of all the other officers. The rector is first mentioned towards the end of the twelfth century, when only one was elected. For a long period two were chosen, one for each university; and finally one, which appears to have been the case in 1514, and which was established as the rule before 1552. He was chosen annually by the preceding rector, the counsellors of the nations, and a certain number of electors appointed by the university at large, and was taken from the different nations, according to a regular order of succession. The necessary qualifications for a rector were, that he should be twenty-five years of age, a *clericus*, not a member of any religious order, and should have studied law for at least five years, at his own cost. The powers of the rector were extensive. He possessed supreme authority over all members of the university, except those of the German nation, who were subject to their own procurators alone. His civil jurisdiction was not doubted when both parties belonged to the university, or when a citizen consented to bring before him a suit against a scholar; but when a suit against a scholar was brought before the magistrates of the city, the claim of the rector to hear it generally gave rise to a violent contest between the city and the university. Soon after the institution of the rectorate, an attempt was made by the city to abolish the office, or to render it subservient to the civic power; but the university succeeded in maintaining its privileges, which were ultimately confirmed by the authority of the pope. The criminal jurisdiction of the rector was limited generally to matters of academical discipline. He had the power of punishing both professors and scholars by fine and expulsion; and, in deciding more serious matters, he sometimes acted in conjunction with the magistrates of the city. In 1544, the pope confirmed by a bull his criminal jurisdiction when both parties belonged to the university, and when the offence was not capital. The rector was assisted by a council, consisting of the counsellors of the nations.

Bologna. Rector.

In Bologna, as in Paris, there were two chancellors. Honorius III., whose pontificate extended from 1216 to 1227, when he regulated the *promotions* or collation of degrees in the school of law, placed them under the superintendence of the archdeacon of Bologna, whose consent, to prevent abuse, was rendered necessary. Savigny appears to consider this as a personal authority vested in the archdeacon for the time; but it was retained by his successors, who assumed the title of chancellor, and exercised authority over all the faculties except the faculty of theology. The bishop of Bologna was constituted chancellor of the university of theologians, when this faculty was established by Innocent VI. in 1362. All honours emanated from the chancellors. Chancellors.

Besides the rector and chancellors, the other officers of the university were—1. The *counsellors* or representatives of the nations, who assisted the rector, and formed his council. Each nation elected one counsellor: the German nation was represented by two *procurators*, who were invested with judicial power over their own nation, independently of the rector. 2. The *syndic* or common agent of both universities, whose duty it was to defend their rights and privileges. He was elected annually from among the scholars, and was subject to the jurisdiction of the university at large. He received a salary of twelve *lire*, and latterly a third of all fines. 3. The *notary*, who was also common to both universities. 4. The *treasurer*, who was elected annually from the bankers of the city. 5. Two *bedelli*; one for each university. Other officers.

The precise time when degrees, properly so called, began to be conferred, cannot be ascertained; but perhaps we shall not much err in asserting that they were nearly coeval with the university itself. The earliest teachers were designated *dominus*, *magister*, *judex*, lord, master, judge; but these were names given to them as public lecturers, and were not titles of honour, carrying with them certain privileges, conferred by authority, and after examination. *Magister* was probably applied indiscriminately to any teacher, while *dominus* and *judex* were designations assigned only to the teachers of the civil law. There appears to be no reason to doubt that the terms soon came to be used synonymously. Savigny states that, in the records of the university, Irnerius is styled *judex* or Degrees.

Bologna.

causidicus, but never *doctor*, and assigns the middle of the twelfth century as the date of this last title. The term doctor, here as in Paris, originally signified merely a teacher, and implied nothing more than that the person bearing it had obtained a license to teach in that particular school. Some writers have asserted that it was borrowed from the theological school of Paris, while others have reversed the transmission, and allege that it was borrowed by the Parisians from the Italian seminary. The truth probably is, that it was given independently at both places. Savigny supposes that it was in consequence of the privileges conferred on the masters and teachers by the edict of Frederick I., that they found it necessary to adopt measures to prevent the voluntary assumption of their office, and to establish a form of admission. If this supposition be admitted, it follows that degrees were conferred by public authority soon after 1158. The first doctors were no doubt those of the civil law, that being the branch of learning to which the Bolognese school was indebted for its early celebrity. At the close of the twelfth century we find doctors of the canon law, who soon obtained an equal rank with the civilians. In the thirteenth century, doctors of medicine, grammar, logic, philosophy, and the other arts, were added. The title or dignity of doctor was at first conferred by the doctors themselves by *co-optation*, that is, they admitted the candidate into their body by common consent. This admission or promotion conveyed to him the right of lecturing in the school of Bologna, of exercising jurisdiction over his pupils, and of voting in the admission of future candidates. By a papal bull, the doctors of Bologna, like those of Paris, afterwards obtained the right of lecturing anywhere. The system of self-election having led to frequent abuse, by the admission of unworthy persons, Honorius III., in the early part of the thirteenth century, interposed his authority, and placed the promotions under the control of the archdeacon of Bologna.

The following extract presents a curious feature in academical history. "Originally," says Mr Malden, "scholars were forbidden to marry into the families of Bolognese citizens, without the license of the rector. Exemptions from this prohibition were granted, which were at last extended to all the descendants of all doctors. By the terms of this exemption, it is manifest that the doctors of the university had become closely connected with the families of the citizens. This connection prepared the way for the gradual encroachments of municipal selfishness; and at last the principal chairs in the university were granted only to Bolognese citizens. But the actual doctors profited by the example, and went a step farther, and took an oath not to grant degrees to any but members of their own families. This outrageous monopoly began to produce its natural effects, in the ruin of the university; and commotions and struggles ensued between the years 1295 and 1304, which ended in compelling the doctors to admit all Bolognese equally to degrees; but the rank of doctor, at least in the two legal colleges or faculties, was still confined to citizens of Bologna."

Degrees were conferred in the civil law, or in the canon law, or in both. In the early age of the university single degrees were more common; in later times double degrees prevailed. Six years' previous study was necessary for the canonist, and eight for the civilian. If the student of the canon law had delivered a course of lectures, it was reckoned equal to a year's study; and in like manner the course of the civilian was shortened one or two years, by three or four years' study of the canon law. The first step necessary for the candidate was to select a doctor who should present or recommend him to the archdeacon. He then underwent two examinations, the first of which (*examen*) was private, and the second (*conventus*) public. Previously to the first examination, two points of law were prescribed to him, which he was required to explain and defend, in presence of the chancellor and college of doctors. The doctor by whom he was presented alone examined him; the rest of the faculty having the power merely of asking questions and of stating objections, after making oath that no previous compact had been made with the candidate. The doctors were bound to treat the candidate *lovingly* as their own son, on pain of suspension from their functions for a year. The votes of the faculty were then taken, and if the examination was sustained, the candidate became a *licentiate*, that is, he obtained a license to present himself for public examination.

Examinations.

Bologna.

The *conventus* or public examination, by which the degree of doctor was acquired, took place in the cathedral, in presence of the university, when the licentiate read a thesis, and an exposition of a legal question, which was criticised, not by the doctors, but by the scholars. This was followed by an address from the archdeacon, or from a doctor deputed by him, in which the new graduate was solemnly proclaimed. He was then presented with the insignia of his rank, and had his place in the cathedral assigned to him. It is probable that, in the earliest age of the university, this public examination by the scholars was the only one, and that the previous examination originated in an assumption of power by the doctors. The public examination frequently took place very soon after the private one, but sometimes a considerable interval was suffered to elapse, and thus the title of licentiate became a species of degree.

Conventus.

The candidate, before being received for examination, was required to swear, in presence of the rector, that he had studied for the period prescribed; before the private examination, that he had paid merely the requisite fees; and before the public examination, that he would promote the interest of the university and scholars, and if he remained in Bologna, would obey the rector, and comply with the statutes. At one time the commencing doctors took an oath to the magistrates of the city, that they would not lecture out of Bologna; but this oath was abolished in 1312, on the petition of the scholars, who purchased exemption from it with a sum of money. It is a curious point in the history of this university, that the female sex were admitted to its honours and offices. In early times degrees were conferred on learned women, who were even permitted to occupy professorial chairs. Novella d'Andrea read lectures on the canon law in the fourteenth century; Laura Bassi was professor of physics in the eighteenth century; and Clotilda Tambroni, who was professor of Greek, died in 1817.

Expense.

The expense of graduation was considerable. The fees for the private examination amounted to sixty *lire*; those for the public examination to eighty. Besides the fees, it was usual for the licentiate to give clothes to many of those who took part in the solemn procession; a custom which was found so oppressive that Pope Clement V., in 1311, ordained that an oath should be exacted from each candidate that he would not expend more than 500 *lire*.[1]

Teaching.

All doctors, in right of their degree, had the power of lecturing or teaching publicly; licentiates could not lecture without the permission of the rector. But even simple scholars, after five or six years of diligent study, might obtain from the rector a license to teach, on payment of a fee proportioned to the importance of the branch of law on which they proposed to lecture. The scholar who had lectured on an entire treatise, or who had delivered a formal interpretation of a point of law, was considered to have earned his first degree, and took the name of Bachelor. When degrees became so common that the doctors were not all necessarily obliged to teach, the jurisdiction over the scholars was confined to the *legentes*, or those who actually lectured. All doctors who had at any time taught in the schools retained the right of voting in promotions.[2]

Professors

It is a remarkable feature in the constitution of the University of Bologna, that the Professors at an early period received fixed salaries. In the year 1279 the scholars made an agreement with a lecturer to deliver a course of lectures for a certain specified sum; and in the following year they petitioned the city to pay a sum to the canonist Garsias for a course of lectures on the *Decretum*, and their petition was granted. In 1289 two professorships, one of the civil law and another of the canon law, were established, with a fixed salary. The choice of the professors rested with the scholars, who elected annually, sometimes re-electing the same person, and sometimes choosing another. The number of endowed chairs continued to increase, so that in 1384 we find nineteen salaried lecturers in law, and twenty-three in arts. The salaries of the professors of the civil law, which were the highest, amounted to 495 *lire* each. The salaries which had hitherto been granted only for a year, now began to be considered permanent, and the professors to regard themselves as established functionaries. In 1420 there were twenty-

[1] Antony à Wood mentions several instances of the expense and magnificence which attended the early taking of the higher degrees in England in the reigns of Henry III. and Edward I. About the year 1268, he says, when Alphonsus de Senis or Siena, an Italian, studied at Oxford, one Mr Bonifacius de Saluciis proceeded in the civil law, at whose inception there were such ceremonies and feasting used, that the like for that faculty was scarce before known here. The abbot and convent of Osney gave him the free use of their monastery on that occasion. He adds, that a still greater solemnity was performed some years after, at Gloucester College, by the Benedictines, for one William de Broke, a monk at St Peter's monastery in Gloucester, who took the degree of D.D. in 1298, being the first of his order who had attained that dignity. He was accompanied by the abbot and whole convent of his own monastery, the abbots of Westminster, Reading, Abingdon, Evesham, and Malmesbury, numerous other priors and monks, and by a hundred noblemen and esquires on horses richly caparisoned. (*Hist. and Antiq. of the Univ. of Oxford*, i., pp. 65, 66.)

[2] The *legentes* and *non-legentes* of Bologna correspond to the *regents* and *non-regents* of Paris, Oxford, and Cambridge, except that the former terms were applied only to doctors, while the latter were applied equally to doctors and masters.

Oxford. one teachers of law, of whom scarcely one is said to have been elected by the university. Besides the salaries given by the state to the doctors, there were six endowed lectureships, to which scholars only were eligible. The lecturers were appointed annually, by seventy-six electors, and were equally divided between the Citramontane and Ultramontane scholars. Doctors, licentiates, and natives of Bologna were ineligible. This arrangement, according to Savigny, was acted upon in 1338; but in consequence of the tumult attending the election, it afterwards became customary for the universities to select twelve candidates, from whom were chosen by lot four lecturers on the civil law, and two on the decretals. According to Conringius, there were, in 1664, 126 professors in the school of Bologna, of whom forty-nine belonged to the faculties of law; and the corporation of the city was said to expend annually in their salaries nearly 40,000 crowns. The unsalaried professors received fees from their pupils; and in the flourishing ages of the university many of them acquired great wealth.

During the whole of the thirteenth century, the professors assembled their pupils in their own houses; in the fourteenth century public schools were founded, and were appropriated solely to the use of the doctors. The bachelors were allowed the use of them twice a week in the afternoon, if they were not occupied by a doctor. The courses of lectures were begun on the 19th of October, and continued for a year. The holidays amounted to about ninety, including two weeks at Easter and eleven days at Christmas.

The following are the other universities established in Italy previous to the year 1500:—Salerno, apparently in the tenth century, and probably the most ancient in Europe; Vicenza, A.D. 1204; Naples, 1224; Padua, 1228; Piacenza, 1248; Arenza, 1255; Perugia, 1290; Macerata, 1290; Cesena, uncertain; Rome, 1303; Pisa, 1338; Siena, 1350; Pavia, 1361; Ferrara, 1391; Palermo, 1394; Cremona, 1413; Florence, 1438; Catania, 1445. Within the Germanic empire, which then included many provinces now incorporated into France, and also the Netherlands:—Prague, 1348; Vienna, 1365; Heidelberg, 1387; Cologne, 1388; Erfurt, 1392; Leipzig, 1409; Rostock, 1419; Louvain, 1426; Trier, 1454; Griefswalde, 1456; Freyburg, 1457; Basle, 1459; Ingolstadt, 1472; Tübingen, 1477; Mayence, 1477. In Spain and Portugal:—Salamanca, 1240; Coimbra (originally estalished in Lisbon), 1290; Valladolid, 1346; Huesca, 1354; Valenzia, 1410; Siguenza, 1471; Saragossa, 1474; Avila, 1482; Alcala, 1499. In the Baltic States:—Upsala, 1476; Copenhagen, 1479.

ENGLISH UNIVERSITIES.

Origin. The English universities, like most of those which came into existence in remote times, were formed on the model of the university of Paris; and in the earlier period of their history bear a striking resemblance to the parent institution. Till 1836, England contained only two universities, those of Oxford and Cambridge. The origin of both is involved in doubt and obscurity, and it is perhaps impossible to decide at how early a period schools and places of general education existed in either. The question of the comparative antiquity of the two seminaries was agitated with great keenness in the seventeenth century, but the industry of the antiquaries engaged on either side has not thrown much light on the subject. Some of the more eager advocates of the remote antiquity of Oxford contend that it was a seminary of learning immediately after the destruction of Troy; while the Cambridge antiquaries ascribe the origin of their university to one Cantaber, a Spaniard, by whom it was founded B.C. 375, and from whom it obtained the name Cantabrigia. But though such speculations may amuse and interest the curious, they cannot be admitted as historical facts. The universities of London and Durham are of very recent origin.

UNIVERSITY OF OXFORD.

History. The honour of founding this celebrated university is usually assigned to Alfred the Great, who is said to have "built in this city three halls in the name of the Holy Trinity, for the doctors in grammar, philosophy, and divinity." This opinion, though long maintained and strenuously supported, appears to be now generally abandoned. Oxford. The ablest antiquaries of modern times seem to be agreed that, although the university may be traced to very high antiquity, and far beyond the age of satisfactory records, the illustrious monarch whose name was formerly associated with it as its founder or restorer, had really no share whatever in its establishment. It is at least certain that no document or well-authenticated history can be produced in which the name of Alfred appears as a benefactor of the university. Soon after the reign of Alfred—at least during the succeeding century—schools for the acquisition of learning appear to have been established in Oxford; but these were either of a private character, or were attached to the religious houses with which the city abounded. It is certain that Oxford was a place of study in the reign of Edward the Confessor (1041–1066); but even at the time of the conquest it does not appear to have enjoyed any greater pre-eminence than that which naturally arose from the number of its monastic establishments, and from the circumstance of its having been, during the preceding century, a favourite residence of the English monarchs. Its schools might, therefore, be more numerous and better attended than those in other towns possessing ecclesiastical establishments, and might possibly derive from royal favour some trifling privileges. When a number of the secular scholars resided in one house, it got the name of a hall or hostel; and governors or principals were appointed to superintend the discipline and domestic affairs of the house. The schools were divided into grammar-schools, sophistry-schools, schools for arts, medicine or physic-schools, law-schools, divinity-schools, &c., names which, but for the literary remains of the early ages, would seem to indicate something like a defined system of education. No traces, however, of a regular plan of education can be discovered before the foundation of the first college in the middle of the thirteenth century.

In the beginning of the twelfth century, Oxford is again mentioned as a place of education. Robert Pulein, a theologian from Paris, expounded the holy Scriptures under the patronage of Henry I., and gave new life to the study of theology in England. He continued his labours under the protection of Henry II. till he was called to Rome, and became chancellor of the apostolic see. In the reign of Stephen, Vacarius, a Lombard by birth, who had studied the civil law at Bologna, formed a school for instruction in that branch of knowledge at Oxford; and it is reasonable to suppose, as Hallam observes, that a foreigner would not have chosen that city as the scene of his labours if he had not found a seminary of learning already established there. The introduction of this new science was opposed by the students of philosophy and theology, who prevailed upon the king to prohibit the lecturer from teaching, and to demand that all the books of law should be delivered up to him. This prohibition, however, was not carried into effect; since it appears from two decretals of Alexander III. in 1164 and 1170, that Vacarius remained in England in the reign of Henry II.; and there is evidence that the school subsisted for some time after his death. The difficulty and expense of obtaining copies of the original works on the civil law induced Vacarius to compile for the use of his pupils an abridgment of the Pandects and Code which, according to Savigny, was written in England about the year 1149. This opinion of Savigny is confirmed by Wood, who assigns 1149 as the date of the introduction of the civil law into Oxford, and refers to the same period, or to a time very little later, the introduction of the scholastic theology and the degree of doctor.[1] The study of the civil law, though honoured with the special patronage of the clergy, obtained but little

The civil law.

[1] It can scarcely be doubted that these last were introduced from Paris; and it may be suspected that Wood is a little too early in

Oxford.

favour from the laity of England. The circumstance of its being introduced from Italy, and recommended by ecclesiastical authority, disposed all laymen to look upon it with suspicion, while its rigid enactments accorded ill with the more liberal principles of the common law. The attention even of the clergy was soon diverted from it by the introduction of the canon law, which must have been taught at Oxford soon after the publication of Gratian's *Decretum*. The Benedictines of St Maur mention the existence of an eminent school of the canon law at Oxford about the end of the twelfth century, to which many students repaired from Paris.

The canon law.

Even in that rude age, education seems not to have been entirely neglected by the English monarchs. Henry I. is said to have extended special patronage to Oxford as a seminary of learning, and to have granted to the teachers and scholars, in their several capacities, some important privileges. In the reigns of his two immediate successors learning declined, but it again revived under the encouragement of Richard I. New halls and schools were established under his patronage, and money was issued from his exchequer for their support. To so flourishing a condition indeed did he raise Oxford, that in the early part of the succeeding reign (1201) it is said to have contained 3000 scholars. The first reference to any public instrument where the term university (*universitas*) is applied to Oxford, is the 3d John (1201), an earlier date than any extant application of the word to Paris. An unfortunate incident which occurred in 1209 interrupted this course of prosperity, and even threatened the ruin of the town as a seat of learning. A student, while engaged in some active exercise, accidentally killed a woman belonging to the town, and, dreading the consequences, fled from justice. The mayor and burgesses immediately surrounded the hall to which the supposed murderer belonged; and failing to apprehend him, seized three students entirely unconnected with the affair, and hanged them without proof or trial. The teachers and scholars, justly enraged at this barbarous act, unanimously quitted Oxford, and retired, some to Cambridge, and others to Reading. Not satisfied with this, they even applied to the pope, and obtained an interdict against the town, and against all persons who should settle in it for the purpose of teaching. The inhabitants finding themselves thus deserted by those on whom the prosperity of the city chiefly depended, waited upon the pope's legate, and obtained absolution, on conditions which induced the students to return to their former habitations. The king likewise bestowed on the students some new immunities, exempting them from any foreign judicature, and even granting to the university the power of taking cognisance in causes where one party was a scholar or the servant of a scholar. (1214.) From this year Meiners dates the commencement of the university properly so called.

Patronised by the kings.

Henry III. took advantage of a serious dispute which arose between the students and citizens of Paris in 1229, to advance the interests of Oxford, and invited the Parisian masters and scholars to settle there, promising them greater privileges than those which they had enjoyed in Paris. A thousand accordingly accepted his invitation; but presuming too much on the immunities which had been held out to them, they introduced a levity of manners, which gave rise to frequent tumults, and caused great alarm and disquiet in the town. The reign of this monarch is particularly memorable in the annals of the university. In the year 1244, he granted to it the first charter of privileges as a corporate body, and in 1255 confirmed and extended the privileges which he had formerly conferred. Previous to this period, the scholars and students lodged and studied in halls rented from the townsmen; and this was one great source of the numerous quarrels which constantly took place between them. To remedy the evil, and also to encourage learning, several public-spirited individuals purchased or built large houses for the reception of the teachers and scholars, and thus set the example of appropriating funds for the support of those who had not the means of prosecuting their studies to advantage. Such was the origin of the English colleges, which at first modified, and at length entirely superseded the universities. Additional charters, some of fresh privileges, and others of general confirmation, were granted by Edward I. in 1275, Edward II. in 1315, Edward III. in 1327, and by succeeding kings. The English universities, it appears, solicited a recognition and renewal of their privileges at the beginning of every new reign. Till the passing of the University Act in 1854, their privileges depended upon the act of the 13th Elizabeth, 1570, "concerning the Incorporations of the Universities of Oxford and Cambridge, and the Confirmation of the Charters, Liberties, and Privileges granted to either of them." The *Corpus Statutorum*, or body of statutes, by which the University of Oxford was governed, was compiled, chiefly from existing statutes, by a committee appointed during the chancellorship of Archbishop Laud, and was solemnly ratified by the king, chancellor, and convocation in 1636. These statutes, however modified by subsequent interpretations, additions, or restrictions, determined the law and constitution of the university; and every member was bound by oath and subscription to their faithful observance. Various accounts are given of the number of students at Oxford in the reigns of the early Norman kings. Wood, in his *Annals*, says, that in the time of Henry III. they amounted to 30,000; and even when Merton College was founded (1264), the number is said to have been 15,000. It may readily be granted that these statements are greatly exaggerated; still they seem to imply that the real number was very great. Of the students, many were foreigners, from Paris and other places.

Oxford.

Incorporation.

The University of Oxford was confirmed by papal authority, and received from the see of Rome those privileges which it claimed the sole power of bestowing. It obtained a confirmation of its privileges from Innocent IV. in 1252; and from Boniface VIII., in 1296, the doctors and masters received permission to become lecturers and regents in any university in Christendom, without further examination. Oxford is mentioned along with Paris, Bologna, and Salamanca, in the constitutions published by Clement V. after the council of Vienne in 1311. By these constitutions it was ordained that schools for Hebrew, Arabic, and Chaldee, should be erected in each of these *studia*; and that all prelates and ecclesiastical corporations in England, Wales, Scotland, and Ireland, should be taxed for the maintenance of professors of these languages at Oxford. The influence of the Roman pontiff was never predominant in England; and though it was submitted to by the less able of the English kings, it is clear that his power by the more vigorous of the early monarchs, in matters relating to the universities, was little regarded, or rather that it was utterly disclaimed. The kings considered the universities as not amenable to ecclesiastical superintendence, and took them under their own peculiar authority. Thus Henry III. on going to Gascony, appointed the archbishop of York and two others as guardians of the university, to receive complaints during his absence, though, according to the canons, the government of it was vested in the bishop of Lincoln, as the bishop of the diocese, and the archbishop of Canterbury, the metropolitan of the province. Edward I. published a brief, which was confirmed by a parliament assembled at York, against

Confirmation.

Power of the Pope disregarded.

Privileges.

claiming for Oxford the title of doctor, no such distinction being at that time known in the Parisian school. Of course the appellation, when first used, signified merely a teacher, and was not a technical degree. (Hallam's *Introduction*, &c., i., 21, note.)

Oxford. the interference of the preaching friars in matters connected with the university, although they were supported by papal bulls. Edward III., in the fortieth year of his reign, in consequence of petitions from the Universities of Oxford and Cambridge on the one hand, and from the friars of the four mendicant orders on the other, made an ordinance, with the assent of parliament, by which, after removing a prohibition imposed by the universities upon the admission of young scholars into these orders, it was enacted, "that all bulls and processes issuing from the court of Rome, and procured by the friars against either of the universities, or any person in them, should thenceforth be absolutely null and void; and the friars were forbidden to use or allege them in justification of their proceedings." The same king, nine years after, abrogated statutes made by the chancellor, proctors, and heads of the university, cited the official persons before him, and removed them for contumacy, although they pleaded in justification the pope's bulls. Indeed, the whole tenor of the privileges conferred by the various kings upon the universities may be considered as proving that, constitutionally, the power of the king and parliament was held to be supreme, and that the interference of the pope was submitted to only by sufferance.

Our space will not allow us to pursue in detail the history of this university. Besides the unfortunate incidents already alluded to, others occurred which gave a temporary check to its prosperity. In the reign of Edward I. a violent dispute arose between the university and the bishop of Lincoln, in whose diocese Oxford was then included, concerning the limits of the bishop's jurisdiction in university matters, which ultimately led to the total emancipation of the learned body from ecclesiastical authority, under the sanction of a bull granted by Boniface VIII. in the year 1301. The plague which broke out in 1349 nearly ruined the university, all the colleges and halls having been deserted and shut up during its prevalence. The reign of Richard II. is distinguished by the appearance at this university of John Wycliffe, who was the first warden of Canterbury College, and whose lectures on divinity loosened the shackles of popish thraldom, which Henry VIII. afterwards burst asunder, from motives very different from those which animated the first of the reformers. The succeeding reigns present little that is remarkable in the annals of the university, except religious dissensions, which had nearly caused its dissolution. The reign of Henry VII. is entitled to the proud distinction of having fostered, with more than ordinary success, the revival of learning. Genuine scholarship had, during the preceding century, become exceedingly rare, and the Greek language had not only fallen into general disuse, but was affectedly held in contempt by a great body of the students, who formed themselves into an association, under the name of Trojans, to resist its cultivation. So strong indeed was the prejudice against this language that, when Erasmus went to Oxford for the purpose of teaching it, several leading men in the university read lectures against him in the schools, and endeavoured to attach ridicule both to the man and to the knowledge which it was his object to disseminate. Through the vigorous efforts of Cardinal Wolsey, the Greek language was again received into estimation, and a taste for elegant literature was introduced. In 1518, the cardinal founded seven lectures for theology, the civil law, physic, philosophy, mathematics, Greek, and rhetoric, and appointed to all of them the men who were most distinguished for their abilities, and for their knowledge in these several branches of learning. After the commencement of the reformation under Henry VIII., when the monastic orders were dissolved and their property confiscated, and when the church in its unsettled state presented but few inducements to the study of theology, the number of scholars was very much reduced. In 1546 only thirteen degrees were conferred; and in 1552, though the students who had their names on the books were a thousand and fifteen, yet the greater part were absent, and had in effect quitted the university.

Oxford.

The changes which took place in the religion of the court during the reigns of Edward, Mary, and Elizabeth, affected considerably the prosperity of the university. The last-named sovereign granted to both universities an act of incorporation; and her successor, in 1603, conferred upon them the privilege of sending each two representatives to the national council. From the period of the Revolution the University of Oxford has continued to flourish; its revenues have been increased; and the system of education introduced at the beginning of the present century, and since greatly extended, has been still farther promoted by the recent University Act.

Colleges and halls.

One of the distinguishing peculiarities of the English universities, is the existence of collegiate establishments, some of which were founded at a very early period. We have already mentioned similar establishments in the University of Paris; but the English colleges, being more richly endowed, have to a much greater extent engrossed the powers and privileges of the universities. Of the existing colleges of Oxford, three, University College, Balliol College, and Merton College, were founded before the end of the thirteenth century, and in the following century the number was increased to seven. The motive which led to these foundations was the same which has been mentioned in treating of the University of Paris:—to furnish the students with lodgings, to relieve the indigent from some portion of the expense of their education, and to provide more effectually for the discipline of the university. In Oxford, the chancellor and his deputy combined the powers of the rector and the two chancellors in Paris; and the inspection and control, chiefly exercised in the latter, through the distribution of the scholars into nations,[1] under the government of rector, procurators, and deans, was in the former more especially accomplished by collecting the students into certain privileged houses, subject to a principal, who was responsible for the conduct of the members. But the number of the *colleges* in which provision was made for the support of the members was, for many centuries, small in comparison to the *halls* or *inns* (Aulae, Hospitia), in which the students lived chiefly at their own expense, and were merely furnished with cheap and convenient lodgings. At the commencement of the fourteenth century the number of halls was about *three hundred*, while the colleges amounted only to *three*. For the establishment of a hall, nothing more was necessary than that a few students, on a mutual agreement to live together, should hire a house, find security for a year's rent, and choose for principal a graduate of respectable character. The chancellor or his deputy could not refuse to sanction the establishment, and to admit the principal to his office. The

[1] "The division of the scholars into *nations*, which prevailed in all the universities of the continent, was unknown in England; probably because our insular situation prevented the influx of foreign students. There was a tendency at one time at Oxford to establish a similar distinction between the natives of the counties north and south of the Trent. For some time the proctors were chosen, one from each division, but the schism was healed. At Cambridge, by the composition between the scholars and the burgesses, in the fifty-fourth year of Henry III., conservators of the peace were to be elected annually at the beginning of the academical year, twenty-three in number (the original number of a jury), ten from the town, and thirteen from the university; and of these latter, five were to be English, three Scotch, two Welsh, and three Irish. This arrangement might easily have given rise to a division of the scholars into nations, each choosing its own conservators; but it was not attended by any such consequence." (Malden *On the Origin of Universities*, p. 108.)

Oxford. halls were in general held only on lease; but, by a privilege common to most universities, the rent was fixed every five years by sworn taxers, two masters, and two citizens; and houses once occupied by students could not be resumed by the proprietors so long as the rent was punctually paid. The halls were governed by peculiar statutes, and were liable to be visited and regulated by the university. The causes which occasioned a diminution in the numbers of the scholars, diminished also the number of the halls, though that of the endowed colleges continued to increase. At the commencement of the fifteenth century, while the students were diminishing, the colleges had risen to *seven*. In the beginning of the sixteenth century, the number of halls had fallen to *fifty-five*, while the endowed colleges had increased to *twelve*. In 1546, the inhabited halls amounted only to *eight;* and in 1551, Wood remarks that "the ancient halls lay either waste, or were become the receptacles of poor religious people turned out of their cloisters." As the students fell off in number, the rents of the halls were taxed at a lower rate; and they became at last of so little value to the proprietors that they were willing to dispose of them for a trifling sum. The old colleges thus extended their limits by easy purchase; and the new colleges, of which *six* were founded during the sixteenth century, were built on sites either obtained gratuitously or for an insignificant price. Before this period the colleges had rarely admitted any students who were not on the foundation, and provided for by endowment; but they now began to receive independent members, and the diminution of the number of students in the university rendered it possible to receive nearly all of them. Since the beginning of the eighteenth century only one college has been founded; and three of the eight surviving halls have been changed by endowment into colleges, but one of these is now extinct.

Taxers.

In addition to the want of endowments, it may freely be admitted, that the more effectual superintendence and tuition which were supplied in the colleges, in consequence of the greater number of graduates who were members of them, contributed to the downfall of the halls. It remains only to mention the reason which, in the most crowded state of the university, has prevented the former system from being restored. Before the period of their downfall, the establishment of a hall was easy, and the chancellor was not at liberty to refuse his sanction. A piece of university legislation effectually secured the monopoly to the colleges. The Earl of Leicester, when chancellor of the university, about 1570, "through the absolute potency he had," obtained from the university the right of nominating the principals of all halls, and consequently in effect a *veto* upon the institution of any; and this right was vested by statute in his successors. The heads of colleges being in reality the governing body, have since prevented any interference with their monopoly, by the establishment of a new hall. From the middle of the sixteenth century till 1855, the University of Oxford consisted of nineteen colleges and five halls.

Regents.

In the earliest period of the university, the scholars lodged, without domestic superintendence, in the houses of the citizens, as at Paris and Bologna, and attended such lectures as they chose. In the year 1231, it was ordained "that every clerk or scholar resident in Oxford must subject himself to the discipline and tuition of some master of the schools;" *i.e.*, should enter himself as the pupil of one or other of the actual regents, while he was still left at liberty to select his own place of residence. At the commencement of the fifteenth century, however, it had become the established law, that all scholars should be members of some college, hall, or entry, under a responsible head. The scholars who frequented the lectures of the university, without attaching themselves to any college or hall, were called *Chamberdekyns*, as in Paris they were called *Martinets*. In the foreign universities, it was only the students of the faculty of arts who were obliged to place themselves under collegiate superintendence; but in the English universities the graduates and under-graduates of every faculty were equally required to be members of a privileged house. It is necessary, however, to observe, that entrance at a college or hall did not imply entrance under any particular tutor. "Young students, and many in those days were mere boys, were placed by their friends under the care of tutors; but these were private tutors; and the universities did not interfere with the private arrangement. It was not till the time when Leicester was chancellor, that the university undertook to regulate who might be tutors; and it was not till the chancellorship of Laud, that it was made necessary to enter under a tutor resident in the same college or hall with the pupil. Laud, therefore, may be regarded as the author of the system of college tuition." In Oxford, according to its original constitution, as in all the older universities of the Parisian model, the business of instruction was not confided to a special body of privileged professors, but was conducted by the graduates at large. Every graduate had an equal right to teach, and even incurred the obligation of teaching publicly, for a certain period, the subjects of his faculty, as the condition on which he obtained his degree. Even the bachelor was obliged to give proof of his ability in teaching, by reading a short course of lectures under the superintendence of his faculty; and the doctor, after his promotion, immediately commenced (*incipiebat*) his duties as a public teacher (*regebat*). It was, however, necessary for the university to enforce this obligation of public teaching, during the term of *necessary regency*, only if a sufficient number of *voluntary regents* did not present themselves. When this was the case the period of *necessary regency* was shortened, and even a dispensation from actual teaching during its continuance commonly allowed. The regents, whose duty as public lecturers was dispensed with, still retained their privileges as members of the governing body. The period of *necessary* regency was finally limited to one year; but the masters were allowed to remain *voluntary* regents (*regentes ad placitum*) for two years. A lecturer might continue to teach as a *voluntary regent*, after his term of *necessary* regency had expired; or he might resume his regency at pleasure. Now that the sole effect of regency is to entitle the master to become a member of the house of congregation, all continue regents for two years. All professors and public lecturers, the masters of the schools, and public examiners, are regents; and the name has been extended to all resident doctors, to the heads of houses, and to the deans of colleges.

Oxford.

Tutors.

Before proceeding to give an account of the system of education at present pursued in Oxford, it seems necessary for us to describe shortly the constitution of the various colleges of which the two English universities are composed. These may be regarded either as charitable foundations for the maintenance of a certain number of students and of resident graduates, or as houses of education in which young men desirous of obtaining degrees are lodged and placed under the superintendence of tutors. In the first point of view, each college is an independent corporation, wholly unconnected with the university, except in so far as its members are subject to the statutes; it is governed by its own laws, and is subject to the inspection of its own visitor, appointed by its charter of foundation. Every student must be entered in some college or hall, to the discipline of which he is subject. The commissioners, under the recent university act, authorised the erection of private halls, on certain specified conditions, and one has since been established. The terms colleges and halls, though bearing a different meaning in Oxford, are synonymous in Cambridge.

Colleges.

Each college consists of a Head, called by the various names of provost, master, rector, president, principal, or warden, of a body of fellows (*socii*), and generally of scholars also, besides various officers or servants. With the exception of one or two royal foundations, the heads of colleges are elected by the fellows, usually from their own

Heads.

Oxford.

number, possess superior authority in the discipline of the college considered as a place of education, and exercise an important influence in the government of the university. In most colleges the heads are clergymen, and are allowed to marry. Their incomes vary so much as to render it impossible to make a definite estimate of them. They arise generally from the produce of a double fellowship, and from canonries or college livings attached to the office. The office is tenable for life.

Fellows.

The Fellows are the governing body of the college, and vary in number according to the extent of the colleges. They were either constituted by the original founder, or have been endowed by subsequent benefactors. In the great majority of colleges in both universities the fellows are necessarily graduates, either by statute or by common usage; having passed the lowest degree, that of B.A., or student in the civil law. By the commissioners under the University Act of 1854, the restrictions to founder's kindred, certain specified dioceses, archdeaconries, &c., have been removed, and the fellowships thrown open to all members of the university who have reached the requisite standing. The fellowships are of very unequal value. A few of the best at Oxford are said to be worth, in good years, from L.600 to L.700, while many do not exceed L.100; and many at Cambridge fall far short of the latter sum. They are paid out of the college revenues, which are for the most part received in corn-rents, and vary with the price of that commodity. The senior fellowships are the most lucrative: but all confer upon their holders the right to apartments in the college, and usually entitle the holders to privileges as to commons or meals. The fellowships are tenable for life, unless the holder marries or inherits estates of a certain fixed value, or is presented to a living. At Oxford, in some colleges, graduates who have been elected to fellowships are required to pass a year of probation, during which they receive no income. A college may, by special vote, permit a fellow upon marriage to retain his fellowship, and several have already availed themselves of this permission.

Scholars.

The scholars are placed under different regulations, and enjoy different advantages, in the different colleges. They are on the foundation, but their connection with the college is not so intimate as that of the fellows. They are always chosen from the undergraduates, and are often elected before they have commenced their residence at the university. In respect of discipline and education, they are on precisely the same footing as the independent students. The scholarships vary, in point of emolument, from L.100 or L.80 to L.20, or less, per annum, together with some advantages in the way of board. Under the recent university act, many of the scholarships which were formerly restricted have been thrown open to public competition, and their emoluments have been increased. In some colleges the students corresponding to the scholars bear different names, as the demies (*semicommunarii*) of Magdalen, and the servitors of Christ Church, Oxford.

Exhibitioners.

Besides the scholars, there are in nearly all the colleges students named Exhibitioners, who have exhibitions, or annual pensions, given in some instances by the colleges, in others by free and endowed schools, to young men proceeding to the universities, or to particular colleges. The number of these is great; and many of them are valuable.

Servitors. Sizars.

There are also several classes of inferior students, who are maintained either wholly or in part by the endowments. These poor students were, in former times, required to wait on the fellows, and to perform other menial offices in the college. They bear various names. At Oxford they are called Servitors, Bible-clerks, Postmasters; at Cambridge they are generally termed Sizars. In the latter university their position is more elevated than at Oxford.

Tutors.

The Tutors who conduct the education of the students are selected from the fellows. These, with the officers, as the Dean, who is the highest connected with education, the Bursar, &c., are sometimes the only resident fellows.

Present constitution.

The University of Oxford is a corporate body, known by the style or title of "The Chancellor, Masters, and Scholars of the University of Oxford." Its privileges have been granted, or renewed, by a succession of Royal Charters from a very early period. All previous grants were confirmed by the Act 13, Elizabeth, and further ratified by Charles I., in 1635 and 1636. During the chancellorship of Archbishop Laud, the statutes were at last digested into one uniform code; and by this code, along with certain statutes subsequently enacted at various times, the university was governed till the passing of the University Act in 1854.

University Act.

The object of this act is declared in the preamble to be, "to enlarge the powers of making and altering statutes and regulations, now possessed by the University of Oxford and the colleges thereof, and to make and enable to be made further provision for the government and for the extension of the said university, and for the abrogation of oaths now taken therein, and otherwise for maintaining and improving the discipline and studies, and the good government of the said university and colleges." The oaths formerly administered at matriculation and graduation have, in consequence, been abolished, and the oaths of secrecy, &c., previously taken by the members of the various colleges and halls, have been declared to be illegal. The statutes of the colleges have been revised and placed in accordance with the feelings and opinions of the present day; and a wide field has thus been opened up for young men ambitious of distinction. The restrictions by which many of the fellowships were formerly hampered have been removed, and these are now open to all members of the university. In some colleges a few of the fellowships have been abolished, and in others a few have been temporarily suspended; and funds have thus been obtained for establishing additional professorships, increasing the number of scholarships, and raising the emoluments of such as were formerly small. Important changes have also been made in the manner of electing exhibitioners. The introduction to a larger extent of the professorial system, if attendance on the lectures by the under-graduates is strictly enforced, cannot fail to be a valuable aid to the tutors.

Oxford.

Chancellor

The highest officer in the university is the Chancellor, who is elected by the members of convocation, and now holds his appointment for life. In the thirteenth century the chancellor was nominated by the regents and non-regents, and confirmed by the bishop of Lincoln, who was then the diocesan of Oxford. After the reign of Edward III. he was elected and confirmed by the regents and non-regents only. Till 1484, the office was held only for one, two, or three years, and was always conferred on a resident ecclesiastic. Sir John Mason, who was elected in 1552, was the first lay chancellor. For nearly two hundred years the office has been conferred on noblemen of distinction, who have been members of the university. The duties of the chancellor are, to protect the privileges of the university, and to decide, either in person or by deputy, in any civil questions in which a member happens to be involved.

High Steward.

The Seneschallus, or High Steward, is appointed by the chancellor, with the approval of convocation, and holds his office for life. The high steward assists the chancellor, vice-chancellor, and proctors in the execution of their respective duties, and defends the rights, customs, and liberties of the university. If required by the chancellor, he hears and determines capital causes, according to the law of the land and the privileges of the university, when a scholar or privileged person is the party offending. He likewise holds the university court-leet, at the appointment of the chancellor or vice-chancellor, either by himself or deputy.

Vice-Chancellor.

The vice-chancellor is in effect the supreme judicial and executive authority in the university; his court, in all matters of law, being governed by the common and statute law of the realm. He is annually nominated by the chancellor, from the heads of colleges; but the office is, in practice, held by rotation for four years. The vice-chancellor appoints four deputies, from the heads of colleges, who perform his duties in the case of illness, or necessary absence from the university. It is his duty also to make up and promulgate a register of the persons qualified to be members of the congregation of the university, and to make the necessary regulations for voting, &c.

Burgesses.

The university possesses the right of returning two burgesses as its representatives in the House of Commons, who are elected by convocation, every member of which has a vote. The poll is held by the vice-chancellor, and may continue for five days. Candidates must be proposed, but it is not usual for the nomination to be seconded.

Proctors.

The proctors (*procuratores*) are two in number, who must have completed four years, and not have reached the sixteenth year from their regency. They are chosen from the several colleges separately, or halls conjointly, according to a cycle which passed convocation in 1856. The election is made by the common suffrage in colleges of the heads and fellows, and in halls of the principals and vice-principals; and, in either case, of all members of convocation being also members of congregation of the respective colleges or halls from which the proctor is to be chosen. The proctors, after taking the oaths of office, nominate each two members of the university, who must be of three years' standing from the time of taking their degree, to be their respective deputies, to whom the official oaths are likewise administered by the vice-chancellor. Their duties are, to preserve the peace of the university, in which they are assisted by their deputies, and have under their command the academical constabulary force; to repress disorders among the students, and to inflict summary academical punishments, as the imposition of tasks, confinement to college, &c. They have also an extensive police jurisdiction in the town. Their summary authority extends both to under-graduates and bachelors of arts.

Legislative government.

The legislative government of the university is vested in three bodies,—the Hebdomadal Council, Congregation, and Convocation; the last two of which are technically called "Houses."

Hebdomadal Council.

The Hebdomadal Council consists of the chancellor, the vice-chancellor, the proctors, six heads of colleges or halls, six profes-

Oxford.

sors of the university, and six members of convocation, of not less than five years' standing; the chancellor, or in his absence the vice-chancellor or his deputy, if a member of the council, being president. The heads of colleges and halls, professors, and members of convocation, are elected by congregation for six years; and all members of the council, with the exception of the chancellor, must be resident. The functions of the council are, to maintain the discipline, and transact the ordinary business of the university; to deliberate upon all matters relating to the preservation of its privileges and liberties; and to inquire into and consult respecting the due observance of statutes and customs. All letters of the chancellor, in the case of dispensations, which are addressed to convocation, must, previous to a recital in the "House," be sanctioned by the council. It possesses, moreover, the power of making rules for the regulation of its own proceedings; and the right, though no longer the exclusive right, of initiating measures to be submitted to congregation.

House of Congregation.

The House of Congregation is composed of the chancellor, the high steward, the vice-chancellor, the heads of colleges and halls, the canons of Christ's Church, the members of the Hebdomadal Council, certain university officers, the professors, assistant, or deputy professors, the public examiners, &c., and resident masters of arts, the chancellor being president; and in his absence, the vice-chancellor or his deputy. Subject to any statute of the university thereanent, congregation possesses the power to frame regulations for the order of its own proceedings; and all measures emanating from the Hebdomadal Council must be promulgated in it; and may be adopted, amended, or rejected, as the "House" may see fit. Congregation, as well as the Hebdomadal Council, enjoys the right of framing statutes, and of bringing them before convocation. On the promulgation of any statute, the members are allowed to speak thereon in English. In the sole instance of supplications for graces, but in no other, every member of the "House," in addition to his right of suffrage, has a suspending *negative* upon each grace for three times, as the grace is proposed in three distinct congregations; but previously to the fourth supplication, he is required to state privately to the vice-chancellor and proctors the ground and proof of his objection, which are subsequently submitted to the judgment of the house for approbation or rejection. All suffrages for or against graces and dispensations in congregation are to be whispered secretly into the ear of the proctor, by a majority of which, given in the word *placet* or *non-placet*, the fate of the measure is ultimately determined.

House of Convocation.

The House of Convocation, which is, with some limitations, composed of regents and non-regents alike, extends its power to all subjects connected with the credit, interest, and welfare of the university. In the exercise, however, of one particular branch of its privileges, the enacting of new or the explaining of old statutes, some restriction is prescribed. No proposition to explain or amend a royal or Caroline statute (statutes enacted by Charles I.) can be received without royal permission. A proposition to enact any other new statute, or explain an old one, must be previously referred to the Hebdomadal Council, which, if it approve the proposition, draws up the terms in which it must be submitted to convocation.

In both houses the chancellor or vice-chancellor singly, and the two proctors jointly, are officially invested with an absolute *negative* upon all proceedings, except in elections. When the negative of these officers is not interposed (an interposition nearly as rare as the royal veto in Parliament), every question is decided by a majority. All elections, except for members of Parliament, are made by a private scrutiny, in which the vice-chancellor presides, and the two proctors are scrutators.

Professorships.

The professorships are of two kinds; those instituted by the crown, and those established by private endowment. The regius professors are appointed by the crown, the others according to the will of the founders. The professors as such have, for two centuries at least, had little direct concern with academical instruction or discipline. Attendance on their lectures was not, except in a few merely formal instances, necessary for the attainment either of university rank or college emolument; although, for the purpose of being admitted to holy orders, it was necessary for bachelors of arts to attend the lectures of the regius-professor of divinity for a short time, unless they obtained a dispensation. It is to be hoped that, under the new statutes, this defect will be greatly remedied.

The following is a list of the professorships, readerships, &c., with the date of their foundation:—

Regius Professor of Divinity	1535
" " Civil Law	1546
" " Medicine and Tomlin's Praelector of Anatomy	1535 / 1623
" " Hebrew	1540
" " Greek	1540
Regius Professor of Ecclesiastical History	1842
" " Pastoral Theology	1842
" " Modern History and Modern Languages	1724
Rawlinsonian Professor of Anglo-Saxon, &c.	1795
Margaret Professor of Divinity	1497
Sedleian Professor of Natural Philosophy	1618
Savilian Professor of Geometry	1619
" " Astronomy	1620
Camden's Professor of Ancient History	1622
Professor of Music	1626
Choragus	1626
Laudian Professor of Arabic	1636
Sherardian Professor of Botany, and of Agriculture	1728
Professor of Poetry	1708
Vinerian Professor of Common Law	1755
Clinical Professor	1780
Lord Almoner's Reader in Arabic	1636
Lord Lichfield's Clinical Medicine	1780
Aldrichian Professor of Chemistry	1803
Professor of Political Economy	1825
White's Professor of Moral Philosophy	1621
Boden's Professor of Sanscrit	1830
Teacher of Hindustani	1859
Ireland's Exegetical Professor	1847
Professor of Modern Languages	1848
Professor of Latin Language and Literature	1854
Lee's Lecturer in Anatomy	1750
Professor of Experimental Philosophy	1700
Reader in Mineralogy	1683
Reader in Geology	1683
Professor of International Law and Diplomacy	1859
Waynflete Professor of Moral and Metaphysical Philosophy	1859
Reader in Logic	1839

Oxford.

Public Orator.

The Public Orator is chosen by convocation, and must be at least either a bachelor in the civil law or master of arts. He writes letters and addresses on public occasions, presents those on whom the honorary degree of master of arts is to be conferred, and delivers the annual Creweian oration alternately with the professor of poetry.

Matriculation.

Every student admitted to the university is entered on the books of some college or hall. If there is room for him in the college, he may commence residence immediately on matriculation; but this is not necessarily required of him till two terms have elapsed. Lodging in the town is in no case allowed to men under twelve terms residence. There is no difference in respect of priority of degree, admission, &c., between gentlemen-commoners and commoners. The only privileges of the former consist in a particular dress, and in a separate table at the college dinner, with some trifling indulgences in particular colleges. The fees at matriculation are: for a servitor, or bible-clerk, 10s.; for a nobleman, or the eldest son of a peer, L.8; for privileged persons not claiming immunity, L.5; for all others, L.2, 8s.

Tuition.

The student, on entering his college, is assigned to the superintendence of some one of the tutors. This, however, in most of the colleges, is little more than a form, as the tutors, who are generally three, four, or five in number, usually divide among themselves the discipline and instruction of the college: and the student is equally under the superintendence of all. The instructions of the tutors are directed solely to the preparation of the students for taking a degree, and consist of catechetical lectures, mixed with reading and discussion, on a portion of some classical or mathematical book in common use at the university examinations. Of these lectures the students at first generally attend three or four daily. In the colleges which have a considerable number of undergraduates, divinity is usually taught by the dean, and mathematics by a separate tutor; but, with these exceptions, there is not much division of labour between the tutors in the same house. The subjects which form the academical education may be taken indifferently by any. Besides the class lectures, the tutors have from time to time meetings with their pupils separately, for the purpose of ascertaining more exactly their state of preparation for the public examination, consulting with them on the most effectual means of removing their peculiar difficulties, and arranging generally their plans of study. They also prescribe weekly exercises in composition, in Greek, Latin, and English. In this department, however, the college tutors are not the sole labourers. Although

Private Tutors.

recognised neither by the universities, nor by any particular college, a very numerous class has long existed both at Oxford and Cambridge, who, under the denomination of *Private Tutors*, superintend and assist the studies of the under-graduates. Without interfering with the operation of the college lectures, they are occupied rather in securing for the student the best use of them,

Oxford.

and, in the latter part of his course, in preparing him generally for his public examination. The fee of a *private* tutor at Oxford is L.50 a year; at Cambridge, where the academical year is somewhat shorter, L.40. The course of college lectures closes at the end of each term, with a formal examination of the students separately, by the Head and tutors. This summing up of the business of the term is called *collections* or *terminals*, and occupies from two days to a week, according to the size of the college or hall.

Terms.

The academical year is divided into four terms: 1. *Michaelmas*, which extends from the 10th of October to the 17th of December; 2. *Hilary*, from the 14th of January to the day before Palm Sunday; 3. *Easter*, from the tenth day after Easter Sunday to the day before Whitsunday; 4. *Trinity*, from the first Wednesday after Whitsunday to the Saturday after the act, which is always on the first Tuesday in July. The year of academical residence thus includes nearly seven months. The following are the times requisite for obtaining the different degrees. The B.A. degree is the only one for which residence is indispensable,

Terms and fees.

Bachelor of Arts (B.A.); twelve terms of actual residence, for all except the sons and the eldest sons of the eldest sons of peers and peeresses in their own right, baronets, and the eldest sons of baronets and knights, who are admissible to their degree after having completed two years' residence. Fee, L.7, 10s.

Master of Arts (M.A.); Bachelors of Arts can proceed to their degree in the twenty-seventh term (in the privileged cases twenty-third) from their matriculation, provided they have kept their name on the books of some college or hall for twenty-six terms. Fee, L.12.

Bachelor in the Civil Law (B.C.L.); for those *proceeding through Arts*, twelve terms, or three whole years, computed from the day of admission to the regency. If a candidate be not M.A., he may take his B.C.L. degree in the twenty-seventh term from his matriculation, provided he has resided twelve terms in some college or hall, and has undergone his examination for his B.A. and B.C.L. degree. Every B.C.L., after the expiration of the twenty-sixth term from his matriculation, may be admitted, on conforming to the usual declaration and subscriptions, to his M.A. degree, retaining the bachelor's degree of his faculty. Fee, L.6, 10s.

Doctor in the Civil Law (D.C.L.); after *proceeding through Arts*, four years from the time at which the bachelor's degree was conferred; (*if not*, five years), shortened to four for those who intend to practise at Doctors' Commons. Fee L.40.

Bachelor in Medicine (M.B.); three years, or twelve terms' residence, as in the case of candidates for degrees in arts, with whom they must undergo a public examination, after which three years further are necessary. Fee, L.14.

Doctor in Medicine (M.D.); three whole years after taking the bachelor's degree. Fee, L.40.

Bachelor in Divinity (B.D.); seven years from the regency. Fee, L.14.

Doctor in Divinity (D.D.); four years after taking the bachelor's degree. Fee, L.40.

Degrees in Music are merely honorary. Fee for bachelor, L.5; for doctor, L.10.

Besides the above fees, every member of the university pays L.1, 6s. annually, in four quarterly payments, as university dues. After graduation this payment may be compounded for. All under-graduates are called upon to pay fees on entering their names for their respective examinations, viz.:—for responsions, L.1; the first public examination, L.1, 1s.; the final examination, L.1, 1s.; for admission into any second school, 10s.; for examination in the civil law, L.1; and in medicine, L.1. The fee for tuition varies at the different colleges, but seldom exceeds L.20 per annum.

Degrees.

By a statute passed in 1850, four schools were established, viz., literæ humaniores, mathematics, natural science, and law and modern history; and a certificate from two of these, of which the literæ humaniores must be one, is required for a degree.

Public Examiners.

The examinations are conducted by 16 public examiners, 4 for the school of literæ humaniores, and 3 for each of the other schools; 7 moderators, and 4 masters of the schools; all chosen from among those who have taken the degree of Master of Arts, or Bachelor in Civil Law or Medicine. They are nominated by the vice-chancellor and proctors, and must be afterwards approved by congregation and convocation. Two masters of the schools must always be present at Responsions; and in the absence of the proctors, they are invested with procuratorial power.

Requirements for degrees in Arts.

Candidates for degrees in Arts must undergo three examinations:—1. *Responsions*, i.e., the answering of questions publicly proposed by the masters of the schools (held three times in the year), and to be passed previous to the sixth term. *Subjects:* One Latin, one Greek author, or a portion of each; arithmetic to the extraction of the square root; algebra to simple equations, or two books of Euclid; a passage in English to be translated into Latin, with a paper of grammatical questions, and a paper of arithmetical or mathematical questions. There is also a *viva voce* examination.

2. The *First Public Examination* (held twice in the year), as early as the seventh or as late as the tenth term of standing. *Subjects—Minimum:* The four Gospels in Greek; one Greek and one Latin author, of which one must be a poet and the other an orator; a passage of English to be translated into Latin; a paper of grammatical questions, and a paper of mathematical or logical questions. Pass-men must bring up either logic or three books of Euclid and algebra. Honours are awarded at this examination in classics and pure mathematics. Candidates for classical honours are required especially to bring up poets and orators; and either logic or three books of Euclid and algebra. The highest honour cannot be obtained without logic. Philological and critical questions, as well as Greek and Latin translations, form an integral part of the examination. 3. *The Public Examination* (held twice a year) in two schools at least, as early as the twelfth, and for honours as late as the eighteenth, term of standing. *First School*, literæ humaniores, which must be passed first and by all. *Subjects—Minimum:* The four Gospels and the Acts of the Apostles, sacred history, the evidences and the thirty-nine articles, one philosopher, one historian. *For Honours:* In addition to the above, the Greek and Latin languages, Greek and Roman history, chronology, geography, antiquities, rhetoric and poetics, moral and political philosophy. Logic is indispensable in candidates for first or second class honours. For a degree one other school must be passed at the choice of the candidate, and honours are conferred in them also on the same principles. Oxford.

Classes.

When the examinations are concluded, the names of those who have honourably distinguished themselves, by passing a good examination in a wider range than that necessary for a mere degree, are distributed according to their position in the four schools. In each school the successful candidates are arranged in four classes according to merit. In a fifth class, which contains the pass-men, the number is given, but the names are withheld. The examinations for fellowships, scholarships, &c., are conducted in the same manner as those for honours; and colleges now generally set apart a proportion of their fellowships and scholarships for those who attain to the highest mathematical distinctions.

For degrees in divinity certain disputations are held in presence of the regius professor. Candidates for degrees in medicine are examined in the theory and practice of medicine, in anatomy, physiology, and pathology, &c., by the regius professor and two examiners; and for the highest degree, a dissertation on some medical subject is required. Candidates for the degree of D.C.L. must read in the presence of the regius professor a dissertation on some subject illustrating the civil law; and for degrees in music, candidates must undergo an examination, and compose a piece of music of four parts at least, with organ accompaniment. The first three degrees can be obtained only by those who have passed a bachelor's examination in arts.

Extra-academical examinations.

In June 1857, a statute was passed by convocation, having for its object the examination of candidates not being members of the university; the examinations to take place annually, and the candidates to be examined in two classes:—1st, those of eighteen years of age; and 2d, those of fifteen years of age. Each candidate who has satisfied the examiners receives a *testimonium*, and the seniors assume the title of "associate in arts." Each candidate pays an admission fee—for the junior examination, 5s.; for the senior, L.1, 10s. The examiners, time, and plan of examination, and other particulars, are arranged by a delegacy appointed under the authority of the statute. In June last (1859) 399 seniors and 597 juniors were examined; of these 101 seniors and 167 juniors obtained honours; and 150 seniors and 165 juniors passed without honours, and 148 seniors and 265 juniors failed.

Expense.

The expenses of an under-graduate vary so materially, according to the taste and habits of each individual, that it is impossible to present any satisfactory statement of them. The whole expenditure, exclusive of a private tutor's fee, an expense which is incurred only by those who are preparing for honours, of such commoners as live on the most economical scale, has been estimated from L.150 to L.250 a year. The ordinary college account, including university and college fees of all kinds, boarding, lodging, washing, coals, and servants, varies from L.60 to L.100 at different colleges, for commoners, and from L.30 to L.40 more for gentlemen-commoners. The students dine together in the college hall, sitting at different tables according to their ranks and degrees. Their remaining meals are taken in their own rooms. The university, as a corporation, possesses very little property except the libraries and public buildings; and of these the most important have been raised either by the munificence of individuals or by public subscription. The estates which have been bequeathed to it have been appropriated either to the endowment of certain professorships, or to the augmentation of the libraries.

For the Bodleian Library, Clarendon Press, &c., see LIBRARIES and OXFORD.

Cambridge.

The following are the existing Colleges and Halls at Oxford, in the Order of their Foundation.

Cambridge.

Names.	Date of Foundation.	Founders.	Visitors.	On the Foundation.	Members in 1860. Of the Convocation.	Members in 1860. Total on the Books.	Patronage, Advowsons.
1. University Coll.	1253	William of Durham.....	The Queen.....	Master, 13 fellows, 17 scholars, & 15 exhibitioners.....	166	286	10
2. Balliol College..	between 1263 and 1268.....	John Balliol of Bernard Castle, & Dervorguilla his wife....	Bishop of Lincoln	Master, 12 fellows, 10 scholars, & a considerable number of exhibitioners; 10 from the university of Glasgow.....	193	392	20
3. Merton College	1264, removed to Oxford 1274.....	Walter de Merton, bishop of Rochester...	Archbishop of Canterbury...	Warden, 22 fellows, 14 post-masters, 4 scholars, 2 chaplains, & 2 clerks.....	108	181	18
4. Exeter College..	1314	Walter de Stapleton, bishop of Exeter.....	Bishop of Exeter.....	Rector, 21 fellows, and 16 scholars and exhibitioners, and 2 Bible-clerks.....	318	545	12
5. Oriel College....	1326	Adam de Brome.....	The Queen.....	Provost, 16 fellows, 8 scholars, and 18 exhibitioners.....	207	391	13
6. Queen's Coll.....	1340	Robert de Eglesfield.....	Archbishop of York.....	Provost, 23 fellows, 10 taberdars, 4 scholars, 24 exhibitioners, &c.	156	256	29
7. New College.....	1386	William of Wykeham, bishop of Winchester.....	Bishop of Winchester	Warden, 70 fellows and scholars, 7 chaplains, 6 scholars, an organist, 3 clerks, & 16 choristers...	120	189	36
8. Lincoln Coll.....	1427	Richard Fleming, bishop of Lincoln.....	Bishop of Lincoln	Rector, 12 fellows, 22 scholars, & 3 Bible-clerks.....	134	202	11
9. All Souls Coll...	1437	Henry Chichele, archbishop of Canterbury	Archbishop of Canterbury...	Warden, 34 fellows, 2 chaplains, and 4 Bible-clerks.....	97	115	17
10. Magdalen Coll..	1458	William of Waynflete, bishop of Winchester	Bishop of Winchester.....	President, 36 fellows, 30 demies, schoolmaster, usher, 4 chaplains, organist, 7 clerks, and 16 choristers.....	166	242	38
11. Brasenose Coll..	1509	William Smith, bishop of Lincoln, and Sir Richd. Sutton, Knt..	Bishop of Lincoln.	Principal, 16 fellows, and a considerable number of scholars & exhibitioners.....	274	428	42
12. Corpus C. Coll..	1516	Richard Fox, bishop of Winchester	Bishop of Winchester	President, 20 fellows, 20 scholars, 2 chaplains, & 7 exhibitioners..	101	180	22
13. Christ Church...	1525	Cardinal Wolsey, suspended by Henry VIII., and re-established in 1532.....	The Queen.....	Dean, 7 canons, 104 students, 7 chaplains, organist, 8 singing-men, and 8 choristers.....	463	840	91
14. Trinity College	1554	Sir Thomas Pope, Knt...	Bishop of Winchester	President, 10 fellows, 13 scholars, and 3 exhibitioners	187	307	9
15. St. John's Coll..	1555	Sir Thomas White, Knt.	Bishop of Winchester	President, 54 fellows and scholars, chaplain, organist, 6 singing-men, and 8 choristers.....	227	331	29
16. Jesus College....	1571	Hugh Price, LL.D., treasurer of Saint David's	Earl of Pembroke	Principal, 18 fellows, 16 scholars, and nearly 30 exhibitioners.....	82	153	22
17. Wadham Coll...	1613	Nicholas Wadham, Esq., & Dorothy his wife.....	Bishop of Bath and Wells.....	Warden, 15 fellows, 18 scholars, 2 chaplains, 2 clerks, and a number of exhibitioners.....	162	301	9
18. Pembroke Coll..	1624	Thomas Tesdale, Esq., and Richard Wightwick, B.D.....	Chancellor of the university	Master, 15 fellows, & 29 scholars and exhibitioners	126	238	13
19. Worcester Coll..	1714	Sir Thos. Cookes, Bart...	Bishops of Oxford & Worcester, & vice-chancellor of university....	Provost, 20 fellows, 16 scholars, 3 exhibitioners, & 2 Bible-clerks.	189	321	8
20. St Mary Hall...	1333	...	Chancellor of the university	Principal, 4 scholars, and 1 exhibitioner.....	49	71	...
21. Magdalen Hall	1487	...	Ditto	Principal, vice-principal, 8 scholars, and 4 exhibitioners.....	137	255	1
22. New Inn Hall...	1438	...	...	Principal.....	16	29	...
23. St Alban Hall..	About 1550..	...	...	Principal and vice-principal.....	7	20	...
24. St Edmund Hall	About 1269..	...	...	Principal, vice-principal, and 10 exhibitioners.....	42	64	...
25. Litton's Hall....	1855	...	...	Licensed master.....	1	8	...
					3828	6345	450

Matriculations, 1859..... 419
Masters..... 258
Bachelors..... 300

UNIVERSITY OF CAMBRIDGE.

Origin.

It is probable that Cambridge first became a seat of education in the seventh century, when, according to Bede, Sigebert, king of the East Angles, with the assistance of Bishop Felix, instituted in his kingdom a school for learning, in imitation of those which he had seen during his exile in France. This school is supposed to have been fixed at Cambridge, which then bore the name of Cairgrant, and was one of the most celebrated towns in Britain, though the fact is not asserted by Bede. How long the school thus founded continued to flourish, we are not informed; but the complaint of Alfred that, in his youth, when he had leisure to be instructed, he could not find

Cambridge. teachers, would lead to the inference that in his time no public seminaries existed. The merit of restoring, or probably of founding, the school which formed the nucleus of the future university, is ascribed to Edward the Elder, son of Alfred, who appears, from the chronicle of Hyde Abbey, to have erected, "at his own expense, halls for the students, and chairs and seats for the doctors;" at the same time appointing teachers, and adopting other necessary measures, which seemed to secure the stability of the institution. The importance of the town, however, rendered it liable to numerous vicissitudes, and exposed it to the ravages of the Danes and Saxons. In the year 1010 it was burnt and plundered by the Danes; and towards the end of the eleventh century, William the Conqueror destroyed a part of it, to make room for the fortress which he found it necessary to erect for the purpose of overawing the refractory monks of Ely. In all these reverses of fortune the scholastic establishments had their full share.

History. The reign of the succeeding monarch was not more favourable to the tranquillity of the town, and the schools were, therefore, for some time abandoned. Henry I., who is said to have been educated at Cambridge, conferred on the town some valuable privileges, and induced the wandering students to return to their former dwellings. In his reign (1109) Joffred, abbot of Croyland, "sent to his manor of Cottenham, near Cambridge, Gislebert, his fellow-monk, and professor of divinity, with three other monks who had followed him into England. These being well versed in philosophy and other sciences, went daily to Cambridge, and, having hired a public barn, made open profession of their sciences, and in a little time collected a great concourse of scholars. In the second year after their arrival, the number of their scholars from the town and country increased so much, that there was no house, barn, or church capable of containing them. For this reason they separated into different parts of the town, imitating the plan of the University of Orleans." An old building is still pointed out as the representative of the barn in which these missionaries taught. The number of students continued to increase, and the school gradually acquired celebrity, till 1174, when nearly the whole town was consumed by a fire "so merciless," says Fuller, "that it only stopped for want of fuel to feed its fury." From this disaster the seminary appears to have speedily recovered; and, in 1209, it received an accession of numbers from Oxford, in consequence of an act of severity on the part of King John, which has been already alluded to. This, according to Hallam, is the earliest authentic mention of Cambridge as a place of learning; though he admits the reasonableness of the conjecture, that the Oxford scholars would not have removed to a town so distant, if it had not already been the seat of academical instruction. Cambridge was not yet permitted to enjoy the tranquillity which is indispensable for the successful prosecution of study. In the year 1215, during the contentions between King John and his barons, the town was laid waste; and it shared the same fate afterwards in the civil war under Henry III. Previously to this last disaster, the king had extended his patronage to the rising seminary, in consequence of some of the Parisian scholars who had accepted his invitation having settled there, and had by public letters confirmed the authority of the academical officers, and checked the disorders which from time to time manifested themselves. In these remote Cambridge. times, the students lodged in the houses of the citizens, or in *halls* or *inns* hired of them, under the superintendence of principals, who were responsible to the chancellor for the conduct of their pupils. The extravagant demands for Taxers. rent gave rise to numerous disputes between the scholars and townsmen, and drew from the king, in 1231, a public letter ordaining that lodgings or hostels (*hospitia*) "should be taxed according to the custom of the university—namely, by two masters and two respectable and lawful men of the town, and let to the scholars according to their valuation." This order was repeated in letters-patent of the same king, with the addition that the valuation should be renewed every five years. A similar regulation prevailed at Oxford.

The most important of the public instruments of Henry III., relative to the university, besides those already mentioned, are, his letter addressed to the sheriff of the county (*vice-comes*), calling upon him "to repress the insubordination of the clerks and scholars, and to enforce obedience to the injunctions of the Bishop of Ely, either by imprisonment or banishment from the university, according to the discretion of the chancellor and masters;" his letter to the Bishop of Ely, ordering that "clerks who were contumacious and rebellious against the chancellor should be imprisoned or banished from the town;" and his letter addressed to the sheriff, in the twenty-sixth year of his reign, in which it is ordered that "when any clerk of the university of scholars studying at Cambridge, has been guilty of any misdemeanour, and has been convicted by the university, and sentenced to imprisonment, if the burgesses of the town are negligent in carrying the sentence into effect, or are unable to do so, the sheriff, on the warrant of the chancellor, is to cause such malefactor to be committed to prison, and kept in safe custody, until the chancellor demand his liberation." The mixture of jurisdictions implied in these documents is singular; the authority of the Bishop of Ely, as diocesan, is distinctly recognised; but delinquents are to be tried by the chancellor and masters, and the civil power of the sheriff is necessary to carry their sentence into execution. It likewise appears, from what has already been stated, that Cambridge, though not yet incorporated, was recognised as a university,[1] and received a support from the civil power which was not given to the continental universities. A more explicit recognition of the privileges of the university is found in a royal enactment of the 45th of Henry III. (1260), prohibiting "the king's justices from interfering in hearing and determining offences between scholars and laymen;" meaning by the latter term those who were not scholars.

The royal support thus given to the university was not sufficient to check the spirit of insubordination among the scholars, nor to prevent them from engaging in frequent conflicts with the townsmen. On one occasion the students from the north and south, arranged on opposite sides, espoused the cause of two of their countrymen who had quarrelled, and proceeding from words to blows, threw the university and town into the utmost disorder. The chancellor interfered, but academical authority was too weak; and the townsmen who were called to his aid, mixing in the fray, contributed only to increase the confusion. Public plunder, burning of records, and every species of horror

[1] Mr Dyer states (*Privileges*, i., 412, note), that he finds the term *University* applied to Cambridge in a public instrument of 1223. Hallam (*Middle Ages*, iii., 527, note) assigns the date of its first incorporation to the fifteenth of Henry III., or 1231; but in Hare's *Register of the Charters*, and other monuments of the liberties and privileges of the university, which is the authority on which the university relies, there is no charter of incorporation of this year, or indeed any of this monarch. It is probable, therefore, that Hallam has mistaken one of the public letters for a charter of incorporation. (Malden, pp. 93, 94.) "Wherever," says Dyer, "we choose to make our stand, whether at the diploma of Henry III., which is undoubtedly authentic, or any which preceded him, that are of doubtful authority, they all suppose the existence of a university, but say nothing of its creation; nor, indeed, from the meaning of the word, does it seem to have been necessary; the word was previously in use, and suited to a literary as well as any other body, so it was insensibly adopted, without annexing to the term any of that charm attached to it in later years." (*Privileges*, i. 385.)

Cambridge.

ensued. The king sent a delegate to inquire into the disputes, and to cause summary justice to be executed on some of the delinquents. Sixteen of the townsmen were hanged, and others belonging both to the university and town took refuge in the religious houses, or were committed to the common gaol. By this means peace was restored; but many of the scholars retired to Northampton, where they were allowed by the king to form themselves into a literary society.[1] These tumults were likewise increased by the tournaments which were held at Cambridge during the thirteenth century, and which not only interrupted the studies of the university during their continuance, but gave rise to animosities which did not easily subside. To remove this impediment to learning, Henry III. issued letters-patent, which were confirmed by Edward II., forbidding any tournament from being held within 5 miles of the town.

Composition.

The most important document of Henry III. is the famous Composition (1270) between the scholars and burgesses, confirmed by royal authority, which ordained that "a certain number of the scholars and the townsmen should be bound by oath to take the names of all the principal houses in the town, and of those who dwelt in them, so that no person should be lodged therein who could disturb the public peace." Offenders who could not be expelled by the authorities of the university and town, were to be denounced before the king and his council. The effects of this arrangement were beneficially felt by the university; and accordingly the current of its history was not disturbed by any violent agitations during the next century. In the year 1381, the hostility of the townsmen to the students displayed itself with great violence, which led to the destruction of the charters of the university, and those of Bennet College. After numerous other acts of violence, the tumult was suppressed by the Bishop of Norwich, and the principal leaders were punished. The mayor was deprived of his office, and the liberties of the town were declared forfeited, and bestowed on the vice-chancellor, in whom they were vested till the reign of Henry VIII., when the corporation was restored, though several of its former privileges were retained by the university.

Charters.

The university obtained its first formal charter of privileges from Edward I. in the twentieth year of his reign (1291). This charter, besides confirming the letters of Henry III. and the Composition, conferred upon the university some new privileges, among which was one, that no one imprisoned by order of the chancellor should be liberated by the mayor and bailiffs under pretext of a king's brief formerly issued. Charters more and more ample were granted by Edward II., Edward III., Richard II., and Henry IV., in the beginning of their respective reigns, as we have already found to be the case with the University of Oxford. By these charters the university obtained the control over victuallers of all sorts, with power to punish *regraters* and *forestallers*, and to deliver scholastics and clerks from prison; and all causes in which they were concerned, relating to laws, letting of houses, &c., were made cognisable before the vice-chancellor or his commissary. The jurisdiction of this officer was extended to all cases, whether civil or criminal, except those of mayhem and felony, in which one of the parties was a master or scholar. The assize of bread, wine, and beer, with the supervision of weights and measures, which had formerly belonged to the magistrates of the town, were exclusively lodged in the university; and for these privileges the university was to pay into the exchequer a yearly tribute of ten pounds. The mayor and bailiffs of the town were sworn every year, before the vice-chancellor, to keep the peace of the university. Cambridge.

Confirmation.

So far as the extant documents enable us to judge, Cambridge was not much troubled by papal bulls and rescripts; and was less exposed than the sister university to ecclesiastical interference at home. When Edward II., in the tenth year of his reign (1316), granted to the university a charter containing some additional privileges, he solicited a confirmation of them from the papal see. A bull was accordingly issued at Avignon, by John XXII., in the second year of his pontificate (1318), which, after confirming the privileges conferred by former popes and former kings of England, ordains "that there shall be thenceforth at Cambridge a *studium generale*, and that every faculty shall be maintained there; and that the college and masters of the said *studium* shall be accounted a university, and enjoy all the rights which any university whatsoever, lawfully established, can and ought to enjoy." From the date of this bull, Cambridge was recognised among the universities of Christendom.

Privileges.

We have already seen that the jurisdiction of the Bishop of Ely, as bishop of the diocese, was in ancient times distinctly acknowledged; but it was soon limited, partly by the concessions of the bishops themselves, and partly by papal authority. Hugh Balsham, the founder of St Peter's College, disclaimed (1275), by a public letter, any intention of derogating from the privileges of the university, or disturbing the jurisdiction of the chancellor, but required all suits to be brought before the chancellor, in the first instance, restricting himself to receiving appeals. In the following year the same bishop limited the jurisdiction of his archdeacon. Farther limitations in the power of the bishop were made in the early part of the reign of Edward III.; and in the thirty-sixth year of the same reign, letters-patent were granted, by which the scholars were protected from being summoned out of the university into any ecclesiastical court; and appeals to any ecclesiastical court whatever were prohibited in cases cognisable by the chancellor. These immunities were confirmed by royal letters to the Bishop of Ely in the 15th of Richard II. The university elected its chancellor and other principal officers, but the confirmation of the Bishop of Ely was anciently required. This confirmation was, however, dispensed with by a bull of Boniface IX. in 1401; and in 1430, Pope Martin V. appointed a commission to inquire whether the university by grant or custom was subject to the ecclesiastical jurisdiction of the chancellor, and exempted from that of *all others*; empowering his delegates, if they should find it so, to confirm, by his authority, that jurisdiction and exemption, which was accordingly done. The sentence of the delegates was ratified by a bull of Eugenius IV. in 1433. The university was thus relieved from the jurisdiction of the bishop of the diocese, but not from that of the archbishop of the province. Two examples of metropolitan visitation are recorded, the one in 1309, and the other in 1401; but in neither case does the archbishop appear to have acted on his own authority. Dyer shows that the former visitation was undertaken by the authority of letters-patent from the king. The proceedings of the latter, which had special reference to the heresy of Wycliffe, were confirmed by act of Parliament. The right of visitation and inspection is vested in the sovereign.

In the reign of Henry V. the university obtained two remarkable privileges. The one was a public statute, ordaining that none should practice the art of medicine except those admitted into the universities, and approved by them; offenders were to be punished at the discretion

[1] Dyer's *History*, i. 62. This *university* lasted only four years. The students were ordered by the king to return to Cambridge in 1264.

Cambridge. of the Privy Council. The other was a mandate from the archbishop, granted with the consent of the prelates of his province, that patrons should bestow ecclesiastical benefices only on graduates and students of the university. Some additional privileges were conferred by Edward IV. and Henry VII. The changes which took place in the religion of the state during the four succeeding reigns affected considerably the internal arrangements and prosperity of the university. Queen Elizabeth, in the third year of her reign, granted to it an extensive charter; and by the Act of Parliament 13 Eliz. c. 29, for the incorporation of the two English universities, this and all preceding grants from Henry III. downwards were confirmed, and the university was declared to be incorporated by the name of the "Chancellor, Masters, and Scholars of the University of Cambridge."

Colleges. Our materials do not enable us to give so minute an account of the collegiate foundations of Cambridge, and of other religious houses for the residence of students, as we have already given respecting those of Oxford. In the early part of the thirteenth century, the halls or hostels are said to have been very numerous, and to have been crowded with students. This is indeed implied in the public letters of Henry III.; and it would appear from the terms of the Composition, that the *hospitia*, to which it referred, were liable to fluctuation and change. The principal houses were those of St Mary, St Bernard, St Thomas, and St Augustin, assigned to artists; and St Paulinus, St Nicholas, St Clement, and Hovens, to students of the civil and the canon law. Several of these houses were at length deserted, and sunk into decay; others, being purchased by patrons of literature, and obtaining charters of incorporation, are represented by the present colleges. Caius says there had been twenty hostels, of which seventeen remained in his time. All the existing colleges have been founded since the beginning of the reign of Edward I.; and of these Peter House, or St Peter's College, was founded so early as 1257; five were incorporated during the succeeding century, four in the fifteenth, six in the sixteenth, and one, Downing College, so late as 1800. The term *hall* is not restricted, as at Oxford, to houses without endowment, but is used indiscriminately with *college;* nor has residence in some college or hall ever been strictly enforced on undergraduates as at Oxford.

Incorporation. The University of Cambridge was formally incorporated (13 Eliz., c. 29) by the name of the "Chancellor, Masters, and Scholars of the University of Cambridge," and consists of seventeen colleges, or societies, devoted to the study of learning and science. Each college is a body corporate, bound by its own statutes, but is likewise controlled by the paramount laws of the university; each furnishing members both for the legislative and executive government of the whole. The statutes of Elizabeth have hitherto been the foundation of the existing government, and have formed the basis of all the subsequent legislation; indeed, no grace of the senate was considered valid which was inconsistent with these statutes, and certain nearly contemporary interpretations of them, or with king's letters, which had been accepted and acted on by the university. By the recent university act, it is provided that the statutes of Queen Elizabeth, "for the government and regulation of the university, or such and so much of them, or of any of them, as shall be then unrepealed by any statute made under the authority of this act, shall be repealed, but not so as to revive any statute of the university thereby repealed." The principal officers of the university have nearly the same offices and titles as at Oxford—namely, the chancellor, high steward, vice-chancellor, commissary, public orator, assessor, two proctors, a librarian, a registrary, two moderators, professors, syndics, &c. The commissary is an officer under the chancellor, and appointed by him. He holds a court of record for all privileged persons and scholars under the degree of M.A. The duty of the assessor is to assist the vice-chancellor in his court *in causis forensibus et domesticis*. The Syndics are members of special committees of members of the senate, appointed by grace from time to time for specific purposes. The chancellor is always a nobleman, and is elected by the members of the senate. His office is biennial, or tenable for a longer period with the consent of the university. The other officers are elected nearly in the same manner as at Oxford. Cambridge, like Oxford, is represented in Parliament by two burgesses, who are chosen by the collective body of the senate.

Officers.

Cambridge

In 1856 an act, identical in its object, and similar in its provisions, to that already mentioned in the case of Oxford, obtained the sanction of parliament and of the crown. The preamble of the act declares its object to be, "to enlarge the powers of making and altering statutes, ordinances, and regulations, now possessed by the University of *Cambridge* and the colleges thereof, and to make, and enable to be made, further provision for the government, and for the extension of the said university, and for the abrogation of oaths now taken therein, and otherwise for maintaining and improving the discipline, and studies, and good government of the said University of Cambridge, and the colleges thereof." The commissioners appointed under the act sanctioned a new body of statutes drawn up by the council of the senate and adopted by the senate at large, and have issued various ordinances in accordance with its spirit, which have been approved by the Privy Council, and now form the statutes of the university. The university system at Cambridge having been all along more open and liberal than that of Oxford, there were fewer restrictions as to the election to fellowships, scholarships, &c., to remove; but these have been dealt with in the same way, and, with the exception of a few scholarships attached to particular schools, have been thrown completely open. All oaths enforcing concealment of matters relating to the colleges, resistance to, or non-concurrence in, any change in the statutes of the university or colleges; and also the oath formerly exacted on graduation, have been declared to be illegal. Other changes have been introduced, which are included in the following account of the present constitution of the university.

University act.

The legislative government of the university is, by the recent act, vested in two bodies; the *Council of the Senate*, and the *Senate* itself.

Legislative government.

The Council of the Senate consists of the chancellor, the vice-chancellor, four heads of colleges, four professors of the university, and eight other members of the senate, chosen from the electoral roll, published by the vice-chancellor. Two of the heads of colleges, two of the professors, and four other members of the senate, are elected by the persons whose names are on the electoral roll, on the 7th of November in every other year; and they all hold office for four years.

Council of the Senate

It is the duty of the vice-chancellor, on or before the second *Monday* in October in every year, to make up, and cause to be promulgated, a list of the members of the senate, resident for fourteen weeks previously within one mile and a half of *Great Saint Mary's Church;* and such list, together with all officers of the university, after having been submitted to, and approved by, the senate, forms the electoral roll for the year ensuing. The regulations as to voting for election, resignation, and return of members of the council, and for keeping the number complete, are made by the vice-chancellor. The council has the power to make, from time to time, rules for the regulation of its own proceedings, and to revise the regulations of the vice-chancellor. The president of the council is the chancellor, or, in his absence, the vice-chancellor or his deputy. No business can be transacted unless *five* members are present; and all questions are determined by the majority of the votes of the members present, the president having a second, or casting vote, when the votes are equally divided. Every university grace must be approved by the council before it can be offered to the senate.

Senate.

The senate consists of all masters of arts or law, or doctors in one or other of the three faculties—viz., divinity, law, and physic, having their names on the university register.

A few days before the beginning of each term, the vice-chancellor publishes a list of the several days on which a congregation or assembly of the senate will be held for transacting university business; these fixed days occur about once a fortnight; but in case of emergency, the vice-chancellor summons a congregation for the dispatch of extraordinary affairs; three days' notice of such congregations is required to be given. A congregation may be held without three days' previous notice, provided at least *forty* members of the senate be present at its assembling. An ordinary meeting is constituted by the presence of *twenty-five* members, including the proper officers, who are obliged to be present.

Graces.

No degree is ever conferred without a grace of the senate for that purpose. After the grace has passed, the vice-chancellor is at liberty to confer the degree. The grace, in this instance, is termed a *supplicat*. Every degree must have been allowed, or passed, by the college to which the candidate belongs. It is signed by the master or prælector of the college to which the candidate belongs, and the subscriber is made responsible for the assertion which it contains. Every member has a right to present any proposition, or grace, to the consideration of the senate; but previously to its being voted upon, it must be approved by the council. After passing the council it is read in the senate; and if the *placets* exceed

Cambridge. the *non-placets*, it is considered a regular act of the senate. An assembly of the senate held out of term time is called a *convocation*, in which case a grace is immediately passed to convert the convocation into a congregation, when the business proceeds in the ordinary manner.

Professors. The professors, as at Oxford, take but a subordinate part in the public education of the university. Many of them deliver courses of lectures, which are in general better attended and more celebrated than those in the sister university; but these are on branches of learning or science of recent growth, and not on subjects included in the ancient and regular studies of the place. Attendance on their lectures is only to a limited extent required for the attainment of degrees. Students proceeding to the lower degrees in the civil law and medicine are required to present certificates of attendance on the lectures of particular professors of these departments of knowledge. The professors are paid from various sources, and few of them are richly endowed. The endowments of the oldest foundations, which were very small, have been supplemented by estates left for that purpose, and by having tithe and ecclesiastical benefices attached to them; the others are provided for from the university chest. By a supplementary act, passed in 1858, the stamp-duties on matriculation, and the taking of degrees, were wholly abolished, on condition of the university paying certain specified salaries to the professors of modern history, civil law, chemistry, anatomy, botany, mineralogy, and the Jacksonian professor of natural and experimental philosophy. Education is conducted chiefly by the tutors of the various colleges, assisted, as at Oxford, by private tutors.

The following table contains a list of the professorships, lectureships, &c., with the date of their establishment:—

Lady Margaret's professorship of Divinity	1502
Regius professorship of Divinity	1540
„ „ Civil Law	1540
„ „ Physic	1540
„ „ Hebrew	1540
„ „ Greek	1540
Professorship of Arabic	1632
Lord Almoner's readership in Arabic	
Lucasian professorship of Mathematics	1663
Professorship of Moral Philosophy, or Casuistry	1683
„ „ Chemistry	1702
Plumian professorship of Astronomy and Experimental Philosophy	1704
Professorship of Anatomy	1707
Regius professorship of Modern History	1724
Professorship of Botany	1724
„ „ Geology	1731
Lowndean professorship of Astronomy and Geometry	1749
Norrisian professorship of Divinity	1768
Jacksonian professorship of Natural and Experimental Philosophy	1783
Downing professorship of the Laws of England	1800
„ „ Medicine	1800
Professorship of Mineralogy	1808
„ „ Political Economy	1828
Disney professorship of Archæology	1831
Professorship of Music	1684
Sir Robert Rede's lecturer	1524
Lady Margaret's preacher	1503
Sadlerian lecturers	1710
Christian advocate	1789
Hulsean lecturer	1789

Colleges. The organisation of the collegiate bodies, and their rules of government at Cambridge, vary from those of Oxford only in a few unessential particulars. The three ranks of independent under-graduates in the former university are noblemen, fellow-commoners (so called originally from having their commons, or college dinner, at the same table with the fellows), and pensioners. Lodging in college is not enforced on under-graduates if there be not room within the walls of the building to accommodate them. It is chiefly to this circumstance that the great increase of students at Cambridge of late years is to be attributed, the members of the other university being necessarily limited by the amount of room for lodging them. With regard to members on the foundation, the scholars of most colleges at Cambridge, being generally elected by free competition from among the under-graduate members, form a distinguished class among the students, rather than a body distinct from the independent members, and chosen without free competition, as was formerly the case at Oxford. A distinction exists between two different classes of fellowships in most houses at Cambridge, which is only partially known at Oxford, viz., between the foundation-fellowships and what are termed the bye-fellowships; the former being part of the original endowments, and generally open to all the world; the latter, founded by subsequent donations, and to some extent limited by local and other restrictions. In all the colleges, the governing body is composed of the foundation-fellows only; and they alone are generally elected to college office. It has been already stated, that the general usage at Cambridge is for each college to elect its fellows from among its own members, whether scholars or independent; the chief exceptions to this rule occur in the small colleges, when they are in want of some individual to fill the office of tutor, and no satisfactory candidate presents himself from their own number. Cambridge.

In general, it may be said that the Cambridge system is less strict in point of external discipline, and the under-graduates under rather less close control than at the sister university; on the other hand, that emulation and close attention to study are more favoured and encouraged. All the regulations, both of the colleges and university, tend in this direction. Open competition, and rank according to merit, form the cardinal principles of the academical constitution, as far as it relates to students, and the numerous college prizes give a powerful stimulus to exertion.

Terms. The academical year consists of three terms, viz., *Michaelmas*, beginning on the 1st of October, and ending on the 16th of December; *Lent*, beginning on the 13th of January, and ending on the Friday before Palm Sunday; and *Easter* or *Midsummer*, beginning on the Friday after Easter-day, and ending on the Friday after the last Tuesday but one in June. The time included in the three terms is nearly seven months. The mode of admission on the boards of a college is either by a personal examination before the tutors and officers, or through a recommendatory certificate, specifying the age, qualifications, &c., of the candidate, signed by a master of arts of either university, and accompanied by a deposit called caution-money.[1] This is generally done before the end of Easter term; and if the certificate be deemed satisfactory, the name is at once entered on the boards of the college, and the student usually comes into residence in the beginning of October following, when the academical year commences. The following are the principal regulations necessary for proceeding to degrees. Admission

Degrees. The distinguishing characteristic of this university has, for nearly two centuries, been the pursuit of mathematical studies, and of those branches of natural philosophy which depend on them. To these the lectures, both public and private, are prominently devoted, and thus present to the student the only means by which he can attain the honours and emoluments either of the university or of his college. The study of classical literature, on which the fame of the university originally rested, after having been long thrown into the shade by the preference given to mathematical science, has for many years been prosecuted to an extent not inferior to that in the sister university; and it is a curious fact that, notwithstanding this discouragement, Cambridge has produced the largest proportion of our most distinguished native philologists. Still, the encouragement now given to it has failed to raise it above a secondary position. The prizes for the encouragement of literature, free and open for competition to the whole university, amount to upwards of L.1500 annually, three-fourths of which are given for classics and English composition. The amount of the annual prizes in the different colleges is about L.800, more than the half of which is given for the encouragement of classical literature. Original composition forms no part of the examination for honours, but it is made a leading feature in the competition for scholarships and other prizes.

Terms for degrees. *Bachelor of Arts* (B.A.), nine terms, of which *two-thirds* of each term must be in residence. Noblemen, sons of noblemen, the relations of the king, with their eldest sons, baronets and knights, are admissible after having kept seven terms. Fee, L.7.

Master of Arts (M.A.), three years after taking a bachelor's degree. Fee, L.12.

Bachelor in Divinity (B.D. or S.T.B.), must be M.A. of seven years' standing. Fee, L.8.

[1] The caution-money for a nobleman is L.50; for a fellow-commoner, L.25; for a pensioner, L.15; and for a sizar, L.10. This money remains in the hands of the tutor or sponsor, and is not returned till a person takes his name off the boards. The fees paid to the Registrary for the common chest at matriculation are:—Nobleman, L.15, 10s.; fellow-commoner, L.10, 10s.; pensioner, L.5; sizar, 15s. Before admission to the previous examination, every candidate is required to pay the sum of 50s. to the common chest; and in each college a quarterly payment is made by each member of it, according to his degree and condition, on a scale which differs in the several colleges. The terminal payments for tuition of persons in *statu pupillari* in every college, are the following:—Nobleman, L.13, 6s. 8d.; fellow-commoner, L.10; pensioner, L.6; sizar, L.2; bachelor fellow-commoner, L.2, 10s.; bachelor of arts, if in residence, L.1, 10s.

Cambridge.

Doctor in Divinity (D.D. or S.T.P.), must be B.D. of five, or M.A. of twelve years' standing. Fee, L.20.

Bachelor of Laws (LL.B.), nine terms at least. AB.A. of four years' standing is also admissible to this degree.

Master of Laws (M.L.), three years after taking a bachelor's degree. Fee, L.7.

Doctor of Laws (LL.D.), five years after taking the M.L. degree. Fee, L.20.

Bachelor of Medicine (M.B.), must be of five years' standing, and must reside six terms in the university. Fee, if a B.A., L.2; if not, L.8.

Doctor of Medicine (M.D.), subject to the same regulations as an LL.D. Fee, L.10.

Bachelor in Music (Mus. B.), must enter his name in some college, and compose and perform an exercise in his art. Fee, L.8.

Doctor in Music (Mus. D.), generally a Mus. B., and his exercise is the same. Fee, when a candidate is Mus. B., L.10; when he has no degree, L.15.

Examinations.

The system of public examinations at Cambridge differs in many respects from that which prevails at Oxford; and, as these examinations are intended to exhibit the result of the academical instruction, a short account of them is here necessary.

Previous examination, or "Little go."

The first university or "previous" examination (popularly called the "Little go") takes place in the end of the Lent term of the second year from that in which the student commences his academical residence, and is conducted by eight examiners nominated by the colleges, and approved by the senate. The subjects of examination are one of the four Gospels, in the original Greek, Paley's *Evidences of Christianity*, and one of the Greek and one of the Latin classics, the *Elements of Euclid*, books i., ii., and iii., and arithmetic. Public notice of the subjects of examination in each year is issued in the Lent term of the year preceding. Every student is required to translate some portion of each of the subjects appointed, to construe and explain passages of the same, and to answer, both in writing and *viva voce*, such plain questions in grammar, geography, and history, particularly the Old Testament history, as may arise immediately out of the subjects. After the examination, the students are arranged in two classes; those who have passed with credit, and those to whom the examiners have only not refused their certificate of approval. Rejected candidates are required to attend a supplementary examination in the following October. A certificate of having passed this examination is indispensable for proceeding to the degrees of B.A., M.B., and LL.B., and to honours in the four triposes. Additional subjects of examination in mathematics are prescribed for those students who intend to be candidates for honours in mathematics, or classics, or law; and no student is admitted to examination as a candidate for such honours, who has not passed an examination in these additional subjects to the satisfaction of the examiners. The names of those who have passed the general previous examination, and also the examination in the additional subjects, to the satisfaction of the examiners, are placed alphabetically in one class.

The examinations for the ordinary B.A. degree take place in January of each year, and are conducted by examiners appointed by the senate. It may be premised, that the course of study preparatory to the degree of B.A. is comprehended under the three heads of natural philosophy, theology, and moral philosophy and the belles lettres. The first comprises pure and mixed mathematics; the second, the evidences of Christianity, the Greek Testament, Butler's *Analogy*, Paley's *Moral Philosophy*; and the third comprehends the most celebrated Greek and Latin classics. Besides a constant attendance on lectures, the under-graduates are examined in their respective colleges yearly or half-yearly, on the subjects of their studies; and, according to the manner in which they acquit themselves in these examinations, their names are arranged in classes, and some of those who obtain the honour of a place in the first class receive prizes according to merit. By this course the students are prepared for those *public* examinations which the university requires candidates for the degree to pass.

The examination of the questionists[1] who are not candidates for honours, embraces the following subjects:—The Acts of the Apostles in the original Greek, one of the Greek and one of the Latin classics previously published, the *History of the English Reformation*, Euclid, books i., ii., iii., and iv.; and Props. 1–6 of book vi.; together with such parts of algebra, mechanics, and hydrostatics as are prescribed by the schedule. In order to be admitted to this examination, every candidate is required to have attended the lectures delivered during one term at least, by one or more of a specified list of professors; and to present a certificate of having passed an examination satisfactory to one of the professors whose lectures he has attended.

Of the six examiners, two confine themselves to mathematics, two to classics, and two to moral philosophy. The examination lasts six days, and is conducted entirely by printed papers. The questions proposed are of an elementary character, and presuppose but moderate attainments on the part of the questionists. The examiners are strictly enjoined to take care that the number of the questions to be answered, and the length of the passages to be translated, in any one paper, do not exceed what a person well prepared may be expected to answer and translate in the time allowed. The candidates who pass this examination satisfactorily are arranged in four classes according to merit; the names in each class being placed alphabetically. No candidate is approved by the examiners, unless he show a competent knowledge of all the subjects of examination. The candidates belonging to all the classes are admitted to their degree by the vice-chancellor, at a congregation held for that purpose, on the last Saturday in January. Cambridge

Mathematical tripos

The examination of candidates for mathematical honours, technically called the *Mathematical Tripos*, is confined to pure and mixed mathematics. It commences in every year on the Tuesday after the 30th of December, is conducted by two moderators and examiners, and continues for eight days; the first three days being assigned to the more elementary, and the last five to the higher parts of mathematics. After the first three days there is an interval of eight days; and on the seventh of these days the moderator and two examiners declare what persons have so acquitted themselves as to deserve mathematical honours. The candidates thus selected, and no others, are admitted to the examination in the higher parts of mathematics; and after that examination, the moderators and examiners arrange all the candidates who have been declared to deserve mathematical honours; those between whom they cannot assign a difference of merit being *bracketed* as equal. At the close of the examinations the names of those who have most distinguished themselves are arranged according to merit, classed in three divisions, viz., wranglers, senior optimes, and junior optimes, which constitute the three orders of honour. The highest of all is the senior wrangler, for the year, "the greatest of English academical honours."

Classical tripos.

The *Classical Tripos* examination was instituted for the purpose of conferring academical honours for proficiency in classical learning, and commences on the fourth Monday after the last Saturday in January. The examination is superintended by the regius professor of Greek, the public orator, the professor of law (if such professorship be established), together with the examiners for the classical tripos in the current and two preceding years. All students who have passed satisfactorily the general previous examination, and the additional examination in mathematics, are admissible to this examination. It is conducted by four examiners; and extends over six days. The candidates are required to translate into English passages selected from the best Greek and Latin authors, and to give explanatory answers to questions arising immediately out of those passages; to translate also passages from English into Greek and Latin, both in prose and verse. There is likewise a paper on ancient history and classical antiquities. The names of those who pass the examination with credit are, by an arrangement similar to that of the mathematical tripos, placed in three classes. Those who obtain such honours are entitled to admission to the degree of bachelor of arts.

For the purpose of encouraging the pursuit of other branches of science and learning besides mathematics and classics, the university, by a grace which passed the senate in 1848, instituted *triposes* of honour in the *moral* and *natural sciences*, analagous to the mathematical and classical triposes; and all students who pass with credit the examination in either of these triposes are entitled to admission to the degree of bachelor of arts. No student is admitted to the examinations who has not passed the examination in the additional subjects of the previous examination.

Moral sciences tripos.

The *Moral Sciences Tripos* is placed under the management of the board of moral science studies, consisting of the regius professor of laws, the professor of moral philosophy, the professor of modern history, and the professor of political economy, together with the examiners in the current and two preceding years. The subjects of examination are:—Moral philosophy, mental philosophy and logic, modern history, political economy, and general jurisprudence. The examination commences on the last Monday in November, and is conducted by two examiners nominated annually by the board. The names of the students who pass the examination with credit are placed, according to merit, in three classes; the places being determined by estimating the aggregate merits of each student in all the subjects of examination.

Natural sciences tripos.

The *Natural Sciences Tripos* is placed under the management of the board of natural science studies, consisting of the professor of anatomy, the professor of chemistry, the professor of botany, the

[1] *Questionist* is the name given to a student during the last six weeks of preparation for taking his degree.

Cambridge. professor of geology, and the professor of mineralogy, together with the examiners in the current and two preceding years. The subjects of examination are:—Chemistry, botany, geology, mineralogy and zoology, with comparative anatomy and comparative physiology. The examination commences on the first Monday in December. The rules for conducting it, and also for the classification of the successful candidates, are the same as those of the moral sciences tripos.

Prizes. Besides the honour of occupying a high place in the tripos lists, Cambridge holds out to the ambitious student many strong inducements to exertion, in the prizes which are annually submitted for competition. Those to which the greatest degree of importance is attached are *Smith's Prizes*, the *Chancellor's Medals*, and the *University Scholarships*. The first are assigned to two commencing bachelors of arts, for proficiency in mathematics and natural philosophy; and as the competition takes place soon after the mathematical tripos, the adjudication of them forms a severe test of the accuracy of the previous decision. It sometimes happens that the judgment of the tripos examiners is reversed, and the second wrangler becomes first prizeman. The chancellor's medals are given to two commencing bachelors of arts, who must have been senior optimes at least in the mathematical tripos. For these there is also a separate competition, but it generally happens that the first medal is gained by the person whose name is at the head of the classical tripos.

Degrading. To check the practice of "degrading," or postponing for a year the degree of B.A., which had become common among the students, a statute as enacted in 1829, by which degraders are not allowed to present themselves for university scholarships, or any other academical honours, without special permission.

Divinity. The *proceedings* in divinity, laws, and medicine, are respectively superintended by the board of theological studies, the board of legal studies, and the board of medical studies. The *Board of Theological Studies* consists of the professors of divinity and the Christian advocate, together with the examiners for the theological examinations of the current and two preceding years. There are two examinations annually, which are open to those students only who have passed the examinations entitling to admission to the degree of B.A., or have passed the examinations and performed the exercises necessary for the degree of bachelor of laws or medicine. A master of arts must be of at least seven years' standing before he can be admitted to the degree of bachelor in divinity; and a doctor in divinity must be a bachelor in divinity of five years' standing.

Laws. The *Board of Legal Studies* consists of the professors of laws, moral philosophy, modern history, laws of England, and international law, along with the examiners for the degree of bachelor of laws in the current and two preceding years. Candidates must have passed the previous examination, and must have kept nine terms at least. They are subjected to an examination in portions of the Roman civil law, the constitutional and general law of England, international law, and general jurisprudence. A bachelor of law may take the degree of master of law by incepting, as in arts, at any time after the completion of three years from his inauguration. Bachelors of arts and masters of arts may also take the degree of master of law, by passing the same examination as candidates for the degree of bachelor of law. A master of law of five years' standing may proceed to the degree of doctor of law. Cambridge.

Medicine. The *Board of Medical Studies* consists of the professors of physic, chemistry, anatomy, botany, medicine, and comparative anatomy and zoology, &c. Five years of medical study are required of candidates for the degree of bachelor of medicine, of which time six terms must be so spent in the university. In the case of bachelors of arts, four years of medical study are deemed sufficient. There are two examinations for the degree of M.B., the first of which may be passed after the completion of three years of study, and the second after the completion of the course. Candidates are required to produce certificates of diligent attendance on certain courses of lectures in succession; and also of having practised dissection and attended hospital practice. The examinations embrace all the branches of medical science, and are conducted by the professors of the various branches, along with two doctors of medicine nominated by the board and approved by the senate. All persons proceeding to the degree of doctor of medicine must produce certificates of having been engaged in medical study during five years, &c., with some modifications in favour of masters of arts, and students who have obtained honours in the natural sciences tripos.

The following table of *average expense* regularly incurred by the student, is calculated for one of the colleges. The difference is not much at any other college.

Annual.			
Tuition	L.18	0	0
Rooms, rent	10	0	0
Attendance, assessed taxes, &c.	6	5	0
Coals	3	10	0
College payments	5	7	4
Cost of Living.			
Breakfast, dinner, and tea, at 16s. 6d. a week for 25 weeks, making the average of 3 terms' residence in the year	20	12	6
Laundress	5	8	0
Amount	L.69	2	10

Rent of rooms varies in the several colleges from L.4 to L.30.

In the year 1858, a statute was passed by the Senate, instituting examinations of candidates not being members of the university. The examinations take place annually, and are held in various cities and towns previously fixed. The candidates are divided into two classes:—1. Those under 16 years of age; and 2. Those under 18 years of age; and those who pass with credit, or satisfy the examiners, receive certificates to that effect. At the first examination 383 candidates appeared; and of these very nearly two-thirds succeeded in satisfying the examiners, and received certificates accordingly. Each candidate pays a fee of 20s.

The following are the existing Colleges and Halls at Cambridge, in the order of their Foundation.

Names.	Date of Foundation.	Founders.	Visitors.	On the Foundation.	Members in 1859. Of the Senate.	Members in 1859. Total on the Boards.	Patronage. Advowsons.	Patronage. Colls.
1. St Peter's College	1257	Hugh de Balsham, bishop of Ely	Bishop of Ely	Master, 14 foundation and 10 bye-fellows, and 59 scholars	170	235	11	1
2. Clare Hall	1326	Elizabeth de Burgo.	Chancellor and two persons appointed by grace of the senate	Master, 10 senior, 9 junior, and 3 bye-fellows, 44 scholars, and 4 exhibitioners	150	221	16	...
3. Pembroke Hall	1347	Countess of Pembroke	Lord High Chancellor	Master, 14 foundation and 2 bye-fellows, 25 scholars, and several bye-scholars and exhibitioners	89	125	11	...
4. Gonville and Caius College	1348	Edmund Gonville, increased by John Caius in 1558	Master of Corpus Christi, senior doctor in physic, and master of Trinity Hall	Master, 12 senior and 18 junior fellows, 39 scholars, 15 exhibitioners, 1 scholar in chemistry, and 3 in physic	272	502	23	1
5. Trinity Hall	1350	W. Bateman, bishop of Norwich	Lord High Chancellor	Master, 13 fellows, and 6 scholars	98	242	8	...
6. Corpus Christi Coll.	1352	The brethren of two Cambridge guilds	Vice-chancellor and two senior D.D.; in extraordinary cases, the Queen	Master, 12 fellows, and 52 scholars and exhibitioners	190	290	11	...
7. King's College	1441	Henry VI.	Bishop of Lincoln	Provost, 70 fellows and 12 scholars, the latter supplied by a regular succession from Eton College	102	139	9	...
8. Queen's College	1448 1465	Margaret of Anjou... Eliz. Widville, consort of Edward IV.	The Queen	President, 19 foundation fellows, 1 bye-fellow, 15 scholars	166	262	11	...
9. St Catherine's Coll.	1473	Robert Woodlark, D.D.	The Queen	Master, 6 foundation and 8 bye-fellows, and 43 scholars	145	199	4	...
10. Jesus College	1496	John Alcock, bishop of Ely	Bishop of Ely	Master, 16 foundation fellows, 3 Sey fellows, 46 scholars and exhibitioners	153	234	16	...

London.

Existing Colleges and Halls at Cambridge—Continued.

Names.	Date of Foundation.	Founders.	Visitors.	On the Foundation.	Members in 1859. Of the Senate.	Members in 1859. Total on the Boards.	Patronage. Advowsons.	Patronage. Schools.
11. Christ's College	1456 1505	Henry VI. ... Countess of Richmond and Derby ...	Vice-chancellor, and two senior D.D.	Master, 15 clerical and 2 lay fellows, and 85 scholars and exhibitioners ...	207	375	18	...
12. St John's College	1511	Countess of Richmond and Derby ...	Bishop of Ely	Master, 32 foundation fellows, 32 appropriated and 8 bye-fellowships, and 181 scholars and exhibitioners...	900	1446	50	6
13. Magdalene College	1519	Baron Audley	Possessor of Audley End.	Master, 4 foundation and 13 bye-fellows, and 50 scholars	127	189	7	...
14. Trinity College	1546	Henry VIII., augmented by Mary ...	The Queen	Master, 60 fellows, 72 scholars, 4 chaplains, and a librarian, besides exhibitioners and sizars	1674	2601	63	4
15. Emmanuel College	1584	Sir Walter Mildmay	In some cases vice-chancellor and two senior D.D.; in others, master of Christ's, and two senior D.D.	Master, 13 foundation and 2 bye-fellows, 4 foundation and 32 other scholars	229	383	23	3
16. Sidney-Sussex Coll.	1598	Countess of Sussex	Sir J. S. Sidney, Bart.	Master, 9 foundation and 4 other fellows, 20 foundation scholars, and 26 other scholars and exhibitioners. A mathematical lecturer	82	130	8	...
17. Downing College	1800	Sir George Downing, Bart.	Lord High Chancellor	This college will consist of a master, 2 professors, 16 fellows, and 6 scholars	44	59	1	...
18. Dr Humphrey's Hostel	...	...	...	...	0	0	...	...
Commorantes in villa	...	...	...	...	23	23	...	...
Not on the College boards	...	...	...	...	72	...	...	...
					4898	7664	321	15

UNIVERSITY OF LONDON.

Origin.

The establishment of the University of London forms a new era in the history of academical institutions in this country; and thus demands from us as minute an account of its extensive, and perhaps too ambitious aims and objects as our limits will admit. It embraces in its constitution a portion of the ancient element, inasmuch as it is not limited to any particular spot, nor to buildings specially set apart for the instruction of its alumni. It differs, however, from the universities of the middle ages in this, that the regents in these, though sometimes forced to find accommodation for their pupils at a distance, were still under the direct control of the university. The University of London is separate and distinct from all the establishments which it has admitted to the enjoyment of its privileges, and receives for examination candidates educated in any portion of her Majesty's dominions at home or abroad. It thus ignores the advantages of academical training and habits; and recognises mere knowledge, wherever that has been acquired, irrespective of any disadvantages which may accompany the mode of acquiring it. It is, in fact, a great literary incorporation, legalised for the purpose of testing the qualifications of young men who present themselves as candidates for literary and scientific honours; and of conferring these honours on the candidates who are found to possess the necessary requirements. It is, besides, placed under the control of the executive government, and some of its most important regulations require the sanction of a secretary of state, or of the Lords of her Majesty's Treasury, and thus involves a principle which has not hitherto existed in any of our universities. In the latter respect, it bears some resemblance to the Royal University of France, with the important exception that its enactments are not imperative, but are left open for acceptance to any educational institutions which find it advantageous to adopt them. The experiment is a bold one, and it would be premature yet to express an opinion of its results. In the meantime the university goes on prosperously.

History.

The University of London was created in 1836 by a royal charter of William IV., granted during "royal will and pleasure;" and was confirmed by a new charter, revoking the former and not so determinable, granted by Queen Victoria in 1837. The object of the university was declared, in the latter charter, to be "the advancement of religion and morality, and the promotion of useful knowledge, by holding forth to all classes and denominations of her Majesty's subjects, without any distinction whatsoever, an encouragement for pursuing a regular and liberal course of education, by offering to persons who prosecute or complete their studies in the metropolis or in other parts of the United Kingdom, such facilities, and conferring on them such distinctions and rewards as may incline them to persevere in their laudable pursuits; and for the purpose of ascertaining by examination the persons who have acquired proficiency in literature, science, and art, by the pursuit of such course of education, and of rewarding them by academical degrees as evidence of their respective attainments, and marks of honour proportioned thereunto." The institution was incorporated under the style and title of the "University of London," and was to consist of a chancellor, a vice-chancellor, and thirty-six fellows, nominated by the crown, with the usual provisions as to acquiring, holding, and disposing of property, and with the power, after due investigation and examination, to confer upon candidates the usual degrees in arts, laws, and medicine. In 1849 a supplementary charter was granted, confirmatory of the former, and extending some of its provisions, which continued in force till 1856. In this last mentioned year another charter was granted, whereby the others were revoked, and a more extended and definite constitution was given to the university. In addition to the chancellor, vice-chancellor, and thirty-six fellows, the university, as now incorporated, consists of all persons on whom it has conferred, or shall hereafter confer, "any of the degrees of Doctor of Laws, Doctor of Medicine, Master of Arts, Bachelor of Laws, Bachelor of Medicine, or Bachelor of Arts." All goods and property formerly belonging to the university have been transferred to the new incorporation; the degrees previously conferred have been sanctioned, and the bye-laws and regulations declared to be still in force.

Co tio

The body politic and corporate thus consists of a chancellor, a vice-chancellor, fellows, and graduates. The number of fellows is thirty-six, exclusive of the chancellor and vice-chancellor; and consists of such persons as the crown shall from time to time appoint under the sign-manual, and such as shall be appointed by the members of the Senate from the graduates of the university, under the powers conferred by the charter.

Off

The chief officers of the university are the chancellor, the vice-chancellor, the registrar, and the chairman of Convocation, with

London. the Queen as the visitor. The chancellor is appointed by the crown, and holds his office for life. The vice-chancellor is elected by the fellows from their own body, and remains in office for one year.

Senate. The business of the university is conducted by two courts,—the Senate and the Convocation. The Senate consists of the chancellor, vice-chancellor, and fellows, and is invested with the entire management and superintendence of the affairs, concerns, and property of the university, with power to make and alter any by-laws and regulations which may appear to be necessary, with the exception of "imposing on any person any compulsory examination or test;" such by-laws and regulations being binding on all candidates for degrees after the common seal of the university has been affixed to them; and after they have been submitted to one of the principal secretaries of state, and been approved of, and countersigned by him. The Senate also appoints, and, if necessary, removes all examiners, officers, and servants of the university; and forms regulations for the examinations, and the conferring of degrees. The chancellor, if present, presides as chairman; in his absence the vice-chancellor; and, failing him, a fellow elected by the members present. All questions brought before the Senate are decided by a majority of the members present; the chairman having, in the case of equality, a second or casting vote. No question is decided unless six members are present.

Convocation. The Convocation consists of the graduates of the university, viz., all doctors of laws, doctors of medicine and masters of arts, all bachelors of law of two years' standing, all bachelors of medicine of two years' standing, and all bachelors of arts of three years' standing. Those graduates only are entitled to vote whose names appear in the register, kept by the officer appointed for that purpose; and for the registration of which a reasonable annual fee, sanctioned by the commissioners of the treasury is exacted. The functions of convocation are very limited. They elect their own chairman, who holds office for three years; have the power of nominating three persons for every fellow to be appointed in the manner already mentioned; of discussing any matter relating to the university, and declaring their opinion; but are not "entitled to interfere in, nor have any control over, the affairs of the university." The Senate is bound to convene a meeting of the Convocation at least once a year; and the chairman is empowered to convene an extraordinary meeting on a requisition signed by twenty or more members. Thirty members are necessary to constitute a meeting; and all questions are decided by a majority of votes; the chairman having, in the case of equality, a casting vote. All meetings of the Senate and Convocation take place in Burlington House.

Affiliated institutions. The university having no collegiate establishments under its immediate control, is empowered to receive into connection with itself such educational institutions in Great Britain, Ireland, and the British Colonies, as shall transmit to the Senate sufficient evidence that they furnish to young men in *statu pupillari* such a course of instruction in one or more departments of knowledge as to justify their being taken on examination for degrees. The following institutions are already in connection with the university:—The universities of Oxford and Cambridge, and the several colleges and houses of learning in these universities; the universities of Durham, Edinburgh, Glasgow, and St Andrews; the King's College of Aberdeen; the Marischal College, Aberdeen; the University of Dublin; the Queen's University in Ireland; the University of Sydney; University College, London; King's College, London; the Queen's College at Belfast; the Queen's College at Galway; the Queen's College at Cork: St Cuthbert's College, Ushaw; Stoneyhurst College; Manchester New College, London; St Mary's College, Oscott; St Patrick's College, Carlow; St Edmond's College, near Ware; Spring Hill College, Moseley, near Birmingham; the College, Regent's Park (late Stepney College); College of St Gregory the Great, Downside, near Bath; Countess of Huntington's College at Chesnut; the Baptist College at Bristol; Airedale College, Undercliffe, near Bradford; Protestant Dissenters' College at Rotherham; Presbyterian College at Caermarthen; St Kyran's College, Kilkenny; Huddersfield College; Lancashire Independent College; Wesley College, near Sheffield; Queen's College, Birmingham; Wesleyan Collegiate Institution, Taunton; Western College, Plymouth; West of England Dissenters' Proprietary School, Taunton; St Patrick's College, Thurles; New College, London; Owen's College, Manchester; Bedford Grammar Schools; Brecon Independent College; Horton College, Bradford; Hackney Theological Seminary; Trevecca College, Brecon; Springfield College, Ennis; Bishop Stortford Collegiate School; Working Men's College, London; the University of Toronto; Queen's College, Liverpool, &c. &c. It is in the power of the Senate, with the consent of one of the principal secretaries of state, to add to, alter, vary, and amend the list, by striking out any of the institutions included therein. Subject to the same sanction and approval, the Senate have the power to admit persons not educated in any of the institutions connected with the university for matriculation, and as candidates for any of the degrees other than medical, on such conditions as shall from time to time be determined. The Senate are further called upon to report from time to time to one of the principal secretaries of state, what appear to them to be the medical institutions and schools from which, either singly or jointly with other medical institutions and schools in this country, or in foreign parts, it may be fit and expedient to admit candidates for medical degrees; such report to be approved of by the said secretary; and no persons to be admitted as candidates for degrees unless they shall satisfy the Senate that they have, in one or more of such institutions or schools, completed the requisite course of instruction. Of these medical institutions and schools, a large number are already in connection with the university. London.

Examinations. The chancellor, vice-chancellor, and fellows, have the power, after examination, to confer the several degrees of bachelor, master, and doctor, in arts, laws, science, medicine, music; and also in such other departments of knowledge, except theology, as they by regulations in that behalf shall from time to time determine. The examinations are held at least once a year, and embrace such branches in the several departments of knowledge as the Senate consider necessary. All the examinations, including the matriculation examination, are conducted by means of printed papers, the examiners reserving to themselves the power of putting *viva voce* questions to any candidate for the purpose of ascertaining his competency to pass. In every case, with the exception of the matriculation examination and the scriptural examination, the successful candidates are arranged in two divisions, those being *bracketed* together between whom there is not, in the opinion of the examiners, a clear difference. Those of the first division are admissible to examination for honours. All the examinations take place annually, except that for matriculation, which is held twice a year; and for each a reasonable fee is exacted, subject to the sanction and approval of the Lords of the Treasury. In the case of failure no fee is returned; but it is available in the event of the candidate presenting himself at a subsequent examination. There are at present 26 examiners, all elected by the Senate:—14 in arts; 1 in laws; and 11 in medicine. No fellow is eligible as an examiner; and no examiner is eligible for re-election for more than four years consecutively.

Matriculation examination. Every candidate for the degree of bachelor of arts, bachelor of science, or bachelor of medicine, is required to have passed *the Matriculation Examination*. This examination takes place twice a-year,—on the second Monday in January, and the first Monday in July; for admission to which it is necessary for each candidate to have transmitted to the registrar of the university a certificate, showing that he has completed his sixteenth year. The examination embraces the following subjects:—*Mathematics, Arithmetic and Algebra;* the ordinary rules of arithmetic,—fractions, extraction of the square root, addition, subtraction, &c., of algebraical quantities, proportion: *Geometry;* the first four books of Euclid, &c.: *Natural Philosophy;* mechanics, hydrostatics, hydraulics, pneumatics, acoustics, and optics: *Chemistry;* powers of matter, heat, combustion, the atmosphere, &c.: *Classics;* one Greek and one Latin subject, selected one year and a half previously by the Senate, from the works of certain Greek and Latin authors, and published; the classical papers containing simple and easy sentences of English to be translated into Latin, and also questions in grammar, history, and geography: *The English Language;* orthography, writing from dictation, &c.: *Outlines of English History;* the *French* or the *German* language. Simultaneously with the examinations in London, examinations are conducted in such provincial cities, towns, and colleges, as have obtained the sanction of the Senate. The candidates who have passed are arranged in three divisions, each in alphabetical order; and pass certificates, signed by the registrar, are given to those who apply for them. Fee for matriculation L.2.

Honours. Any candidate who has passed may be examined for honours in mathematics and natural philosophy, classics, chemistry, and natural history. The candidates who acquit themselves to the satisfaction of the examiners are arranged in the order of proficiency, according to the several departments; and in determining their relative position, regard is had to the proficiency evinced by them in the same departments at the matriculation examination. If, in the opinion of the examiners, any candidates of not more than twenty years of age shall possess sufficient merit, the highest candidate in mathematics, and the highest candidate in classics, receive each an exhibition of L.30 a year for the next two years, on condition of their pledging themselves to proceed, within three years, either to the degree of B.A., or to the first examination for the degree of M.B. The highest candidates in chemistry and in natural history, if they possess sufficient merit, receive each a prize to the value of L.10 in books or money.

London.

First B.A. examination.

Candidates for the degree of bachelor of arts are required to have passed the matriculation examination, and to pass two subsequent examinations. *The first B.A. examination* commences on the third Monday of July in London, and the pass examination is also held at the same time, under special arrangement, in other cities, towns, and colleges of the United Kingdom. No candidate, with the exception of those who have obtained honours either in classics, or in mathematics and natural philosophy at the preceding matriculation examination, can be admitted to this examination within one academical year of the time of his passing the matriculation examination; nor unless he has produced a satisfactory certificate of good conduct.

Candidates are examined in the following subjects:—*Mathematics: Arithmetic and Algebra: Geometry: Plane Trigonometry: Latin and Roman History: The Latin Language: The English Language, Literature, and History: The French* or *the German Language.* Candidates are not approved by the examiners, unless they show a competent knowledge in (1.) Latin and Roman history; (2.) English language, literature, and history; (3.) Mathematics; (4.) Either the French or the German language. Fee for the examination, L.5.

Honours.

Any candidate who has passed the *first B.A. examination* may be examined for honours (1.), in mathematics and mechanical philosophy; (2.) in Latin; and (3.) in English; and for prizes in the French and German languages and literature. The successful candidates in each department are arranged in the order of proficiency; and in determining their relative position, the examiners have regard to the proficiency evinced by them in their respective departments at the first B.A. examination. If, in the opinion of the examiners, any candidates not more than twenty-two years of age shall possess sufficient merit, the highest candidate in mathematics, and the highest candidate in Latin, each receive an exhibition of L.40 a year for two years, on condition of declaring their intention of presenting themselves, within two years, at the second examination for the degree of B.A. On the same conditions, the highest candidate in English receives an exhibition of L.30 a year for two years. The highest candidates in French and German receive each a prize to the value of L.10 in books or money.

Second B.A. examination.

This examination commences on the fourth Monday in October; and no candidate can be admitted to it within one academical year of the time of his passing the first B.A. examination; nor unless he have produced a satisfactory certificate of good conduct. The examination embraces the following subjects:—*Mechanical and Natural Philosophy: Statics, Dynamics, Hydrostatics and Pneumatics, Optics* (geometrical), *Acoustics, Optics* (physical), *Astronomy, Animal Physiology, Classics, Greek and Latin Languages.*—One Greek subject and one Latin prose subject, selected two years previously by the Senate, and published; papers containing passages of Greek and Latin to be translated into English, and passages of English to be translated into Latin, with questions in grammar, history, and geography: *History: Logic and Moral Philosophy.* Candidates are not approved by the examiners, unless they show a competent knowledge in (1.) Classics; (2.) Grecian history; (3.) Mechanical and natural philosophy; (4.) Animal physiology; (5.) Logic and moral philosophy. The candidates who have passed are arranged in two divisions, each in alphabetical order; and a certificate under the seal of the university, and signed by the chancellor, is delivered to each successful candidate. Fee for the examination, L.5.

Honours.

Any candidate who has passed may be examined for honours in (1.) Mathematics and natural philosophy; (2.) Classics; (3.) Logic and moral philosophy; (4.) Chemistry; (5.) Animal physiology; and (6.) Vegetable physiology and structural botany. A list of the successful candidates, in the order of proficiency in each subject, is published by the examiners; and in determining the relative position of candidates, regard is had to the proficiency evinced by each at the second B.A. examination. If, in the opinion of the examiners, any candidates of not more than twenty-three years of age shall possess sufficient merit, the highest candidate in each of the first three branches receives L.50 a year for the next three years, with the style of *University Scholar.* Under the same circumstances, the highest candidates in the other three branches receive each a prize to the value of L.10 in books or money.

M.A. examination.

The examination for the degree of master of arts commences on the first Monday in June. While in the two great English universities, this degree is conferred almost as a matter of course after the lapse of a certain period from the candidate taking the B.A. degree, in this university the examination is of a stricter and more extensive character than any of the preceding examinations. No candidate can be admitted to examination until after the expiration of one academical year from the time of his obtaining the degree of B.A. in this university, or in one of the universities of Oxford, Cambridge, Dublin, and Durham, nor unless he has shown evidence of having completed his twentieth year.

The examination embraces the following branches of knowledge, and no candidate is approved by the examiners, unless he has shown a competent knowledge in one of these:—I. *Classics.* II. *Mathematics and Natural Philosophy.* III. *Logic and Moral Philosophy; Political Philosophy; History of Philosophy; Political Economy.* The examination includes in *Classics*—The Greek and Latin classic authors; prose composition in Greek, Latin, and English; with ancient history, and the history of Europe to the end of the eighteenth century; in *Mathematics and Natural Philosophy*—The subjects required for the B.A. honour examination, with the addition of plane astronomy and physical astronomy; and in Branch III. the subjects already enumerated. The candidates who pass to the satisfaction of the examiners are arranged in the order of proficiency. The most distinguished candidate in each branch, if in the opinion of the examiners he possesses sufficient merit, receives a gold medal of the value of L.20; and if the same candidate distinguish himself the most in two or more of the branches, he receives a gold medal for each branch in which he distinguishes himself. Fee for the examination, L.10. London.

Scriptural examinations.

Examinations in the Hebrew text of the Old Testament, in the Greek text of the New Testament, in the evidences of the Christian religion, and in Scripture history, take place once a year, and, like the others, are conducted entirely by means of printed papers. Each examiner has the power of putting a veto upon any question proposed; and no question is put bearing on any doctrinal point disputed among Christians; or such as to require an expression of religious opinion on the part of the candidates; nor is any answer or translation objected to on the ground of its expressing any peculiarity of doctrinal views.

First examination.

No candidate is admitted to this examination unless he shall have previously obtained the degree of B.A. in this university. The subjects of examination are:—1. The Hebrew text of the Book of Genesis; 2. The Greek text of the Gospel of St Luke; 3. Paley's Evidences and Butler's Analogy; 4. Scripture history. Candidates who show a competent knowledge in any two out of the four subjects of examination are approved by the examiners.

Further examination.

No candidate is admitted to this examination unless he has passed the first examination at least two years previously. The subjects of examination are:—1. The Hebrew text of one of the larger or two of the smaller historical books, and of one of the larger or two of the smaller prophetical or poetical books of the Old Testament; 2. The Greek text of one of the historical books, and of one of the larger or two of the smaller epistles of the New Testament; 3. The evidences of the Christian religion; 4. Biblical history, including the history of the books of Scripture. The passages are selected and published from time to time. Candidates who show a competent knowledge in any three out of the four subjects are approved by the examiners, and are alphabetically arranged in three classes according to their proficiency. The highest candidate in each class, in both examinations, receives books to the value of L.5.

First B.Sc. examination.

Candidates for the degree of bachelor of science are required to have passed the matriculation examination, and to pass two subsequent examinations. Bachelors of arts of the university, and undergraduates of the university who have passed the first examination for the degree of bachelor of medicine, are admitted to the degree of B.Sc. on passing the second examination only. The first B.Sc. examination commences on the third Monday in May; and no candidate is admitted within one academical year of the time of his passing the matriculation examination, nor unless he has produced a satisfactory certificate of good conduct. Candidates are examined in the following subjects:—*Mathematics:* The same departments which are required for the first B.A. examination: *Mechanical and natural philosophy:* The same departments which are required for the second B.A. examination, with the addition of *heat, electricity,* and *magnetism: Chemistry;* Elementary substances and combinations: *Botany and Vegetable Physiology: Zoology and Animal Physiology.* The extent of acquirement in natural philosophy, chemistry, and biology, is such as may fairly be attained by attendance on a course of lectures on each of these subjects, extending through an academical session.

No candidates are approved by the examiners unless they show a competent knowledge in the fundamental principles of (1.) Mathematics; (2.) Mechanical and natural philosophy; (3.) Chemistry; (4.) Biology, including botany and vegetable physiology, and zoology and animal physiology. The successful candidates are alphabetically arranged in two divisions; and pass certificates, signed by the registrar, are given to those who apply for them. Fee for the examination, L.5.

Honours.

Any candidate who has passed may be examined for honours, (1.) in mathematics and mechanical philosophy; (2.) in chemistry and natural philosophy, and in biology. A list of the successful candidates is published, arranged in the order of proficiency in each department. In determining the relative position of the candidates, the examiners have regard to the proficiency evinced by them in the corresponding subjects at the pass examination. If, in

London. the opinion of the examiners, there are candidates of not more than twenty-two years of age who possess sufficient merit, the highest in each department receives an exhibition of L.40 a year for the next two years, on condition of declaring his intention to present himself at the second B.Sc. examination within two years.

Second B.Sc. examination. This examination commences on the fourth Monday in October. Every candidate must have passed the first B.Sc. examination at least one academical year previously, or have obtained the degree of B.A., or have passed the first M.B. examination in the university, and must also have produced a satisfactory certificate of good conduct. The subjects of examination are the following:—(1.) Mechanical and natural philosophy; (2.) Chemistry (theoretical and practical); (3.) Animal physiology; (4.) Geology and Palæontology; (5.) Logic and moral philosophy. The requirements in the first, third, and fifth branches are the same as those necessary for the second B.A. pass examination; and in Branch IV., the elementary portions of descriptive geology and the general stratigraphical distribution of organic remains. The candidates who pass are arranged in two divisions, each in alphabetical order, and a certificate, under the seal of the university, and signed by the chancellor, is delivered to each. Fee for the examination, L.5.

Honours. Any candidate who has passed may be examined for honours:—(1.) In mathematics and natural philosophy; (2.) In chemistry and biology; (3.) Geology and palæontology; and (4.) In logic and moral philosophy. Candidates for honours in Branch I. are examined in the subjects which are required for the second B.A. honour examination; those for honours in Branch II. in the subjects of the previous examinations in a more advanced state; those for honours in Branch III. in descriptive geology, physical geology, and palæontology; and those for honours in Branch IV. in the subjects required for the second B.A. honour examination. A list of the successful candidates in each branch, arranged in the order of proficiency, is published; and in determining their relative position, the examiners have regard to the proficiency in their several branches evinced by them at the pass examination. If, in the opinion of the examiners, there are candidates of not more than twenty-three years of age who possess sufficient merit, the most distinguished candidate in each branch receives L.50 a year for the next three years, with the style of *university scholar*.

D.Sc. examination. The examination for the degree of doctor of science takes place within the first fourteen days of June; and no candidate is admitted to it until after the expiration of two academical years from the time of his obtaining the degree of B.Sc. in the university. Every candidate is examined in some one of the following *branches* of knowledge, to be selected by himself; and no candidate is approved by the examiners unless he show a thorough practical knowledge of the *principal subject*, and a general acquaintance with the *subsidiary subjects*, specified as belonging to the branch so selected. The following are the branches required:—1. Mathematics; 2. Mechanical science; 3. Astronomy; 4. Inorganic chemistry; 5. Organic chemistry; 6. Electricity; 7. Magnetism; 8. Physical optics, heat, acoustics; 9. Animal physiology; 10. Comparative anatomy; 11. Zoology; 12. Vegetable physiology; 13. Systematic botany; 14. Geology; 15. Palæontology; 16. Logic and moral philosophy. Fee for the examination, L.10.

LL.B. examination. The examination for the degree of bachelor of laws takes place within the last fourteen days of June. No candidate can be admitted to it until after the expiration of one academical year from the time of his obtaining the degree of B.A. in this university, or in one other of the universities of the United Kingdom, unless he shall have taken the degree of M.B. in this university. The following are the subjects of examination:—Stephen's Blackstone; the three portions of Dumont's edition of Bentham's *Morals and Legislation*, which contain the principles of legislation, the principles of a civil code, and the principles of a criminal code. The successful candidates are arranged in two divisions, each in alphabetical order.

Honours. An examination for honours subsequently takes place, to which all who have passed the previous examination are admissible. Candidates are examined in one or more of the following subjects:—Principles of legislation; conveyancing; law of the courts of equity; law of the courts of common law; Roman law; law of the admiralty and ecclesiastical courts. Lists of the successful candidates are afterwards published; and, in fixing their relative position, the examiners have regard to the proficiency evinced by them at the previous examination. If, in the opinion of the examiners, any candidate possesses sufficient merit, the candidate who distinguishes himself most in the principles of legislation receives L.50 a year for the next three years, with the style of *university law scholar*. Fee for the examination, L.10.

LL.D. examination. The examination for the degree of doctor of laws takes place within the first fourteen days of July. No candidate under the age of thirty is admissible until after the expiration of two academical years from the time of his obtaining the degree of LL.B. For persons above the age of thirty, no interval is required. There is required from candidates a practical professional knowledge of the law of the common law courts of England, and of one of the three following other branches of positive law according to the laws of England and Ireland:—1. Conveyancing; 2. Law of the courts of equity; 3. Law of the admiralty and ecclesiastical courts. There is also required a knowledge of one of the seven following subjects:—1. Roman law; 2. Principles of international law; 3. Of civil law; 4. Of criminal law; 5. Of the law of evidence; 6. Of judicial organisation; 7. Of procedure. If, in the opinion of the examiners, sufficient merit has been evinced, the candidate who distinguishes himself most receives a gold medal of the value of L.20. Fee for the examination, L.10. London.

Candidates for the degree of bachelor of medicine are required— Medicine.
1. To have been engaged during four years in their professional studies at one or more of the institutions or schools recognised by the university; 2. To have spent one year at least of the four in one or more of the recognised institutions or schools in the United Kingdom; and, 3. To pass two examinations.

The first M.B. examination commences on the first Monday in August. No candidate is admitted unless he has produced certificates to the following effect:—1. Of having completed his nineteenth year; 2. Of having taken a degree in arts in the university, or in a university the degrees granted by which are recognised by the senate of the university, or of having passed the matriculation examination; 3. Of having been a student during two years at one or more of the medical institutions or schools recognised by the university, subsequently to having taken a degree in arts, or passed the matriculation examination; 4. Of having attended a course of lectures on each of four of the subjects in the following list:—Descriptive and surgical anatomy; general anatomy and physiology; comparative anatomy; pathological anatomy; chemistry; botany; materia medica and pharmacy; general pathology; general therapeutics; forensic medicine; hygiene; midwifery and diseases peculiar to women and infants; surgery; medicine; 5. Of having dissected during nine months; 6. Of having attended a course of practical chemistry, comprehending practical exercises in conducting the important processes of general and pharmaceutical chemistry; in applying tests for discovering the adulteration of articles of the materia medica, and the presence and nature of poisons, and in the examination of mineral waters, animal secretions, urinary deposits, calculi, &c.; 7. Of having attended to practical pharmacy during a sufficient length of time to enable him to acquire a practical knowledge in the preparation of medicines. Candidates are examined in the following subjects:—Anatomy, physiology, chemistry, botany, materia medica, and pharmacy; and are also required to translate passages from the Latin pharmacopœia. The candidates who have passed are arranged in two divisions, each in alphabetical order; those only who, in the opinion of the examiners, are admissible to the examination for honours, being placed in the first division. First M.B. examination.

Any candidate who has been placed in the first division may be examined for honours in any or all of the following subjects:—Anatomy and physiology (candidates may illustrate their answers by sketching the parts they describe), chemistry, materia medica, and pharmaceutical chemistry; structural and physiological botany. In determining the relative position of candidates, the examiners have regard to the proficiency evinced by them in the same subjects at the pass examination. Candidates who pass the examinations and acquit themselves to the satisfaction of the examiners, are arranged according to the several subjects and according to their proficiency in each. If, in the opinion of the examiners, sufficient merit is evinced, the candidates who distinguish themselves most in anatomy and physiology, in chemistry, and in materia medica respectively, receive each an exhibition of L.30 a year for the next two years. Under the same circumstances the first and second candidates in each of the preceding subjects, and the most distinguished candidate in structural and physiological botany, receive each a gold medal of the value of L.5. Fee for the examination, L.5. Honours.

Second M.B. examination. The second examination for the degree of bachelor of medicine commences on the first Monday in November. No candidate is admitted to it within two academical years of the time of his passing the first M.B. examination, nor unless he has produced certificates to the following effect:—1. Of having passed the first M.B. examination; 2. Of having, subsequently to having passed the first M.B. examination, attended a course of lectures on each of two of the subjects enumerated in No. 4 of the requirements for that examination, and for which he had not presented certificates previously; 3. Of having, subsequently to having passed the first M.B. examination, dissected during six months; 4. Of having conducted at least six labours; 5. Of having attended the surgical practice of a recognised hospital or hospitals during twelve months, and lectures on clinical surgery; 6. Of having attended the medical

London. practice of a recognised hospital or hospitals during other twelve months, and lectures on clinical medicine; 7. Of having, subsequently to the completion of his attendance on surgical and medical hospital practice, attended to practical medicine in a recognised hospital, infirmary, or dispensary during six months; 8. Of moral character.

Candidates are examined in the following subjects:—Physiology (the papers include questions in comparative anatomy), general pathology, general therapeutics, hygiene, surgery, medicine, midwifery, forensic medicine. The candidates are also required to translate passages of the Latin pharmacopœia into English, and of the English pharmacopœia into Latin. The candidates who have passed are arranged in two divisions, each in alphabetical order; and a certificate, under the seal of the university and signed by the chancellor, is delivered to each. Those candidates only who, in the opinion of the examiners, are admissible to the examination for honours are placed in the first division.

Honours. Candidates who have been placed in the first division may be examined for honours in any or all of the following subjects:—Physiology and comparative anatomy, surgery, medicine, midwifery. In determining the relative position of candidates, the examiners have regard to the proficiency evinced by them in the same subjects at the pass examination. Candidates who pass the examinations, and acquit themselves to the satisfaction of the examiners, are arranged according to the several subjects and according to their proficiency in each. If, in the opinion of the examiners, sufficient merit be evinced, the candidates who distinguish themselves the most in physiology and comparative anatomy, in surgery and in medicine, receive each an exhibition of L.50 a year for the next two years, with the style of *university medical scholar*. Under the same circumstances, the first and second candidates in each of the preceding subjects, and the most distinguished candidate in midwifery, receive a gold medal of the value of L.5. Fee for the examination, L.5.

M.D. examination. The examination for the degree of doctor of medicine commences on the fourth Monday in November. No candidate is admitted to the examination unless he has produced certificates to the following effect:—1. Of having taken the degree of bachelor of medicine in the university, or a degree in medicine or in surgery at a university the degrees granted by which are recognised by the senate of the university. Candidates who have not taken the degree in this university must produce a certificate of having completed their twenty-third year: 2. Of having attended, subsequently to having taken one of the above degrees in medicine, (*a.*) to clinical or practical medicine during two years in an hospital or medical institution recognised by the university; (*b.*) or, to clinical or practical medicine during one year in an hospital or medical institution recognised by the university, and of having been engaged during three years in the practice of his profession; (*c.*) or, if he have taken the degree of bachelor of medicine in the university, of having been engaged during five years in the practice of his profession. One year of attendance on clinical or practical medicine, or two years of practice, are dispensed with in the case of those candidates who, at the second M.B. examination, have been placed in the first division: 3. Of moral character, signed by two persons of respectability.

Candidates are examined in logic and moral philosophy, and medicine. Candidates who have taken a degree in arts in this or in any other university in the United Kingdom, are exempted from the examination in logic and moral philosophy. The subjects of examination in this branch are:—Names, notions, and propositions; syllogism, induction, and subsidiary operations; the senses, the intellect, the will, including the theory of moral obligation. The successful candidates are arranged in two divisions, each in alphabetical order, and a certificate under the seal of the university, and signed by the chancellor, is delivered to each. If, in the opinion of the examiners, sufficient merit is evinced, the candidate who distinguishes himself the most at the examination receives a gold medal of the value of L.20. Fee for the examination, L.10.

Candidates who commenced their professional studies in or before January 1839, and practitioners in medicine or surgery who obtained their licenses or commissions prior to 1840, are admitted to examination for the degrees of bachelor and doctor of medicine on different conditions, for which see *Calendar*.

University College and King's College, London, though not falling strictly within the scope of this article, deserve a passing notice, from the prominent position which they occupy as seminaries of education. With the exception of conferring degrees, they perform all the functions of universities.

University College. University College had its origin in a scheme for establishing a university in the metropolis, which was first promulgated by the author of *The Pleasures of Hope* in 1825, and was speedily adopted by the friends of education. The objects held out by the promoters of the scheme were three:—1. To furnish to the inhabitants of London, at a moderate rate, and within easy reach, a complete education; thus enabling them to educate their sons, while continuing to reside under the parental roof, without incurring the additional expense and risks of residence at the old universities: 2. To afford the opportunity of receiving a university education to the various classes of society in England who, not being members of the Church of England, were excluded, in a greater or less degree, from Oxford and Cambridge: 3. To establish extended and systematic courses of education for professional pursuits, in laws and medicine, and for civil engineering. Within a few months after the scheme was announced, funds sufficient for setting the institution on foot were raised by subscriptions for L.100 shares, and by donations of L.50 each; and before the close of 1828 the classes in the faculties of arts, laws, and medicine were in full operation. The college being established on the principle of free admission to all sects and denominations, the department of theology was not included in the curriculum. The exclusion of theology from the course of instruction gave rise to a long and acrimonious opposition on the part of those who could bear no departure from the established order of things. Even the universities of Oxford and Cambridge shared in the alarm, and, supported by the church party, prevented the granting of a charter of incorporation till 1836. Students are admitted without reference to their religious opinions; and none of them live within the walls of the college. The academical discipline is thus confined to the class-room. The professors are dependent on the fees which they receive from their pupils; and, as in the Scottish and German universities, communicate their instructions by means of public lectures, accompanied by catechetical examinations. There are also public examinations at the end of the session, when prizes are awarded to the most distinguished students. The government is vested in five bodies:—1. The general meeting of the members of the corporate body—*i.e.*, of the founders of the institution and the representatives of founders; 2. The council; 3. The senate; 4. The faculty of medicine; 5. The faculty of arts and laws. The council, the members of which are elected by the general meeting, consists of a president, vice-president, treasurer, and twenty-one other members; and has power to regulate the teaching of the various branches of literature and science, to accept endowments, appoint professors, tutors, &c.; and to manage, generally, the affairs of the college. The college contains forty-one professorships: twenty-seven in the faculty of arts and laws, and fourteen in the faculty of medicine. In some cases two professorships are held by the same person. The session in arts commences in the middle of October, and terminates at the end of June. The medical session is divided into two terms—the winter term, commencing in the beginning of October and continuing till the end of March; and the summer term—extending from the beginning of May to the end of July.

King's College. King's College owes its origin chiefly to the opposition made to University College, on the ground of excluding theology from the curriculum of study. The friends of the Church finding that, notwithstanding their strenuous opposition, the other was being fast realised, commenced a movement in 1828 for establishing another college on principles which they approved. The ground on which it is situated, forming the east wing of Somerset House, was presented to the foundation by George IV. The funds for the erection and support of the institution were raised partly by shares and partly by donations; and a charter of incorporation was granted to it in 1829. The fundamental principle on which the college was established is the following:—"That every system of general education for the youth of a Christian community ought to comprise instruction in the Christian religion as an indispensable part, without which, the acquisition of other branches of knowledge will be conducive neither to the happiness of the individual nor to the welfare of the state." It was thus instituted professedly, although not exclusively, for the instruction of young men according to the tenets of the Church of England. Rooms are provided within the walls of the college for a limited number of matriculated students, who are placed under the superintendence of the censor. The government is vested in a council consisting of three classes:—The visitor, who is the Archbishop of Canterbury; the perpetual governors by virtue of their offices, as the Lord Chancellor, Archbishop of York, Bishop of London, and other high functionaries; the governors for life, and those who are councillors simply. There are sixty-three professorships, lectureships, &c.; eight in divinity; twenty-three in general literature and science; twelve in applied sciences; seventeen in the medical department; and three in the military department. The year is divided into *three terms*:—*Michaelmas term; Lent term; and Easter term*. The chief distinction between the two institutions consists in the fact of there being professors of divinity attached to King's College. Both have received large benefactions, which are distributed in the form of scholarships, prizes, &c. By nothing, perhaps, is the recent institution of these colleges more distinctly marked than by the provi-

Durham. sion which has been made in them for the cultivation of modern languages and literature. Each of them furnishes instruction in English, French, Italian, and German; in several of the Eastern languages; and even Chinese is taught by an authorized professor.

UNIVERSITY OF DURHAM.

History. The great and increasing population of the north of England, and its distance from the Universities of Oxford and Cambridge, had long pointed out the expediency of establishing in that part of the kingdom an institution which should secure to its inhabitants the advantages of a sound yet not expensive academical education. The first attempt which was made to establish such an institution at Durham was in 1649, during the time of the Commonwealth, and the protectorate of Oliver Cromwell, after the passing of the act for the abolition of deans and chapters. It was not, however, carried into effect till eight years after, when, in virtue of letters patent granted for the purpose, the houses formerly belonging to the deans and prebendaries were converted into a university to be called "the Mentor, or Provost, Fellows and Scholars of the College of Durham, of the foundation of Oliver, Lord Protector of the Commonwealth of England, Scotland, and Ireland," &c. The same letters patent assigned to the university rent charges to the amount of L.900 annually, for the support of the persons belonging to the foundation, and authorized them to purchase and enjoy lands and revenues to the amount of L.6000 a year. These arrangements were never carried into effect. At the Restoration the dean and chapter resumed possession of their houses and lands; and the projected foundation totally disappeared. For nearly two centuries the scheme remained in abeyance; and it was not till during the incumbency of the late Bishop Van Mildert that it was again seriously entertained.

This munificent prelate, along with the dean and chapter, believing that the means of supplying the acknowledged deficiency might be provided from the resources of that body, without contravening the principles on which it was incorporated, agreed, by an act of chapter in 1831, to appropriate property producing L.3000 per annum to the support of an academical institution in connection with the cathedral church; the bishop at the same time promising to provide eventually for the warden, the professor of divinity, and the professor of Greek, by attaching prebendal stalls to the two offices.

Incorporation. In pursuance of this arrangement, an act of Parliament was obtained in 1832, empowering the dean and chapter to appropriate an estate at South Shields, "for the establishment and maintenance of a university for the advancement of learning, in connection with the cathedral church: such university to consist of such warden or principal, of such professors and readers in such branches of learning and science, of such tutors, students, and other officers and persons, and generally to be established and instituted, and continued according to such scheme and regulations as the said dean and chapter for the time being shall, with the consent of the Lord Bishop of Durham, order and prescribe." Under the authority of this act, the university was opened in 1833, and in July 1835, a statute was passed by the dean and chapter, and approved by the bishop, entrusting the ordinary management of the university under the bishop as visitor, and the dean and chapter as governors, to the warden, a senate, and a convocation. After a constitution and the studies of the university had been satisfactorily arranged, a royal charter was granted under the great seal on the 1st of June 1837, incorporating the persons therein described by the name of "the Warden, Masters, and scholars of the University of Durham," and granting to them "all the rights and privileges which are assumed to the university by the act of Parliament, or are incident to a university established by royal charter." It consequently possesses and exercises the right of granting degrees in all the faculties. Durham.

The appointment of the ecclesiastical commission prevented the intentions of Bishop Van Mildert respecting the endowment of the university from being fully carried into effect, but by an order of her Majesty in council, 4th June 1841, it was provided that the office of warden should be permanently annexed to the deanery of Durham; a canonry in the cathedral church was annexed to each of the professorships of divinity and Greek; a professor of mathematics and astronomy, with an increased salary was appointed; provision was made for founding hereafter a professorship of Hebrew and the other Oriental languages; and, in addition to the six fellowships which had previously been established by the dean and chapter, eighteen other fellowships were founded. For providing funds for these purposes, certain estates were assigned to the university immediately; and power was reserved for making a farther endowment at a future period. This power has since been exercised by orders in council, conferring on the university an additional grant in money, and vesting in it certain landed estates formerly belonging to the deanery, or prebendal stalls.

Objects of the founders. In framing their plans for an efficient academical education, the founders of the university provided, not only for the delivery of able lectures, but also furnished the means of uniting a system of domestic discipline and superintendence with academical instruction. With this view they formed a college within the university, to which they gave the name of "University College," and placed it under the superintendence of the warden as master. The accommodation for students has been subsequently much enlarged by the addition of the Castle of Durham, which is held in trust for the university by the bishop. In pursuance of the same object, and with the special view of placing these advantages within the reach of persons of limited means, two halls have since been opened, "Bishop Hatfield's Hall" in 1846, and "Bishop Cousin's Hall" in 1851; and regulations have been framed for licensing and opening additional halls or houses. The rooms in these halls are let furnished, and the other arrangements are all made on an economical scale. Students in every faculty are received in the halls as well as in the colleges; and with a few exceptions, are eligible to the same endowments. The university thus embraces a college and two halls. Every student must reside in his college or hall, unless a dispensation to reside elsewhere has been granted by the warden. College and halls.

Constitution. The university consists of the visitor, governors, a warden or principal, a professor of divinity and ecclesiastical history, a professor of Greek and classical literature, a professor of mathematics and astronomy, two proctors, tutors, and readers in law, medicine, Hebrew, history and polite literature, natural philosophy, chemistry, registrar and librarian; with the graduates and scholars. The warden and the professors of divinity and Greek are appointed by the Bishop of Durham; the professor of mathematics and astronomy, and the other officers, are nominated by the dean and chapter. The business of the university is conducted by the warden and the Senate, and the Convocation. The Senate, which consists of the warden, the professors of divinity, Greek, and mathematics, the two proctors, and three other members of Convocation, transacts the ordinary business, and has the power to originate regulations and other measures relating to it, but such regulations and measures are not valid till they are confirmed by the convocation. The convocation, which, besides the survivors of a certain number of doctors and masters in the faculties of divinity, law, medicine, and arts, from the universities of Oxford and Cambridge, appointed on the first establishment of the university, consists of all persons regularly admitted, since the opening of the university, to the degrees of doctor in divinity, the civil law, and medicine, and to the degree of master of arts, confirms or rejects any measures which are submitted to it by the senate, but has not the power to originate or amend. Senate. Convocation.

Course of study. By the regulations of the university, provision has been made for a regular course of general education similar to that which is

St Andrews.

given at Oxford and Cambridge; and also for a course of theological study. The qualifications of the students are ascertained by examination, before admission, in the rudiments of the Christian religion, in the Greek and Latin languages, and in arithmetic and the elements of mathematics, the warden having, in special cases, a dispensing power of admission in the case of failure; and their proficiency during the continuance of the course is tested by public examinations held annually, particularly at the end of the third year for the degree of bachelor of arts, and at the end of the fourth year for the degree of master. In 1837, an important extension of the benefits of the university was made by the establishment of a course of instruction for students in mining and civil engineering, suggested by the extensive public works in the neighbourhood. The students in this department must pass an examination, on admission, in the Latin language, or in some modern foreign language approved by the senate, in arithmetic, and the elements of mathematics. The full course of study for mining students extends over three academical years at least, and for engineer students over four academical years at least, of which, in both cases, three terms at least must be kept in the university; and includes the several subjects which relate to the theory and practice of mining and civil engineering. The students during their course are subjected to two examinations; and if these are passed satisfactorily, are admitted, by grace of the university, to the academical rank of mining engineer or civil engineer. With the view of giving additional facilities for students in medicine, regulations were made in 1852, by which it is provided that such students, if they reside three terms at Durham, may pursue the remainder of their studies, either there or in some school in connection with the university. In conformity with these resolutions, the Newcastle-upon-Tyne College of Medicine was received into connection with the university, and degrees in medicine are now conferred. The regular course of academical and theological instruction is confined to the members of the university, and is conducted by the professors and tutors, who give lectures daily.

Civil engineering.

Fellowships and scholarships.

There are twenty-four university fellowships, of which eight may be held by laymen. The ten senior fellowships are of the annual value of L.150, and the others of L.120. They are filled up by the warden, the members of the Senate, and the four senior fellows who are resident, and are vacated by marriage, or by holding preferment, office, or property, real or personal, producing L.300 a year or upwards. There are also twenty university scholarships of the annual value of L.30 each, besides ten others founded by private benefactors, of nearly the same value; and four medical scholarships of L.25 a year. Prizes of various kinds are given for the encouragement of merit. Public lectures on various branches of literature and science are also delivered from time to time, which are open, under certain regulations, to persons who are not members of the university.

Degrees.

Degrees are conferred by the warden and convocation, but every grace for a degree must be allowed by the dean and chapter before it is proposed in convocation. The academical year consists of three terms, of not less than eight weeks each, called *Michaelmas*, *Epiphany*, and *Easter*. Michaelmas term commences not earlier than the 10th of October, and Easter term ends not later than the 30th June. No religious test is exacted till a student proceeds to his degree. For the terms and exercises requisite for proceeding to the different degrees, and for the university and college expenses, see *Durham University Calendar* for 1859.

SCOTTISH UNIVERSITIES.

UNIVERSITY OF ST ANDREWS.

History.

At the beginning of the fifteenth century, Scotland contained no academical institution in which the higher branches of knowledge were taught. The Scottish youth who wished to obtain a more liberal education than the seminaries of the country afforded, were under the necessity of seeking it in distant universities; in some of which colleges were early endowed for their reception. Soon after the middle of the thirteenth century, Dervorguilla, daughter of Alan, Earl of Galloway, and mother of John Balliol, king of Scotland, founded and endowed a college at Oxford for Scottish students; and, in 1326, the Scottish College in the University of Paris was founded and endowed for a similar purpose by David Murray, bishop of Moray. The inconvenience and risk attending the removal of the youth to foreign schools were long felt; and the discerning part of the community were not insensible of the great advantages which the country would derive from the establishment of an institution within its own limits, where the higher branches of education, in science, philosophy, and theology might be obtained. One of the men who cherished these sentiments was Henry Wardlaw, bishop of St Andrews, who adopted measures to remedy the evil. Having ascertained that his sovereign James I., at that time a prisoner in England, approved of his scheme, he resolved, with the consent and approbation of the Estates of the kingdom, to erect a *general study* in the ecclesiastical metropolis. The lectures were begun in 1411; and the bishop, with the concurrence of the Prior of St Andrews and the Archdeacon of Lothian, immediately granted to the masters and students the privileges belonging to a university. Benedict XIII. issued a bull of confirmation on the 28th of August 1413, instituting a *studium generale*, or university, for instruction in theology, the canon and the civil law, medicine, and the liberal arts; and conveying to the bishop the power of conferring degrees in these faculties, thereby investing him with the power and dignity of chancellor. The pope on the same day signed five other bulls, securing the rights and privileges of the university, which were ratified by James I. in 1432. The king at the same time granted to the members of the university exemption from all the exigible tributes of his kingdom; an immunity which was confirmed by four of his successors on the throne.

Andrews.

Foundation.

The university was formed on the model of those of Paris and Bologna. The members, or *supposts*, as they were called, were divided into four nations, those of Fife, Angus, Lothian, and Albany, the last including all students who did not belong to any of the other three districts. The supposts, at a congregation or general meeting, elected annually four procurators to watch over their interests, and four entrants, or electors, by whom the rector was chosen. The government was vested in the rector, of whom it was required, as a necessary qualification, that he should be a graduate in one of the faculties, and should also be in holy orders. The university was represented in the rectorial court by twelve assessors, three selected from each nation. With the advice and consent of his assessors, the rector possessed supreme judicial power in all causes, civil and criminal, relating to members of the university, with the exception of crimes which inferred the highest punishment. As in other cases which have already been mentioned, the privileges and powers possessed by the university excited the jealousy of the magistrates of the city; till a concordat was entered into by the contending parties, by which their respective jurisdictions were defined and adjusted. The members of the university were divided into faculties, at the head of each of which was a dean, who presided at the meetings of the masters for regulating the course of study, for examinations, and the conferring of degrees. The university was well supplied with teachers even at its commencement. Before the papal bulls were issued, it included a professor of divinity, four lecturers on the canon law, and three who taught the arts or philosophy. The revenues of the institution were at first extremely limited, and for some time consisted chiefly of small sums received from the students at their admission and graduation; but the persons appointed to conduct the different departments of study generally enjoyed endowments from other sources. During the first twenty years of its existence, great inconvenience was suffered from the want of public buildings; and the schools were held in the different religious houses, which in consequence claimed to be considered as constituent parts of the university. In 1430 a *Pædagogium* was erected for the schools of the faculty of arts, and for chambers for the students of that faculty; while the studies of the faculties of theology and law continued to be conducted in other buildings. The congregations of the university were held for at least 130 years in the Augustinian priory.

Constitution.

St Andrews.

The university was liberally patronised by James I. after his return from his long captivity in England; and being conducted by an active and devoted priesthood, it soon acquired the confidence and respect of the country, and attracted students from all parts of the kingdom. To provide more effectually for their instruction, James Kennedy, the successor of Wardlaw in the see of St Andrews, established in 1450 the College of St Salvator, which was sanctioned by Pope Nicholas V. about the year 1455, and in favour of which new grants were made by the same prelate, and by Pope Pius II. in 1458. The college was to consist of thirteen persons, all of whom were to live within its walls; a præpositus or provost, who was to be a doctor of divinity; a licentiate and a bachelor of the same faculty; four masters of arts; and six poor scholars. The provost was required to lecture in theology once a week, the licentiate twice, and the bachelor every *readable* day; the duty of preaching at stated times to the people being also imposed on the two former. Two of the masters of arts were to be annually chosen as regents, the one to teach logic, and the other physics and metaphysics, according to the method of the schools and the statutes of the university. The masters of arts and poor scholars were to be elected by the provost, licentiate, and bachelor. The benevolent founder granted as an endowment the rectorial tithes of four adjoining parishes, constituting the three principal masters of the college rectors of three of them, and reserving the fruits of the fourth as a common fund for the maintenance and support of all members of the foundation, together with their attendants and servants. About the year 1468, Pope Paul II., in consideration of the rising reputation of the college, honoured it with the privilege of conferring degrees in theology and the arts; thereby constituting it a separate university, though with limited powers.

St Salvator's College.

St Leonard's College.

In 1512, John Hepburn, prior of the Augustinian monastery, and Alexander Stewart, archbishop of St Andrews, founded the College of St Leonard, which was in the same year confirmed by a royal charter from James IV., accompanied, as in the case of the university and the College of St Salvator, with an exemption to its members and property from all national imposts. The prior granted to this new erection the revenues of the hospital of St Andrews, for the support of the principal master; four chaplains, two of whom were to be regents; six graduates in arts, who were to be diligent students of theology; and twenty scholars, students of philosophy. The principal, who was to be nominated by the prior from the canons of the chapter, was constituted professor of divinity, and was invested with absolute jurisdiction over all the members of the college. In conjunction with the prior, he was to appoint the regents; and candidates for the scholarships, after satisfactory examination by him, certified to the prior, were nominated by the latter, who was enjoined to be influenced in the disposal of his patronage by merit alone, and not by individual solicitation. As in the case of St Salvator's, all the members were to live within the walls of the college, and were bound to conform to certain regulations as to dress, amusements, and general conduct. Delinquencies were to be severely punished; and the power of visiting the college and reforming its abuses was retained by the prior and the chapter of the convent.

St Mary's College.

Notwithstanding the superior advantages of the two endowed colleges, there were still in the university professors and students who belonged to neither, and who continued to frequent the *Pædagogium*, although they were supported by but slender funds. The disadvantages to which they were subjected in their competition with the rival colleges induced Archbishop Alexander Stewart to make preparations for giving to the pædagogium a collegiate form, which were frustrated by his premature death on the field of Flodden. The design was resumed by his successor, James Beaton, who, in 1537, founded St Mary's College, or, as it was sometimes called, the New College and in the same year procured for it the confirmation of Paul III. It was founded for all the faculties; and by its charter of erection obtained the power of conferring degrees, thus forming a third independent university. But the college was not finally erected till 1554, when Archbishop Hamilton, under the authority of a papal bull, obtained in the year preceding, extended its constitution, and endowed it with the tithes of six parishes. It was to consist of thirty-six persons; a prefect or principal, who was to be a doctor or licentiate in divinity, and who was to have jurisdiction over all members on the foundation; two professors of divinity, the one a licentiate and the other a bachelor; a professor of the canon law, who was to be in priest's orders; eight students of divinity, whose appointments were tenable for six years, and who, besides attending regularly the lectures of the professors, were themselves required to lecture; three professors or regents of philosophy, who were to teach logic, ethics, physics, mathematics, and the other liberal arts; a professor of rhetoric and one of grammar, who were to be masters of arts; sixteen poor scholars, students of philosophy, who were to be well acquainted with grammar and Latin; a provisor, a janitor, and a cook. The defence and propagation of the Catholic faith being the declared object of the erection of this as well as the other colleges, the principal and professors had certain extra-academical duties assigned to them. The principal was required to lecture on the sacred Scriptures every Monday, the licentiate five times a week, and the canonist to deliver the same number of lectures on the canon law. Appropriate duties were assigned to the other members. The rector of the university, with the principal of St Salvator's College, and some of the highest ecclesiastics of the city, were to elect the principal and the professors of divinity and of the canon law; and they again were to fill up all other vacancies as they occurred in the college. The rector was empowered to visit the college annually, and to see that discipline was duly enforced. The college was to be exempted from all public burdens. All vacations were to be disallowed, and absentees for a month in the year, without permission from the principal, were to forfeit their appointments. Nothing, probably, is more remarkable in the establishment of the colleges of St Andrews, than the success of the founders in obtaining for them the most celebrated teachers. Men who had distinguished themselves in the foreign universities were urgently invited as professors, and appear to have willingly embraced the opportunity to diffuse among their countrymen the learning which they had themselves acquired elsewhere.

St Andrews.

The constitutions of the university and the three colleges remained unaltered till the Reformation, with the exception of the appointment of a professor of humanity in each of the colleges of St Salvator and St Leonard, answering to the grammaticus in St Mary's. During the agitation of the great and vital religious controversy, the academical exercises were interrupted; and in the year 1559 the faculty of arts were under the necessity of discontinuing the public exhibitions usual at graduation. Immediately after the establishment of the Reformation, the laws and practice of the university were accommodated to the change which had taken place in the religious establishment of the country; but the mode of teaching, and the academical exercises, so far as related to philosophy and the arts, continued nearly on their former footing. The students who entered a college at the same time formed a class, and were placed under the superintendence and tuition of a regent, by whom their studies were conducted during the whole course. The regular period of the course was four years, but it was more usually finished in three years and a half. The session commenced on the 1st of October, and continued till the end of July, the months of August and September[1] being allowed as a vacation. The regent assembled his

Course of study.

[1] So early as the days of Augustin, the month of September, as the season of the vintage, appears to have been allowed as a vacation in schools. *Valesiana*, p. 65, as quoted by Dr M'Crie, *Life of Melville*, i. 244.

St Andrews.

class three hours every day, and read and explained to them the books of Aristotle, beginning with dialectics or logic, then advancing to ethics, next to physics, and concluding with metaphysics, which was considered the highest branch of philosophy, and mathematics, which included arithmetic. During their course the students were frequently exercised in disputations and declamations, both privately in their class and publicly before the college and university. The principal frequently read lectures on the higher branches of philosophy, which were attended by all the students of the college.

Degrees.

In the middle of the third year, the students who obtained from their regent and the principal of their college an attestation of regular attendance and good conduct, were allowed to propose themselves as candidates for the degree of bachelor. In the presence of three regents, annually selected from each college as examiners, the candidates *determined* a question in logic or morals, and answered such questions as were proposed to them on any of the branches of study with which they had been occupied. Those who acquitted themselves to the satisfaction of the examiners were confirmed *bachelors* by the dean, the rest were sent to a lower class. A similar form was observed in the act of laureation at the end of the course; except that, on this occasion, the candidates were examined on the whole circle of the arts, and were required to defend a thesis which had been previously affixed to the gates of the different colleges. They were then divided into classes, and their names arranged according to merit, with a certain preference to persons of rank. When the examinations were concluded, the degree of master of arts was solemnly conferred by the chancellor, *in nomine Patris, Filii et Spiritus Sancti*. Certain fees were paid by the graduates, according to their rank, to the purser of the university and of the faculty, to the dean, and to other officers. Small annual fees seem originally to have been paid by the students to their regents.

Course of study.

Soon after the establishment of the Reformation, the leaders of that great revolution proposed a scheme for new-modelling the universities, which, though not adopted by the Legislature, will remain a lasting monument of the enlightened and patriotic views of its compilers.[1] After several other ineffectual attempts, a commission was appointed in 1579, on the petition of the General Assembly, with full powers to consider the foundations in the University of St Andrews, to alter the constitution and form of study, and to introduce such improvements as might appear necessary. The commissioners, finding that all the colleges had departed from their original foundations, agreed upon a new course of instruction, which was laid before the ensuing meeting of Parliament, and ratified on the 11th of November 1579.

St Salvator's.

St Salvator's College was to consist of a principal, and four professors or regents of humanity and philosophy. The first regent was to teach the Greek grammar, and to exercise the students in Latin composition during the first, and in Greek during the second half-year. The second regent, who was also considered as professor of humanity, was to teach the principles of rhetoric, and the practice of it as exemplified in the best Greek and Latin authors. This class was to spend an hour at least every day in composition; and during the last half-year, the students were to declaim once a month in Greek and Latin alternately. It was the duty of the third regent to teach, in the original language, part of the Logic of Aristotle, with the Ethics and Politics; and the Offices of Cicero in Latin. The fourth regent was to teach the necessary parts of the Physics, and the doctrine of the Sphere. Each regent was confined to his own department. Professors of mathematics and law were also established, who were to lecture at least four times every week; and the principal of the college was to act as professor of medicine.

St Leonard's.

Similar arrangements were made in St Leonard's College; with this difference, that no classes of mathematics and law were established in it, and the principal was to lecture on the philosophy of Plato.

St Mary's.

St Mary's College was appropriated solely to the study of theology, and the languages connected with it. The course of study was to be completed in four years, under the instruction of a principal and four professors, each of the professors having under his care only the students of one year. It embraced, in the first year, the elements of Hebrew, Chaldee, and Syriac; during the next eighteen months, the same languages, with critical explanations of the Pentateuch and historical books of the Old Testament; and during the remaining eighteen months, the prophetical books were examined in the same manner. During the whole four years, the fourth professor was to explain the New Testament, by comparing the original with the Syrian version, and the principal was to lecture on systematic divinity. The students were required to attend the lectures of three professors every day during the continuance of their theological course. Such was the form of instruction drawn up by Melville and recommended by Buchanan, which has been well characterized by Dr M'Crie as "the most liberal and enlightened plan of study which had yet been established in any European university." This destination of the colleges continued till 1621, when, by an act of the Legislature, their original constitutions were restored, "in all their heads, articles, and clauses," so far as was consistent with the reformed religion, with the single exception that St Mary's should be confined to the faculty of divinity. Professorships of mathematics and medicine were instituted in 1668 and 1721. We have not the means of ascertaining the precise number of students who belonged to the university at one time. In ordinary cases it appears not to have exceeded 200, and it did not fall much short of that number during the latter half of the sixteenth century. Fewer had attended it during the first half, and still fewer previously to that period.

St Andrews.

Union of St Salvator's and St Leonard's.

The three colleges continued without further alteration till the year 1747, when, in consequence of the inadequacy of the provision for the principals and professors of the two colleges of philosophy, a union of them was effected by parliamentary enactment, which enabled them to consolidate their endowments, and to make provision for a more extended course of instruction. By this statute the United College of St Salvator and St Leonard was to consist of a principal, a professor of Greek, three professors of philosophy, professors of humanity, civil history, mathematics, and medicine, and sixteen bursars on the original foundations. The same statute regulates the patronage of the professorships and bursaries, and makes provision for the disposal of the funds of the college.

In the present position of the Scottish universities (September 1860), it is impossible to offer a complete account of the constitution of any one of them. A feeling had long prevailed that they were failing to supply the increasing demands of the intelligence of the day, and that some improvement in their constitution, as well as additional means of obtaining instruction in the more modern departments of literature and science, were imperatively required. The system of instruction pursued in them, though well suited to the wants of the community a century ago, had ceased to meet the requirements of the present age. In consequence of this a royal commission for visiting the Scottish universities was appointed in 1826, which, after an extensive and minute inquiry, issued in 1831 an elaborate report containing many valuable suggestions for their improvement. In this able document a separate constitution was sketched out for each; and additional professorships suggested where these were deemed necessary. But public expectation was excited only to be disappointed. Not a single suggestion contained in the report was carried into effect; and with the exception of the institution of a few chairs, chiefly medical, in Edinburgh, Glasgow, and Marischal College, Aberdeen, the universities have, till the present year, remained in the same condition. Meanwhile, the demand for renovation continued to gather strength, and being increased by the improvements so happily effected in Oxford and Cambridge, at last induced the government to take up the question; and accordingly, in 1858, an act was passed "to make provision for the better government and discipline of the universities of Scotland, and improving and regulating the course of study therein; and for the union of the two universities and colleges of Aberdeen."

Act of 1858.

The act appoints twelve noblemen and gentlemen as commissioners, with ample powers to carry its provisions into effect; and these are at present occupied in preparing and issuing ordinances to regulate the proceedings of each university separately. In all the universities the act has come into operation, but in none of them have the necessary details been arranged. One object of the act is to introduce a uniform system of government and instruction in all the universities, and accordingly the same constitution is provided for all. In each there are three governing bodies, namely, the Senatus Academicus,[2] the University Court, and the General Council; and the chief officers are the chancellor, the vice-chancellor, and the rector.

Constitution.

Officers.

The Senatus Academicus consists of the principal[3] and professors, possesses and exercises the powers previously belonging to it in so

Senatus Academicus.

[1] See *First Book of Discipline*, "Of the Erection of Universities."

[2] This designation was applied to the meetings of the governing body of the Scottish universities at an early period. It was assumed by the meetings of the rector and dean of faculty, with the principal, professors and regents of the university of Glasgow, as early as the year 1621, and perhaps earlier.

[3] By the act of 1858, laymen are rendered admissible to the offices of principal in the universities of Glasgow, Aberdeen, and Edinburgh, this having previously been the case in the United College, St Andrews, and in Marischal College, Aberdeen. The office is no

St Andrews.

far as these are not altered by the act, superintends and regulates the teaching and discipline of the university, and administers its property and revenues, subject to the control and review of the University Court. The principal is president, and has both a deliberative and a casting vote. One third of the senatus form a quorum.

University Court.

The University Court consists of the rector, principal, and assessors nominated by the chancellor, rector, General Council, and Senatus Academicus respectively. The rector is president, with a deliberative and a casting vote. The rector and the assessor nominated by him continue in office for three years, and the other assessors for four years; and no principal or professor of any university is eligible to the office of rector or assessor, except in the case of the assessor elected by the Senatus Academicus. The following are the powers vested in the University Court:—

Powers of University Court.

1. To review all decisions of the Senatus Academicus, except as otherwise expressly regulated. 2. To improve the internal arrangements of the university, after due communication with the senatus, and with the sanction of the chancellor; all proposed improvements to be submitted to the University Council for consideration. 3. To require the professors to attend to their duties. 4. To fix and regulate the fees payable in the several classes. 5. Upon sufficient cause shown, and after due investigation, to censure a principal or professor, or to suspend him in whole or in part from office and emoluments for not longer than one year, or to require him to retire on an allowance, or to deprive him of office, and provide for the interim teaching of his class; no such sentence to have effect till approved by the queen in council. 6. To inquire into and control the pecuniary affairs of the university, including funds mortified for bursaries and other purposes. The patronage of all professorships at present vested in the senatus, or in any member or officer thereof, is transferred to the University Court. During the subsistence of the commission, the powers of the University Court are to be exercised in subordination thereto; but after the expiry of the commission, any of the rules, statutes, and ordinances, framed and passed by the commissioners, may be altered or revoked by the University Court, with the written consent of the chancellor, and the approval of the queen in council.

General Council.

The General Council consists of the chancellor, the members of the University Court, the professors, all masters of arts of the university, all doctors of medicine of the university who have, as matriculated students, attended classes in any of the faculties for four complete sessions, and all persons who, within three years after the passing of the act, shall have proved to the commissioners that they have attended the university for four complete sessions, or for three complete sessions and some other Scottish university for one session, provided that during two of these sessions they have studied in the faculty of arts. No person can be a member of the council till twenty-one years of age, nor so long as he is an enrolled student in any class in the university. Each member must also register his name in a book kept for that purpose, and pay a small annual fee fixed by the commissioners. The council meets twice a year towards the commencement and before the close of each session, on such days as are fixed by the commissioners, subject thereafter to alteration by the council, with the approval of the University Court. The council has the power to suspend its proceedings from one hour to a later hour of the same day, but not from either of the stated annual days to a future day. The chancellor, whom failing, the rector, or principal, or senior professor, presides, with a deliberative and a casting vote. The council elects the chancellor and an assessor to the University Court, has the power to consider all questions affecting the prosperity of the university, and to make representations on such questions to the University Court, who are required to consider the same, and return to the council their deliverance thereon; but possesses no legislative power.

Chancellor.

The chancellor is elected by the members of the General Council, and holds the office for life. He is the fountain of honour, and all degrees proceed from him. In the election of chancellor or of assessor by the General Council, where more than one person is nominated for the same office, it is the duty of the president of the meeting, by means of a show of hands, to ascertain and declare which of the persons nominated has a majority of votes; and if no poll is demanded, the president declares such person to be duly elected. If a poll is demanded, a poll is taken by means of schedules transmitted through the post, to all the members, which are to be signed and returned to the registrar within twenty-one days after the day of meeting.

Vice-chancellor.

The vice-chancellor is appointed by the chancellor, and, in his absence, may discharge his office in so far as regards the conferring of degrees, but in no other respect.

The rector is elected by the votes of the matriculated students, and continues in office for three years. He is the ordinary president of the University Court, in which he has a deliberative and a casting vote.

St Andrews. Rector.

The act likewise provides assistants for the professors of Latin, Greek, mathematics, and natural philosophy, to aid them in more efficiently conducting their classes. The question as to the superiority of the tutorial system, as it exists in Oxford and Cambridge, or of the professorial system, as followed in the German universities and in Scotland, has been often agitated; and the opinion is now becoming prevalent, that a combination of both is greatly to be preferred to either singly. This is not the place for adducing arguments; but it may be safely affirmed that, for students reared as the great majority of those who attend the Scottish universities are, something more than the lectures of the professors is necessary to enable them to advance satisfactorily in their studies. This acknowledged defect has now been supplied; and the blame will attach to the professors, if the introduction of the tutorial system does not prove to be the greatest advance which has yet been made in university education in Scotland. The professors must not be relieved of any portion of their public duties,—the whole class must attend their lectures as formerly,—while the assistants should be employed in giving additional instructions to those students whose previous preparation is defective, and in taking part in the drudgery of correcting exercises; the least interesting of a professor's duties, but one without which no system of lecturing can be made effective.

Assistant professors.

Constitution.

The University of St Andrews consists of a chancellor, rector, two principals, and twelve professors and students. The University Court consists of the rector, the senior principal, an assessor nominated by the chancellor, an assessor nominated by the rector, an assessor elected by the General Council, and an assessor elected by the Senatus Academicus, with four as a quorum. The rector is elected by a general poll of all the matriculated students. The meetings of the General Council are held on the last Thursday of March and the last Thursday of November. The Senatus Academicus consists of the two principals and twelve professors; the senior principal being president, and having both a deliberative and a casting vote. The length of the session, course of study, class fees, revenues, bursaries, &c., are at present under the consideration of the Universities Commissioners.

Dean.

The Dean of the Faculty of Arts is chosen annually by the members of the faculty, who are the principal and professors of the United College. He presides in the meetings of the faculty, and communicates with the senatus respecting applications for degrees.

Faculties

In the original charters of all the Scottish universities, the four Faculties of Arts, Laws, Medicine, and Divinity, are either expressly enumerated, or, as is the case with Glasgow, are implied in the expression *quavis alia licita facultate*; and in all of them, with the exception of St Andrews, is instruction given in these faculties. Here there are professors of medicine and chemistry, but there is no medical school; and there is no representative of the faculty of laws. The only faculties therefore which are in operation, are the faculty of arts in the one college, and that of divinity in the other.

Curriculum of arts.

The curriculum of arts extends over four sessions, and includes attendance on the classes of Latin, Greek, mathematics, logic (including rhetoric and metaphysics), moral philosophy and political economy, and natural philosophy.

Session.

In the United College the session or annual term of attendance for the Latin and Greek classes begins at present on or about the 20th of October; for the other classes, on the first Thursday of November; and closes on the last Friday of April. In St Mary's College it commences about the end of November, and terminates in the beginning of April.

Revenue.

The revenue of the university, as distinct from the colleges, is small; and the endowments of the colleges have been much curtailed by the augmentations of the stipends of those parishes the tithes of which were granted to them by the original founders. The revenue of the United College is derived partly from the funds of the original foundations, from the donations of private individuals, and from property purchased by the college itself. St Mary's College was originally endowed with tithes only, to which additions were made by James VI. and William III. Both colleges receive an annual grant from Parliament.

Bursaries

There are 57 bursaries connected with the United College, varying in value from about L.30 to L.5. Of these, 25 are open to public competition; the others are in the gift of private patrons or public bodies. There is also a Ramsay fellowship of the value of from L.100 to L.120, tenable for four years by a student who

---

longer to be included in the terms "Chair of Theology;" and the principal of any of the universities is bound to undertake and perform such duties of teaching and lecturing as may be assigned to him by the commissioners, and subsequently by the University Court.

Glasgow. has completed his curriculum in arts. The aggregate annual value of the funds is about L.800. In addition to the bursaries, five valuable prizes of L.25, L.20, L.15, L.14, and L.10, are assigned by public competition at the end of each session. In St Mary's College there are 12 divinity bursaries in the gift of the college, of the average aggregate value of L.160, which are awarded by public competition, besides 3 which are in the gift of private patrons; and 4 of the aggregate annual value of L.90, which are administered by the Presbytery of Perth.

The number of matriculated students in 1859–60 was, in arts, 110, and in divinity, 35. The number of graduates was 102; namely, in arts, 9 (A.M. 6; A.B. 3); in divinity, 0; in laws, 0; in medicine, 93.

Discipline. As none of the students live within the college walls, the discipline in the Scottish universities is limited chiefly to the class-room. Delinquents are punished by admonition or fine; and on a repetition of the offence, or when the offence is of a grave character, are brought before the Senatus Academicus, which possesses the power of rustication and expulsion. Regular attendance on the classes is strictly enforced, and various means are used to stimulate the in-

Prizes. dustry of the students. At the close of the session prizes are awarded to those who are most distinguished in their respective

Dress. classes. The students in arts wear a particular dress, which varies with the rank of the wearer, according as he is a *primar*, *secondar*, or *ternar*. The students of both colleges are required to attend divine worship in the college church, except such as obtain dispensations from the principals and professors.

The following table contains the several professorships, with the patronage.

United College.

Office.	Patronage.
Principal	Crown.
Humanity	Duke of Portland.
Greek	University Court.
Mathematics	Crown.
Logic, Rhetoric, and Metaphysics	University Court.
Moral Philosophy and Political Economy	University Court.
Natural Philosophy	University Court.
Civil History	Marquess of Ailsa.
Anatomy and Medicine	University Court.
Chemistry	Earl of Leven.

St Mary's College.

Office.	Patronage.
Principal and Primarius Professor of Divinity	Crown.
Second Master and Professor of Divinity	Crown.
Ecclesiastical History	Crown.
Oriental Languages	Crown.

UNIVERSITY OF GLASGOW.

Foundation. In the year 1450, Pope Nicholas V., at the solicitation of William Turnbull, bishop of Glasgow, issued a bull establishing a *Studium Generale* or University, "for theology, the canon and the civil law, the arts, and every other lawful faculty," in the city of Glasgow; and granting to it all the rights and privileges belonging to the University of Bologna. The Archbishop of Glasgow was constituted chancellor, with the same authority as was possessed by the heads of the Italian university, and particularly with the power of conferring degrees and licenses on candidates duly examined.

History. No mention is made of medicine, as in the original erection of the University of St Andrews; but it is implied in the expression, "*quavis alia licita facultate.*" In the following year a body of statutes for its government was prepared by the bishop and his chapter, which, with the papal bull, was confirmed in 1453 by a royal charter from James II. The king likewise exempted the members from taxes and all civic burdens; and in the same year various privileges were conferred by the bishop, similar to those granted by Bishop Wardlaw to the University of St Andrews.

In the original constitution of the university, that of Bologna seems to have been imitated as far as circumstances would permit. It consisted of a chancellor, rector, deans of faculties, procurators, regents, masters, and scholars; and was placed by the bishops beyond the control of the civil magistrates. The supreme power was vested in the scholars who had been matriculated, and whose names remained on the *album*; and these, in their *comitia* or congregations, enacted, amended, or repealed the statutes. The *supposts*, or members of the university, were distributed into four nations, each having a procurator, elected annually from its own number, who was invested with considerable trust and power. The supposts, assembled in *comitia*, also elected the rector through the medium of intrants as at St Andrews, and at the same time chose four deputies to form the rectorial council. The rector, acting with the advice of his council, exercised supreme judicial and executive power over all the members of the university: he was invested with jurisdiction in all minor civil cases in which supposts were concerned; graver offences were specially reserved for the decision of the bishop himself. Permission was given to the supposts to bring their causes either before the rector or the bishop, and liberty of appeal to the latter was allowed to any one who thought himself aggrieved by the sentence of the former. In 1461 an ecclesiastical jurisdiction was conceded to the rector; and such a concession implies that this officer was necessarily a person in holy orders. All houses and lodgings for the supposts within the city were subjected to regulations similar to those established by Gregory IX. in the University of Paris. The magistrates and other officers of the city took a yearly oath to observe and defend the privileges and liberties of the university. Glasgow.

This university, at its first erection, was entirely unendowed, and for a considerable time possessed no funds, with the exception of small perquisites paid at promotions to degrees. Its meetings were held in the chapter-house of the Blackfriars, or in the cathedral; and the teachers were furnished with schools in the religious houses. In 1458, the faculty of arts commenced building a *Pædagogium*, at the expense of their common purse; but this design was superseded by the liberality of the first Lord Hamilton, who, in the following year, conveyed to the principal and the other regents of the faculty, for their use and accommodation, a tenement in the High Street, together with four acres of land. The donor required that the principal and regents should, on their admission to office, promise on oath to commemorate himself and his wife as the *founders of the college*. The annals of the university furnish scarcely any information respecting the means of instruction which it provided, and the mode in which that instruction was conveyed. In the higher faculties, the teaching seems to have been confined to occasional lectures. More attention appears to have been paid to the inferior branches of science. The records mention the admission of a regent of philosophy within two years after the erection of the university. It may readily be assumed that the want of salaries to the professors was the principal reason why the higher branches of knowledge were neglected; and even the instruction which the university diffused was furnished by men who derived their emoluments from other sources. The professors of divinity, and of the canon and the civil law, depended for their support on the benefices which they held as ecclesiastics in various parts of the country.

College. By Lord Hamilton's deed of bequest, the faculty of arts obtained the nucleus of the college property; but it is not quite clear that the name of a college was then, for the first time, conferred upon it. Two sets of records are preserved, commencing with the origin of the university, one volume of which is entitled "Annales *Collegii Facultatis Artium* in Universitate Glasguensi;" and if this title was prefixed to it so early as 1451, the college must have existed before the charter of Lord Hamilton. It is not, however, till 1462 that express mention is made of the *Collegium Facultatis Artium*; and it may be questioned if even at that time the college was co-extensive with the faculty, and not rather a

Glasgow. select body, which assumed the government of the whole faculty, like the colleges of faculties at Bologna. The exact imitation of all the customs of Bologna makes the latter supposition probable. It is at least clear that at this early period the term "college" had no reference to a building for common habitation or common maintenance.

The university remained in this state for about a hundred years, during which time it appears, from the language of certain grants, that the university and the college of the faculty of arts were frequently confounded. In the year 1557, two years before the Reformation, James Beaton, archbishop of Glasgow, conveyed to the *Pædagogium*, or *university*, and to the masters and regents in the same, an ecclesiastical benefice, which, from the accompanying restrictions, was clearly intended for the benefit of the whole university. Similar instances might be adduced. At what precise period the two terms ceased to be used synonymously, and the existence of a separate college to be recognised, does not appear.

From its peculiar constitution, the University of Glasgow necessarily suffered more from the change of religion at the Reformation than the other learned seminaries of Scotland. The professors in the higher branches being all supported by their livings in the church, and adhering to the old religion, successors could not be appointed to them, owing to the total want of salaries. It likewise suffered materially from the fraudulent alienation and unjust seizure of its slender revenues. This evil was in some degree remedied in 1563 by Queen Mary, who granted certain houses and lands for the benefit of the college or university, and specially for the maintenance of five bursars. In 1572 the magistrates of Glasgow granted a charter, which was confirmed by act of Parliament, conveying to the college certain church property for the support of a professor of divinity, who was to be principal or provost, two regents of philosophy, and twelve poor students. The whole founded persons were to eat and sleep within the college, and they and all students were required to sign the Confession of Faith. It might be supposed that these gifts would have been sufficient to place the college on a respectable footing; but it appears that even then the whole funds did not exceed L.300 Scots, or L.25 sterling.

Nova erectio. Five years afterwards, James VI., by the advice of the Regent Morton, new-modelled the constitution, and made a very considerable addition to the revenue. The charter then granted forms the basis of the present constitution, and is known by the name of *Nova Erectio*. According to it, the college was to consist of a principal and three regents, to each of whom certain salaries were assigned, four poor students, and servants. The principal, who was to have the ordinary jurisdiction over the members of the college, and to reside there constantly, was to be a proficient in sacred learning, and was required to lecture at least one hour a day for five days in the week. He was to be nominated by the crown; and, failing an appointment by the crown within thirty days, the election devolved upon the chancellor, rector, dean of faculty, and five clergymen, including the minister of Glasgow. The regents were to be elected by the rector, dean, and principal, and were appointed each to a particular department of learning—a principle which had never before been adopted in Scotland, and was afterwards abandoned even in Glasgow,—instead of conducting the students through all the branches of instruction included in the course. The electors were invested with a visitorial power over the regents, and might remove them; and, on the other hand, the rector, the dean of faculty, and the regents, might visit and admonish the principal. The principal, if negligent after three admonitions, was removable by the rector, dean, and regents. The rector, dean, and minister of Glasgow were to inspect and audit the accounts four times in the year, and to direct the surplus revenue to be applied to the necessary uses of the college. It is obvious that the intention of this charter was to place the college under the effectual superintendence of the university. In 1581, Archbishop Boyd granted to the college an additional endowment for the support of a fourth regent, who is believed to have been the professor of Greek. About the same time a new body of statutes was framed by royal authority, which has hitherto regulated both the university and college. Glasgow.

Course of instruction. The course of instruction prescribed by the *Nova Erectio* is an additional proof of the enlightened views entertained by the early leaders of the Church of Scotland on the subject of public education; but having already alluded to this subject in connection with the University of St Andrews, our limits will not permit us to give it in detail. It may be sufficient to say, that it embraced every improvement which the learning and experience of Andrew Melville had been able to devise. Small fees, varying with the rank and standing of the students, were to be paid at matriculation to the rector and beadle. New students, as well as those who had attended the former year, were to be examined in the beginning of October; and the examination of candidates for the degree of master of arts was to be held on the third week of August. After due examination, the dean and others were to decide on the qualifications of the several candidates, and to arrange their names according to merit. The examiners were to be the dean, principal, professors, and the master of the grammar-school, all of whom were sworn to be faithful and impartial. Degrees were to be solemnly conferred by the chancellor. *Honoraria* were to be paid to the regents, according to the rank and fortune of the students. Sons of the nobility and barons of Scotland were to pay annually at least L.3; those of the second rank, who, though inferior to the barons, possessed means sufficiently ample, were to pay L.2; those of the third rank to pay L.1; the poor were to be admitted free of all charge.

The constitution founded on the *Nova Erectio* has at different times been extended and improved by commissions of visitation. One appointed by the General Assembly in 1639, and renewed in subsequent years, recognised in 1640 a class of humanity, and instituted a separate professorship of divinity. In 1642 another professorship of divinity was established by the university, and distinct departments of study were assigned to the principal and the other two professors of this branch. A professorship of medicine, which had existed for some time, was declared to be unnecessary. By the same commission, strict regulations were made respecting the study of Greek and Latin, the performance of public exercises, and the regularity of attendance. The most material change effected on the constitution of James VI. was this:—"On the understanding that it was a disadvantage to students to change their masters annually, it was required that every master, instead of continuing to teach the same branch, should educate his own scholars through all the four classes;"[1] four years being the curriculum necessary for graduation in arts.

In 1727 a royal visitation made several important regulations, which have ever since remained in force. It declared the right of electing a rector to be in all the matriculated members, moderators, or masters and students; revised the system of teaching introduced by the charter of *Nova Erectio*; and assigned permanent professors to the three classes of philosophy. The *Semi* Class was set apart for logic and metaphysics, the *Bachelor* Class for moral philosophy and natural philosophy, and the *Magistrand* Class for physics and experimental philosophy. Besides the professors of humanity, Greek, and philosophy, the visitation recognised professors of divinity, law, medicine, botany, anatomy, oriental languages, mathematics, and history, requiring them to teach whenever five or more scholars presented themselves. The same commission defined the powers of the faculty meetings, and sanctioned certain privileges which had been assumed by them in contradiction to the statutes, and which by this time had passed into usages. As the meetings of the faculty were composed only of professors, this interpretation tended to give the college greater power of self-government, and to remove it from the control of the officers of the university.

The exclusive rights thus granted to the college were submitted to the Court of Session in the years 1771 and 1772. The court declared that the whole revenue and property of the college belonged to the principal and masters, and were not subject to the control of the rector and his assessors. At the same time it recognised the visitors appointed by the charter of foundation, and their right to audit the college accounts and to dispose of the surplus revenue. The right of election to professorships, which the charter intrusted to the rector, dean, and principal, was found to be in the rector, dean, and faculty meeting, or, in other words, in the professors themselves. The distinctive privilege of professors of the University, and of the College of Glasgow, was finally made in 1807, in a lawsuit which arose out of the appointment of

[1] This mode of conducting academical education was long followed in all the universities of Scotland; and, chiefly from the influence of Dr Reid, who gave it a decided preference, continued to prevail at Aberdeen till 1800. (Commissioners' *Report*, p. 221.)

Glasgow.

a regius professor of natural history. The incumbent claimed a right to participate in all the powers and privileges of the faculty, and to be admitted as a member of the college, which was resisted by that body. The Court of Session recognised the rank of the incumbent as a professor in the university, but decreed that he was not a member of the college, and therefore not entitled to share in its property, or to vote in any of its meetings. This decision was acquiesced in by the crown; and, in all subsequent appointments to regius professorships, restrictions have been introduced which were intended to be in conformity with the deliverance of the court. By the act of 1858, the distinction between the two classes of professors has been abolished. All are henceforth to "be deemed to be professors of the university and college," exercising the same rights and functions, but without participating in the income and emoluments already appropriated to existing chairs.

Government of the university.

Under the act of 1858, the government of the university is vested in the senatus academicus, the university court, and the general council. The senatus academicus consists of the principal and twenty-two professors; the university court, of the rector, the principal, the dean of faculties, an assessor nominated by the chancellor, an assessor nominated by the rector, an assessor elected by the general council, and an assessor elected by the senatus academicus; with five as a quorum. The restrictions in the elections, and the period of service, are the same as those already mentioned. The general council meets twice a-year, on the Friday immediately preceding the 2d of May, and on the Friday immediately preceding the first Tuesday of November.

Election of rector.

In the election of rector, the matriculated students vote in four nations: the *Natio Glottiana*, consisting of all students born within the county of Lanark; the *Natio Transforthana*, consisting of all students born in any of the counties lying to the north of the Firth of Forth, including Argyll, Stirling, and Dumbarton; the *Natio Rothseiana*, consisting of all students born in the counties of Bute, Renfrew, and Ayr; the *Natio Loudoniana*, consisting of the students not included in any of the other nations. In the case of an equal number of nations voting for two or more candidates, the rector is chosen from among the candidates by the chancellor intimating his choice personally, or by letter addressed to the senatus academicus within twenty-one days; and failing such intimation, he is chosen by the principal from among the candidates.

Dean of Faculties.

The dean of faculties is elected annually by the senate on the 1st of May; but the same person generally continues in office for two years. The duties of the office, as originally constituted, were to exercise a superintendence over the studies, and, in conjunction with the masters, to judge of the qualifications of applicants for degrees. Along with the rector and the minister of Glasgow, he was called upon to inspect and audit the accounts four times in the year. The rector, dean, and minister of Glasgow, have been relieved of their visitorial duties by the recent act.

Faculties.

In the orginal deed of foundation, the faculties of theology, the canon and the civil law and arts, are expressly enumerated; and medicine and music, though not specified, are implied in the clause *quavis alia licita facultate*. Soon after the erection of the university, some efforts were made to teach the canon and the civil law, and professors of theology are occasionally mentioned; but till the Reformation there seems to have been no regular course of instruction, except in the faculty of arts. The university now contains four faculties: those of arts, divinity, laws, and medicine. The faculty of laws is confined to the single professor of the civil law; the other faculties have the usual complement of professors. The curriculum of arts extends over four sessions, and comprises the classes of Latin, Greek, logic and rhetoric, mathematics, moral philosophy, and natural philosophy. The session at present opens on the first Monday of November, and closes on the last day of April.

Revenue.

The revenues of the university and college, which are very considerable, are derived from estates, tithes, and bequests; and, with some unimportant exceptions, are administered by the principal and professors. The university also receives a grant from parliament.

Bursaries.

Connected with the university are 36 foundations for bursaries, the benefits of which extend to about 81 students. Of these bursaries 55 belong to the faculty of arts, 23 to that of divinity, 2 to medicine, and 1 to laws, and are tenable for from two to six years. They are nearly all in the gift of private patrons or public bodies. Their aggregate annual value is L.1480; the highest being L.100, and the lowest L.5. Besides the bursaries, the principal and professors possess the right of nominating students, natives of Scotland, who have attended two sessions in the University of Glasgow, or one session there, and two in some other Scottish university, to ten exhibitions in Balliol College, Oxford, founded by John Snell, Esq. in 1677. The election is vested in the Master and Fellows of Balliol College. Two of these are hereafter to be filled up annually by an examination held at Glasgow. They are of the annual value of L.116, 10s. each, and are tenable for five years.

Aberdeen.

The number of matriculated students during the session 1859–60 was 1127. The number who graduated in 1859 was 62; namely, in arts, 23 (A.M. 8; A.B. 15); divinity, 1; laws, 5; medicine, 30; masters in surgery, 3. The students in arts wear an academical dress.

The following table contains a list of the professorships, with the date of foundation and the patronage:—

Office.	Foundation.	Patronage.
Principal	1577	Crown.
Divinity	1630	University Court.
Natural philosophy	1577	.....
Moral philosophy	1577	.....
Logic and rhetoric	1577	.....
Greek	1581	.....
Humanity	1637	.....
Mathematics	1691	.....
Oriental languages	1709	.....
Roman law and law of Scotland	1713	Crown.
Practice of medicine	1713	...
Anatomy	1718	...
Ecclesiastical history	1720	...
Practical astronomy	1760	...
Natural history	1807	...
Surgery	1815	...
Midwifery	1815	...
Chemistry	1817	...
Botany	1818	...
Materia medica	1831	...
Institutes of medicine	1839	...
Forensic medicine	1839	...
Civil engineering and mechanics	1840	...

UNIVERSITY OF ABERDEEN.

Foundation.

Another proof of the great impulse which had been given to education in Scotland during the fifteenth century is furnished by the institution of a third university towards its close. William Elphinstone, one of the most eminent and enlightened prelates of his time, who was consecrated bishop of Aberdeen in 1487, prevailed upon his patron James IV. to solicit from the pope the erection of a university in Old Aberdeen, for the purpose of extending the advantages of education to the northern districts of his kingdom. The University of Aberdeen was accordingly founded in 1494, by a bull of Pope Alexander VI., issued on the representation of James IV. The papal edict authorised the erection of a *studium generale et universitas studii generalis*, in the city of Old Aberdeen, for teaching divinity, the canon and the civil law, medicine, and the liberal arts; and conferred upon it all the privileges and immunities which were enjoyed by the Universities of Paris and Bologna. The university was to consist of a chancellor, who was to be the Bishop of Aberdeen, a rector, and doctors of faculties, and was invested with the power of conferring degrees, which were to be held as valid throughout Christendom. Two years after, on the publication of the deed of erection, the king granted a charter in favour of the university, bestowing upon it certain ecclesiastical funds for the support of its members, and granting to it all the rights, liberties, and advantages which his ancestors had given to St Andrews and Glasgow. Its privileges were finally established by a papal bull issued in 1500. In erecting this new seminary, the model of Paris, where Bishop Elphinstone had read lectures on the canon law, seems to have been mainly followed. The supposts were divided into four nations, who seem to have elected their procurators (*procuratores nationum*); but they took no further part in elections, nor in the government of the university, the procurators acting as their representatives.

King's College.

College of the Trinity, or King's College.

In 1505, Bishop Elphinstone, for the purpose of increasing the revenues of the new university, and enlarging the number of its members, founded and endowed a College, or Collegiate Church, in honour of the Trinity and the Virgin Mary, which was in the following year confirmed by the

 head of the church, and soon after by the reigning monarch. The college was to consist of thirty-six ordinary members, the chief of whom was to be a doctor or licentiate of divinity, who was to be styled principal, and to whom all the members were to yield obedience. Next to him were doctors or licentiates of the canon and the civil law and medicine; a master of arts, who was to be regent and sub-principal; and another, who was to teach the elements of literature. Besides these there were five masters of arts, students of divinity, who were to retain their appointments for a limited number of years; and thirteen poor scholars of respectable talents and proficiency, who were to be students of arts. All the members, with the exception of the doctor of medicine, were to be ecclesiastics, and were required to live within the college. The rector of the university, if not a member of the college, and if he was, the dean of the faculty of arts, and the official of Aberdeen, were constituted visitors, with power to remedy whatever was found defective. In the following year, Pope Julius II., at the request of the bishop, conferred on the chancellor, with a separate provision in case of a vacancy in the see, the power of granting the degrees of doctor, master, bachelor, and licentiate in the faculties of theology, the canon and the civil law, and medicine; thereby investing the college, temporarily at least, with the privileges of a university.

History. A new erection, increasing the number of the members of the college, improving their comforts, and introducing a more efficient system of instruction, which had been prepared by Bishop Elphinstone, but left unexecuted at his death in 1514, was officially published by his successor, Bishop Dunbar, in 1531. By this new charter, which, though modified by time and circumstances, has hitherto regulated, in a great degree, the form and practice of the university, the members of the seminary were to be forty-two. The first class consisted of four doctors; a doctor of divinity, who was to be principal, and whom all the other members were respectfully to obey; and doctors of the canon and the civil law, and medicine, or licentiates if doctors could not be found. In the second class were eight masters of arts, the first of whom, learned in philosophy and the arts, was to be sub-principal; the second was to be skilled in poetry, grammar, and rhetoric; and the remaining six, from whom the regents were to be elected, were to be students of divinity, and to retain their appointments for six years, until promoted to the degree of doctor therein. The next class was formed of students of law, who were to study the civil law, and to attend the lectures delivered on that subject. All these, with the exception of the doctor of medicine, were to belong to the priesthood, and were occasionally to say mass for the founders. There were, besides, thirteen students of arts, retaining their endowments for three years and a half, the usual curriculum in that faculty; and eight prebendaries, who were to attend to sacred music, one of them being styled cantor, and another sacrist, and six boys for the choir. For all these, with the exception of the mediciner, grammarian, civilist, and canonist, who were furnished with manses, accommodation was to be provided within the college. The revenues were placed under the charge of a procurator or factor, who was to be appointed by the principal officers of the college.

The principal was to be elected by the rector of the university, the procurators, doctors, sub-principal, regents in arts, humanist, theological students, cantor and sacrist, and to be admitted by the chancellor. His duties were to govern the college, to preside in its meetings, to direct the regents in the delivery of their lectures, and to punish such as were deficient in their duty, to profess every day in philosophy and the arts, and to give lectures in divinity to the people six days in the year. The doctors, who were to be appointed by nearly the same electors, were likewise to be admitted by the chancellor, and to lecture to the students, each on the subjects belonging to his faculty. The election and admission of the sub-principal and humanist were to be conducted in a similar manner. The former was required to lecture in philosophy and the arts *quolibet legibili die*, to instruct the students in manners and virtue, to preside at public disputations among the students, to inflict fines on such as absented themselves from divine worship, and, along with the principal, to take a general superintendence of the affairs of the college. The students of theology and the arts were to be elected by the sub-principal, the regents and the doctors of faculties, and admitted by the principal. The theological students were required to apply themselves to the study of their science, and to be qualified within three years to take their bachelor's degree. Their places, when vacant, were to be filled up from the students of arts. The college was exempted from all civic burdens.

From this statement it appears that the northern seminary closely resembled in its constitution the Colleges of St Andrews and Glasgow. The connection between the college and the university is distinctly marked in the charter of foundation, in which it is recommended that the permanent and higher offices should be supplied from the inferior members if they were qualified, if not, from the members of the university of Aberdeen; and failing these, recourse was to be had to other universities. As at Oxford, Cambridge, and St Andrews, however, the university has disappeared, and the incorporated and endowed college only remains. The college is co-extensive with the university, or rather the university is confined to the limits of the college; nor is any distinction between them preserved, as has hitherto been the case at Glasgow.

The college remained in nearly the same state for more than a century, not, however, escaping the deterioration which seems to be incident to all exclusive bodies. In 1619, Bishop Forbes obtained a commission of visitation, by which the abuses that had gradually been engendered were reformed, and the original foundation, with some exceptions, restored. By the introduction of the reformed religion, some of the offices were rendered unnecessary; and accordingly the General Assembly, in 1639, ordered those of the canonist and cantor to be abolished. After the abolition of episcopacy, Charles I. resolved to apply part of the revenues of the different sees to the support of the universities, and appointed a commission to inquire into the state of those of Old and New Aberdeen; the result of which was his executing a charter, uniting them as one university, under the name of "King Charles' University of Aberdeen." The colleges, however, continued distinct, and are separately recognised in the Act of 1641, by which the grant of the rents of the bishopric of Aberdeen was ratified; nor do they appear ever to have acted together as one university. Bishop Elphinstone's seminary has since retained the name of King's College.[1]

From the period of its institution down to the earlier part of the last century, various improvements were introduced by royal and parliamentary commissions. The General Assembly also extended its jurisdiction to the college; and the chancellor of the university and the ordinary visitors appear to have watched over its interests. In what manner the rector and his assessors were elected, and how frequently their visitations took place, are unknown for a period of 129 years after the institution of the college. Subsequently this court appears to have been efficient, and to have been instrumental, in several instances, in giving effect to improved plans of education. The senate, consisting of the regular officers of the college, likewise applied themselves to the same laudable object, and from time to time introduced such alterations as a change of circumstances or the advancement of knowledge rendered neces-

[1] It would perhaps be difficult to fix the exact date at which this designation was given to Bishop Elphinstone's Foundation. That it was, locally at least, applied to the College at a very early period, is proved by the fact that Hector Boecius, the first principal, whose signature is attached to the new erection, dates the dedication of his *History* to the Archbishop of St Andrews, "Ex Regali Collegio Aberdonensi, ad Kalendas Maias, Anno salutis Christianae sexto et vigesimo supra millesimum quinquagesimum."

Aberdeen.

sary. About the year 1620, a professorship of divinity was instituted by the college, and was confirmed two years after by royal charter. Weekly discourses on catechetical doctrine were established; and in 1764 a professorship of oriental languages was founded, for which an endowment out of the bishops' rents was afterwards obtained. In 1753 the teaching of the elements of Latin was abolished, and the scholarship of the class raised to the standard of the other universities. In the same year, the senate, taking into consideration the whole state of the college, approved of certain statutes intended to regulate the length of the session, the management of the bursaries, and the plan of instruction. On this last head, after mature deliberation, it was determined, chiefly, it is alleged, through the influence of the celebrated Dr Reid, who was at that time one of the regents, that the old system of the same regent conducting the students through the whole course should be continued, as at once more beneficial to the students, and more advantageous to the cause of literature and science. And it is a curious fact, that the system thus sanctioned by high authority prevailed till the year 1800, when the practice of the other universities was introduced.

Marischal College.

History.

Marischal College, in New Aberdeen, was founded as a college of arts by George Earl Marischal, under royal authority, in 1593; and in the same month received the sanction of the General Assembly of the Church of Scotland. In July following it was ratified by an act of Parliament, which granted to it all the privileges and jurisdiction appertaining to "ane frie college" within the realm, but, contrary to the ancient practice, subjected all its members to the jurisdiction of the magistrates of the city, in all things done or committed by them beyond the walls of the college; in consequence, perhaps, of the magistrates having furnished the site for the buildings. The college was denominated an *Academy*, or *Seminary of Learning* (*Academia—publicum Gymnasium*), and was to consist of a chancellor, rector, dean of faculty, principal (*Gymnasiarcha*), three regents, six alumni, and two inferior persons to manage the internal affairs of the seminary. The principal was to superintend the whole establishment, and to exercise jurisdiction over all its members; being invested with the power of censuring the regents, and of expelling them from the college, with the concurrence of the rector and dean, after three admonitions. He was to be well instructed in sacred literature and in the learned languages, particularly in Hebrew and Syriac, and was required occasionally to teach divinity, anatomy, physiology, the principles of geography, chronology, and astronomy, and the elements of Hebrew grammar and construction; duties presupposing an extent of acquirement which the founder must have had some difficulty in obtaining. He was also invested with the power of conferring degrees in arts on such as he deemed worthy of the distinction. The first regent was required to teach the elements of arithmetic and geometry, and the sciences of ethics and politics; the second was to teach the principles of logic, and to exercise the students in writing and declaiming in Latin and Greek; and the third, who was the lowest, was appointed to teach Greek, combining with it, during the first six months, Latin composition, afterwards the writing of Greek, and adding a short account of the elementary principles of logic. It thus appears that, from the commencement of the college, the regents had particular professions assigned to them; and that it originally consisted solely of regents or professors in the faculty of arts. It was expressly ordained that no regent should undertake a new professorship. The Earl Marischal reserved to himself and his heirs the patronage of the professorships; the examination and admission of the persons nominated being vested in the chancellor if he were a clergyman, the rector, dean, the principal of King's College, and three clergymen, including the minister of Aberdeen. By the forfeiture of the Marischal family in 1716, the patronage devolved upon the crown. The election of the bursars was likewise retained by the founder, and their admission vested in the members of the college. No vacation was allowed; and, that the members of the college might devote themselves exclusively to their respective duties, they were prohibited from holding any public office, and even from acting as rector or dean of faculty.

Aberdeen.

The chancellor, rector, and dean, were instructed to visit the college three times a year, for the purpose of correcting whatever might be found wrong in doctrine or discipline. The rector was to be elected by all the students, through the medium of procurators appointed by them when divided into four nations, to have jurisdiction over the college, and to preside in its meetings, after taking the oath of office. The dean of faculty was to be elected by the senate and the minister of Aberdeen; his duties being to preside at examinations, to administer the oath of fidelity to the examiners, and to take cognizance of the doctrine and diligence of the regents. He was invested with all the privileges which were understood to belong to the dean of the faculty of arts in the University of St Andrews, or in any other university. A charter of confirmation and Novodamus was granted by William Earl Marischal in 1623, ratifying the deed of foundation by his predecessor, but withdrawing certain lands and revenues which had been originally assigned to the college. Such was the condition of the college, till it was united with King's College, as forming an integral portion of "King Charles' University of Aberdeen," a union which seems never to have been recognised by the members; and which, independently of the "general act rescissory," was formally rescinded by a new confirmation of its original rights and privileges granted by the Scottish Parliament in 1661. Neither in the charter of foundation, nor in any of the other charters or acts of parliament relating to the college, is it recognised as a separate university; nor is allusion made to any faculty except that of arts. The members have nevertheless, without any apparent legal right, conferred degrees in divinity, laws, and medicine, since before the middle of last century.

Notwithstanding the precautions of the founder, innovations were soon made on the constitution of the college. A few years after its institution, another regent was appointed, additional members were admitted, and each professor, in conformity with the general practice, conducted his students through the whole course. In 1700 the privy council of Scotland assigned the Greek department to one professor; and in 1753 the system was finally altered by the senate. A professorship of mathematics was founded about 1613, and in 1616 a professorship of divinity. From this time the principal seems to have confined himself to the superintendence of the business and discipline of the college. The state of the college was the subject of frequent visitations appointed by the king, the privy council, and the parliament, by means of which, and by the interposition of the senate, a system of instruction differing but little from that which has hitherto prevailed, was at a comparatively early period introduced.

Attempts at union;

For somewhat more than a century, the advantage of having in the north-east of Scotland a complete university, fully equipped in all the faculties, instead of two incomplete colleges, has forced itself upon public attention. In 1747—the year in which the union of the St Andrews Colleges was effected—1754, 1770, and 1786, negotiations for a similar union also took place between the colleges, but led to no definite result. The commission appointed in 1826, and which issued their report in 1831, recommended an entire amalgamation or fusion of the colleges, and the institution of a complete university, with the faculties of arts and divinity at King's College, and those of laws and medicine at Marischal College. In 1835, a bill, founded partly on the report of this commission, providing for the same comprehensive fusion of the colleges, with a different distribution of the faculties, was brought into parliament by the member for Aberdeen; but, in consequence of strong opposition, was withdrawn. This failure was followed by the appointment of a royal commission, specially for investigating the state of the Aberdeen colleges, which recommended a partial union. From this time the question of union remained dormant till 1853, when, on the suggestion of King's College, a scheme of complete fusion of the two establishments, their property, functions, and privileges, was prepared by members of the two colleges, which at first met with the approval of a large majority of both incorporations, of the town council of Aberdeen, &c. &c., and was favourably viewed by

Aberdeen.

Her Majesty's Government. As on former occasions, public clamour was excited; some of those who had been favourable to the scheme changed their views; and the scheme itself was, without much consideration, condemned. The call for university reform still continued; and, accordingly, the members of King's College proceeded to effect certain internal improvements, which, though acceptable to the great majority of their graduates, were held up to ridicule by the people of Aberdeen. They eagerly desired reform, but it must be the gift of the legislature, and not of King's College. In 1856, for the first time since the abortive charter of Charles I., the question of union was taken up by the crown officers, and a bill was introduced into parliament by the Lord Advocate Moncreiff; but difficulties having arisen as to special points, the measure was, like its predecessors, withdrawn. In 1857 a third royal commission was appointed to inquire into the expediency of uniting the two colleges; and they, while reporting "that a complete union or fusion would prove the most advantageous mode of settlement," recommended a form of partial union, which was speedily rejected by all parties as impracticable.

failed to satisfy the Aberdeen reformers.

Act of 1858.

In this state of matters, the general measure for the improvement of the Scottish universities was introduced into the House of Commons by the Lord Advocate Inglis in 1858, one object of which was to unite the colleges of Aberdeen. The latter part of the bill was met with uncompromising local opposition in all its stages in parliament; and the ordinance issued by the commissioners appointed by the act, fixing the site of the different faculties, and the number of professors in the faculty of arts, was carried by appeal to the court of last resort. The act has now finally become law; and university reform has been obtained, though not in the form most acceptable to the people of Aberdeen.

Distribution of faculties.

By the Act of 1858, King's College and Marischal College have been united and incorporated into one university and college in all time coming, under the style and title of the "University of Aberdeen," to take rank among the universities of Scotland, as from 1494, the date of the original University of Aberdeen, and all the funds, properties, and revenues, formerly pertaining or belonging to King's College or to Marischal College, now pertain and belong to the University of Aberdeen. The classes in the faculties of arts and divinity have been fixed at King's College; and those in laws and medicine at Marischal College.

Chancellor.

The present chancellors of King's College and of Marischal College are to be joint chancellors for life, and the survivor to be sole chancellor during his survivance; the chancellor thereafter to be appointed by the general council.

Rector.

The rector is elected by the matriculated students voting in four nations, called respectively the *Mar*, *Buchan*, *Moray*, and *Angus* Nations, by each of which a procurator is chosen, and the procurators elect the rector. In the case of equality in the votes of the procurators, the chancellor of the university has a casting vote, provided he intimate his choice personally, or by letter addressed to the Senatus Academicus, within twenty-one days from the day of election; and failing such intimation, then the principal has the casting vote.

General Council.

The General Council consists of the members already mentioned, and meets twice a year; at present on the Wednesday next after the second Tuesday of April, and the Wednesday next after the second Tuesday of October.

University Court.

The University Court consists of the rector, the principal, an assessor nominated by the chancellor, an assessor nominated by the rector, an assessor elected by the general council, and an assessor elected by the Senatus Academicus; with four members as a quorum. The rector and his assessor continue in office three years, and the other assessors four years.

Senatus Academicus.

The Senatus Academicus consists of the principal and twenty-one professors; seven in the faculty of arts, four in divinity, one in laws, and nine in medicine.

Revenue.

The revenue of both colleges, now of the university, arises from certain properties acquired under the foundation charters, from others acquired subsequently to the dates of these charters, and from royal grants. A large portion of the original grants to King's College consisted of tithes, which, being subject to the burden of supporting the parochial clergy, have been nearly exhausted.

Bursaries.

The university possesses 77 foundations for bursaries, the benefit of which extends to 287 students. About 142 of these are unrestrictedly open to public competition; in the case of 11 a preference is, *ceteris paribus*, given to certain names; the patronage of the rest is vested in public bodies and private patrons. The bursaries vary from L.50 to L.5 and under, and are tenable for four years. Their aggregate annual value amounts to L.3689. No bursary assigned by competition is of lower value than L.10. There are also 19 divinity bursaries of the aggregate value of L.225, and one in medicine of L.23. There are, besides, valuable prizes,—two of L.60 each, and one of L.20,—which are annually assigned to distinguished students at the end of their curriculum.

Edinburgh.

The curriculum in arts extends over four years, and includes attendance on Latin, Greek, English literature, mathematics, natural history, logic, natural philosophy, and moral philosophy. All bursars, and all candidates for degrees, must attend these branches in a certain prescribed order. The fee for the junior classes in Latin, Greek, mathematics, and natural philosophy, is L.3, 3s.; and for the senior classes, L.1, 1s. Those for natural history and moral philosophy are L.3, 3s.; for English literature, L.1, 1s., and for logic, L.2, 2s. The classes of English literature and logic are conducted by the same professor. The matriculation fee is L.1.

Curriculum in arts.

Fees.

Session.

The session at present commences on the first Monday of November, the previous week being occupied in deciding, by comparative trial, the vacant bursaries in the gift of the university, and in ascertaining the competency of the bursars presented by private patrons, and terminates on the first Friday of April. A scarlet gown is worn as an academical dress by all students in arts; and those of them who belong to the Established Church are required to attend the college chapel.

The number of matriculated students during session 1859–60 was 713: in arts, 416; in divinity, 91; in laws, 17; and in medicine, 189. The number who graduated was 143; in arts, 51; in divinity, 0; in laws, 2; and in medicine, 90. The fees for graduation are: for the degree of A.M., L.4, 4s.; of M.B., L.21; and for M.D., L.5, 5s., in addition to the previous fee for M.B.; and exclusive of any stamp duty, which may for the time be exigible.

The following is a table of the professorships, with the date of foundation and the patronage.

Office.	Date.	Patronage.
Principal	1505	Crown.
Greek	1505	Crown.
Humanity	1505	Crown.
Logic	1860	Crown.
Mathematics	1505	University Court.
Moral philosophy	1505	Crown.
Natural philosophy	1505	Crown.
Natural history	1593	University Court.
Systematic theology	1620	Synod of Aberdeen.
Divinity and church history	1616	Crown.
Divinity and Biblical criticism	1860	Crown.
Oriental languages	1674	Crown.
Law	1505	University Court.
Institutes of medicine	1860	Crown.
Practice of medicine	1505	Crown.
Chemistry	1793	University Court.
Anatomy	1839	Crown.
Surgery	1839	Crown.
Materia medica	1860	Crown.
Midwifery	1860	Crown.
Medical jurisprudence	1857	University Court.
Botany	1860	Crown.

UNIVERSITY OF EDINBURGH.

Founda-tion.

The University of Edinburgh owes its origin to James VI. In 1582, "the wise monarch" granted a charter, empowering the lord provost, magistrates, and council of the city to repair and build houses for the reception and habitation of professors and students of the liberal arts, humanity, philosophy, divinity, medicine, law, and any other liberal sciences (*quarumcunque aliarum liberalium scientiarum*). The same charter constitutes the municipal authorities, with the advice of the ministers (*cum avisamento ministrorum*), electors of all the professors, with the power of dismissing them should they find it necessary; and, with strange inconsistency, prohibits all persons not admitted by the patrons from professing or teaching any of the sciences withir the liberties of the city. The king, who was ambitious of being commemorated as the founder and greatest benefactor of this literary establishment, inserted in the charter an imposing list of ecclesiastical properties for its support, which, however, were found to possess little more than a nominal value. Even the ground on which the college was built (the *Kirk-of-Field*) could only be obtained by purchase from a menial servant of the king, who had acquired a title to it; and, in like manner, the other royal benefactions proved in a great measure delusive. The plan of the seminary was thus most extensive; and the patrons, being unfettered by the minute prescriptions contained in the

Edinburgh. foundation charters of the older universities, had fewer difficulties to encounter in adapting it to the existing state of philosophy and science.

History. The design of founding a college in the metropolis had been contemplated by the magistrates within two years after the Reformation; but their endeavours were thwarted by the bishops, who were jealous of the reputation and prosperity of the seminaries placed under their immediate and official protection. In 1562 the town supplicated from Queen Mary a gift of certain ecclesiastical property within the city, to be applied, among other things, for "collegis for leirning and upbringing of ye youth;" but received an evasive answer. Renewing their application the following year, they obtained a grant of "the Kirk-of-Field, to big ane schule;" but seem to have been prevented from carrying their design into effect. It was not till 1579 that successful measures were adopted. In this year the magistrates, encouraged by the ministers and other public-spirited individuals in the city, commenced building apartments for the accommodation of professors and students, and three years after obtained from the crown the charter of erection and confirmation. The chief promoter of the design was James Lawson, the successor of Knox as minister of Edinburgh, by whose recommendation Robert Rollock, one of the regents of St Andrews, and a man of high intellectual endowments, was selected in 1583 to fill the arduous situation of first and indeed sole regent in the new institution. The college was accordingly opened in October 1583, under the newly appointed regent; the number of students, who, as in the other universities, probably all belonged to the faculty of arts, was eighty-four. Rollock was engaged only for a year, with a promise of continuance and promotion if he conducted himself faithfully, and complied with the rules and injunctions of the patrons. His salary was to be L.40 Scots, or L.3, 6s. 8d., with a quarterly allowance of L.30 Scots for board, in addition to the fees to be paid by the students. According to the contract, he was to receive, "for a year's education to the sons of burgesses, L.2 Scots, and to others at least L.3 Scots; a small sum, apparently, but not disproportionate to the scale on which the professor was maintained. This rate of fees continued till 1595, when the town council ordained that the sons of gentlemen not burgesses of Edinburgh should pay L.8 Scots a year, and the sons of burgesses half that sum.

A second regent was appointed soon after the opening of the college; and in 1586, the town council, "having sufficient proif and experience of the lyfe and conversatioun" of Rollock, "and of his qualificatioun and learning," constituted him principal master, with all the emoluments of the appointment, committing to him all the authority vested in the principal of any college in the universities of the realm, and subjecting to his jurisdiction the regents established or to be established, with all other members of the college. He was required to attend to their doctrine and conversation, and to punish delinquents; but the council reserved to themselves the right of deposition, and of enacting statutes for the regulation of the seminary. A third regent was appointed in the same year, a fourth in 1589, and in 1597 a regent of humanity. Till 1620 the principal was regarded as professor of divinity, and his prelections were confined to that department. In this year a second professor of divinity was appointed; but several of the succeeding principals continued to read theological lectures. Those of Dr Leighton were published after his death.

The charter of erection was soon (1584) followed by another, in which the king, gratified by the success of the new seminary, conveyed to the magistrates and council certain property for its support. In 1612 another charter was granted by the king, ratifying those which had previously been given; and in 1621, an act of the Scottish parliament was passed, confirming various grants of property which had been made to the town of Edinburgh for the support of the institution. This act, as exhibiting the only constitution which the college possesses, deserves particular notice. After detailing the establishment of the college, and the purposes for which it was instituted, the grants made for carrying these into effect, the expense incurred by the city in erecting the buildings, and various bequests made by well-disposed persons for the support of the professors, the act declares the anxious desire of the king for the increase of learning within the borough, his willingness to confirm the former grants made to the college, and to extend to it all the immunities enjoyed by any other college within the realm, and ratifies and approves the infeftments previously granted by his majesty under his great seal, "togidder with the erection of the said gryit ludging, manss, and hous of the Kirk-of-Feild, in ane colledge for professioun of theologie, philosophie, and humanitie." The ratification concludes by declaring that the college shall "in all tyme to cum be callit King James Colledge," and conferring on the magistrates as patrons, and the rectors, regents, bursars, and students, "all liberties, fredoms, immunities, and priviledges, appertening to ane free colledge, and that in als ample forme and lairge maner as any colledge hes or bruikis within this his majestie's realme." It is true that the term *university* is not applied to the seminary, either in this act or in the royal charter of 1582; but its rights and privileges are recognised and guarded by subsequent acts of the Scottish parliament. It is thus, like Trinity College, Dublin, a college with the powers of a university.

Act of 1621.

From the first institution of the college, the town council, with the advice of the ministers and some eminent lawyers, regulated the mode of teaching, the discipline, the fees, and the accommodation of the students. Students were admitted on application to a magistrate, under whose authority they were enrolled; as in other universities, they were matriculated by the rector or principal. It was the intention of the founders that all the students should lodge within the walls of the college, and wear an academical dress. The annual rent of a chamber to a stranger student, having a bed to himself, was L.4 Scots; for which sum the town furnished seats, beds, tables, and shelves. Students whose parents were burgesses paid no rent, but furnished the rooms at their own expense. The increase of numbers gradually put a stop to this practice. So lately, however, as the year 1710, the English dissenters offered to contribute L.1000 a year, for the support of a *hospitium*, on condition that their students might participate in the benefit.

Course of study.

The system of instruction originally pursued in the university did not differ materially from that of the other Scottish universities. Each of the four regents conducted his students, during the four years they remained under his care, over the entire curriculum of literature and philosophy, while the prelections of the principal were confined to theology. During the first year, about six months were spent chiefly in the study of the Greek and Roman classics, accompanied by frequent exercises in translation and original composition. The remainder of the session was occupied in the study of the Dialectics of Ramus, without, however, discontinuing the reading of Greek and Latin authors, and committing to memory and reciting large portions of the ancient poets and orators. In the second year, besides being exercised in Greek themes and versions, the students proceeded in the study of logic, rhetoric, and some part of mathematics. The philosophical works of Aristotle were not neglected; and in the later months of the session, the practice of oratory was encouraged by public declamations. The third session, carrying forward the public studies and classical learning, introduced the youth to the knowledge of some branches of natural history and philosophy, and gave every one an opportunity of becoming acquainted with the elements of the Hebrew tongue. In the fourth session, ethics, physics, and metaphysics formed the principal object of study; but great part of the time was occupied in the practice of disputation. The regent prescribed the subject, and every candidate was matched with an antagonist, with whom it was necessary for him to carry on a debate in presence of his teacher. The regents were required to exercise a habitual inspection of their charge, both in the public

Edinburgh.

class and in the hours of recreation in the fields. The principal was bound to maintain a daily superintendence, presiding at the public devotions, and keeping a watchful eye over all the regents, students, and officers of the establishment, so that, when admonition or discipline was required, it might not be omitted or postponed till insubordination and irregularity became inveterate or scandalous. Every Lord's day was partly employed in the religious instruction of the students in their private classes, and chiefly in the public solemnities of divine worship. This course of study, which must have obtained the sanction of the patrons, goes far to justify the powers which had been vested in them by the charter of erection; and when carried into effect by the energy of the regents, readily accounts for the celebrity which the metropolitan university early acquired. The practice of each regent teaching the same class during the whole period of the course was discontinued in 1708, in consequence of a regulation by the parliamentary commission of visitation appointed in 1690. Since that time every professor has been limited to one particular department.

Peculiar constitution.

"The most striking circumstance," say the royal commissioners of 1826, "in the establishment of the University of Edinburgh, is, that it is not erected into an independent seminary, but is subjected, in all essential points, to the provost, magistrates, and council of the city. To them is committed the superintendence of it, the appointment of the professors, and the privilege of removing them when so strong a step seemed expedient. The whole body is enjoined to obey the regulations emanating from the council; and even the powers of the principal are limited by the same authority. In fact, to the college, as a college, nothing seems to be given but immunities and privileges common to the other universities, and which do not seem to have any reference to its internal administration. No senatus academicus, or college meeting, with special authority to regulate the course of education, is recognised. Everything specified is granted with a view to the magistrates and council; and in the only clause which may seem to imply that the college received a separate and independent jurisdiction, the mode in which it is introduced evinces that this could not have been the case." Accordingly, the council always claimed and exercised the privileges which were conferred on them by the charter.

The number of professors, which in 1620 was seven, including the principal, was raised in 1708 to fifteen, one of whom was professor of Greek, the study of that language being required of all students of arts after the Reformation. The present number is thirty-four. The right of instituting new professorships was vested in the patrons; and the promptitude which they showed in adopting the best measures for the advancement of academical instruction was deserving of great credit. Some years ago the clergy of the city put forward their claim to a voice in the election of professors, on the ground that, in the original charter, the right of appointment was to be exercised *cum avisamento ministrorum*. The claim was for some time keenly agitated, and steps were taken to enforce it; but on application being made to the Court of Session in the case of a particular election, the court refused to grant an interdict, and the question was accordingly dropped. Eleven professorships have at various times been founded by the crown, of nine of which it has retained the patronage; but the exercise of this power was disputed by the council, as an infringement of their sole right of control, and a protest was regularly taken that it should not hurt or prejudge their rights. In the case of some of the professorships, certain public bodies have been admitted to a share of the patronage, in consequence of contributing a part of the salaries of the professors. The professor of botany holds two commissions, one from the crown, and another from the town council.

The right of the patrons to interfere in regulating the course of study was of late years disputed by the principal and professors, and the subject was brought before the Court of Session for adjudication. The court decided that the sole government of the university in all points, even in regulating the conditions of graduation, the course of study, and method of instruction, was vested in the town council: and this decision was affirmed by the House of Lords. The council, however, had the discretion to leave matters of discipline and ordinary detail to the principal and professors; and the regulations which were from time to time made by them were considered valid unless disallowed by the patrons.

For a considerable period the college was limited to the faculty of arts; but the other faculties were successively recognised as the course of instruction was extended. The medical school, which has for many years been so famous, had its origin so recently as the end of the seventeenth century, there being no professor of medicine previously to the year 1685. The school of law is still more modern. The class of public law was instituted in 1707, of civil law in 1710, of Scottish law generally in 1722, and that of the theory and practice of conveyancing in 1825.

Edinburgh

By the will of General Reid, dated 1806, a large bequest was made to the senate for endowing a professorship of music, adding to the library, and otherwise promoting the general interests of the university. This bequest, when it became available to the university on the death of the testator's daughter, amounted, after deduction of legacy-duty and expenses, to L.62,000. A professorship of music was accordingly instituted in 1839; a splendid hall and classroom have since been built, and an annual concert established.

Want of public officers.

From what has already been stated, it will appear that the constitution of the University of Edinburgh differed essentially from that of other universities. Indeed it could not be said to have any independent or well-defined constitution; the patrons being invested with the powers generally given to the universities themselves. No power was conferred upon it by the charter as an independent corporation, nor was any provision made for the appointment of public officers. There was no mention made of a chancellor; and although in early times the name was occasionally assumed by the provost of the city, that must be regarded as an unauthorised assumption. The case, in regard to the offices of rector and dean of faculty, was nearly the same. "This important office" (the office of rector), say the commissioners, "has been much less efficient in Edinburgh than in the other universities: and the existence of the office itself has been, apparently at least, suspended." It was held by several persons, though with frequent intervals, till 1640, when the council resolved to elect a rector annually, with six assessors, two members of council, two ministers, and two professors. But in the beginning of last century the office of rector was permanently annexed to that of lord provost, who, as head of the council, already possessed all the authority which could be deputed to the rector, and consequently the office had become obsolete even in name. "It is, accordingly, explicitly asserted, that no chancellor or vice-chancellor, rector or dean of faculty, exercises any authority or jurisdiction over the principal, professors, or students in the University of Edinburgh." The business of the college was managed by a section of the town council, under the name of the college committee, who took charge of the revenue, communicated with the senate, and exercised a general superintendence over the seminary.

Principal.

The principal occupied an anomalous position; he held the same rank as the cognominal officers in the other universities, but apparently without any of the powers which were exercised by the others. Notwithstanding the stipulations made by the patrons to Rollock when he was promoted to the office, his authority seems to have been extremely limited. The principal had long ceased to teach a class, and he had not for a considerable period taken an active part in superintending the instruction of any of the classes. He presided in the meetings of the senate, and was the official organ of the university in communicating with the crown, the patrons, and the public. Beyond this he does not appear, so far as we have been able to ascertain, to have possessed any real power or authority. The late Dr John Lee was both principal and professor of divinity.

Constitution.

By the act of 1858 the constitution of the University of Edinburgh has been, in every respect, assimilated to that of the other Scottish universities; the control previously exercised over it by the town council has been abolished; and the patronage which formerly belonged to the council has been vested in seven curators, of whom four are elected by the council, and three by the University Court.

The university is now governed by a chancellor, a vice-chancellor, a rector, with the three courts—the Senatus Academicus, the University Court, and the General Council. The chancellor is elected by the General Council, and appoints the vice-chancellor. The rector is elected by a general poll of the matriculated students, and continues in office for three years. The University Court consists of the rector; the principal; an assessor nominated by the chancellor; the lord-provost of Edinburgh; an assessor nominated by the lord-provost, magistrates, and town-council; an assessor nominated by the rector; an assessor elected by the General Council; and an assessor elected by the Senatus Academicus; with five as a quorum. The period of office and the restrictions are the same as in the case of the other universities. The constitution of the General Council is the same as in the other universities; and meets twice a year, on the first Tuesday after the 14th of April, and on the last Friday of October.

University Court.

Faculties.

The Senatus Academicus consists of the principal and thirty-four professors, classified under the four faculties of arts, divinity, laws, and medicine. There are nine professors in the faculty of arts, four in that of divinity, four in that of laws, and fourteen in that of medicine. The professor of natural history belongs to the faculty of medicine. The professors of agriculture, music, and technology have not yet been attached to any of the faculties. Each faculty appoint from their number a dean, who presides at their meetings, and forms the medium of communication between them and the Senatus. It is to be borne in mind, however, that the faculties

Edinburgh.

merely perform certain duties under the Senate, without whose sanction their proposals and regulations cannot be carried into effect.

Curriculum.

The curriculum of arts, qualifying for a degree, extends over four sessions, and includes attendance on Latin, Greek, mathematics, moral philosophy, natural philosophy, and rhetoric. At the close of the third year of the regular curriculum, candidates are admitted to that part of the examination which relates to classical proficiency; and those who avail themselves of this permission, are examined in mathematics and philosophy at the close of the fourth year. The examinations take place in April, and are conducted by means of printed papers. Present fee, L,3, 3.

Medical school. Degrees.

The celebrity of Edinburgh as a school of medicine seems to demand from us a general statement of the course of study necessary for obtaining medical degrees. The degrees to be granted under the Act of 1858 are divided into three classes, designated respectively Bachelor of Medicine (M.B.), Master in Surgery (C.M.), and Doctor of Medicine (M.D.) The preliminary branches of education are—I. English, Latin, arithmetic, with the elements of mathematics and mechanics; and, II. No candidate can be admitted to a professional examination who has not passed a satisfactory examination on at least two of the following subjects, in addition to the subjects mentioned above: Greek, French, German, higher mathematics, natural philosophy, moral philosophy. These examinations to take place, as far as possible, before he has entered on his medical curriculum. The examinations are conducted by examiners in arts, along with the medical examiners. III. A regular degree in arts in any one of the universities of England, Scotland, or Ireland, or in any colonial or foreign university specially recognised for this purpose, exempts the candidate from all preliminary examinations. IV. No candidate can be admitted to a degree who has not been engaged in medical and surgical study for four years; the medical session of each year being constituted by at least two courses, of not less than 100 lectures each, or by one such course, and two courses of not less than 50 lectures each; with the exception of the clinical courses, in which lectures must be given at least twice a week during the prescribed periods. V. No candidate can be admitted to examination who has not given sufficient evidence by certificate—(1.) That he has studied each of the following departments of medical science, namely, *Anatomy, Chemistry, Materia Medica* and *Pharmacy, Institutes of Medicine* or *Physiology, Practice of Medicine, Surgery, Midwifery* and the *Diseases peculiar to Women and Children, General Pathology* or *Morbid Anatomy, Practical Chemistry, Practical Midwifery, Clinical Medicine, Clinical Surgery, Medical Jurisprudence, Botany, Natural History*, including *Zoology*. (2.) That he has attended, for at least two years, the medical and surgical practice of a general hospital accommodating not fewer than eighty patients, and possessing a distinct staff of physicians and surgeons. (3.) That he has been engaged, for at least three months, in compounding and dispensing drugs at the laboratory of an hospital or dispensary under a legalised practitioner. (4.) That he has attended, for at least six months, the out-practice of an hospital, or the practice of a dispensary, or of a legalised practitioner. VI. Every candidate must deliver, before the 31st day of March of the year in which he proposes to graduate, to the dean of the faculty of medicine—(1.) A declaration, in his own handwriting, that he has completed his 21st year, and that he will not be, on the day of graduation, under articles of apprenticeship to any surgeon or other master; (2.) A statement of his studies, as well in literature and philosophy as in medicine, accompanied with proper certificates; (3.) A *thesis*, composed by himself, to be approved by the medical faculty. VII. Candidates are examined, both in writing and *viva voce*—first, on chemistry, botany, and natural history; secondly, on anatomy, institutes of medicine, and surgery; and, thirdly, on materia medica, pathology, practice of medicine, clinical medicine, clinical surgery, midwifery, and medical jurisprudence. VIII. Students may be admitted to examination on the first division of those subjects at the end of their second year; and on the subjects of the second division, at the end of their third year; or on both divisions at the end of the third year. The examination on the third division cannot take place till the candidate has completed his fourth *annus medicus*. IX. The studies of candidates for the degrees of bachelor of medicine and master in surgery are subject to the following regulations:—(1.) One of the four years of medical and surgical study must be in the University of Edinburgh. (2.) Another of such four years must be either in the University of Edinburgh, or in some other university entitled to give the degree of doctor of medicine. (3.) Attendance during at least six winter months on the medical or surgical practice of a general hospital which accommodates at least eighty patients, and during the same period on a course of practical anatomy, may be reckoned as one of such four years. (4.) One year's attendance on the lectures of teachers of medicine in the hospital schools of London, or in the school of the College of Surgeons in Dublin, or of such teachers of medicine in Edinburgh or elsewhere as shall from time to time be recognised by the University Court, may be reckoned as one of such four years. (5.) Candidates may, to the extent of four of the departments of medical study required by section V., sub-section (1). attend in such year or years as may be most convenient to them, the lectures of the teachers of medicine specified in sub-section (4). (6.) Candidates, not students of the university, availing themselves of the permission to attend the lectures of extra-academical teachers in Edinburgh, must, at the commencement of each year, enrol their names in a book to be kept by the university for that purpose, paying a fee of the same amount as the matriculation fee paid by students of the university, and having, in respect of such payment, a right to the use of the library of the university; and must also pay, for attendance on such lectures, a fee of the same amount as that exigible by medical professors in the university. (7.) No teacher can be recognised who is at the same time a teacher of more than one of the prescribed branches of study, except in those cases where professors in the university are at liberty to teach two branches. (8.) It is in the power of the University Court to recognise extra-academical teachers, attendance on whose lectures shall be accepted for graduation in the university; and also, if they see cause, to withdraw or suspend such recognition. X. The degree of master in surgery cannot be conferred on any candidate who does not also at the same time obtain the degree of bachelor of medicine. XI. The degree of doctor of medicine may be conferred on any candidate who has obtained the degree of bachelor of medicine, and is of the age of 24 years, and has been engaged, subsequently to his having obtained the degree of bachelor of medicine, for at least two years in attendance on an hospital, or in the military or naval medical service, or in medical or surgical practice. Provided always, that the degree of doctor of medicine shall not be conferred on any person unless he be a graduate in arts of one of the universities of England, Scotland, or Ireland, or of such other universities as are above specified, or unless he shall, before or at the time of his obtaining the degree of bachelor of medicine, or within three years thereafter, have passed a satisfactory examination in Greek, and in logic or moral philosophy, and in one at least of the following subjects: French, German, higher mathematics, and natural philosophy. XII. The examinations are conducted by the professors in the faculty of medicine in the university, with the addition of three persons appointed annually, by the University Court, from among the Fellows of the Royal College of Physicians of Edinburgh, the Royal College of Surgeons of Edinburgh, and the Faculty of Physicians and Surgeons of Glasgow, or persons otherwise fully qualified in the judgment of the University Court; such three persons to be eligible for re-election, and each of them to receive a sum of L.100 for each year in which he shall act as examiner. The examinations take place in May, June, and July, and the successful candidates are admitted to their degrees on the first lawful day of August. Present fee, including stamp, L.25.

Edinburgh.

Session.

The year is divided into two sessions. The winter session commences on the first Tuesday of November, and closes in the end of April, the theological session being somewhat shorter; and the summer session, during which a few classes of the medical faculty are taught, begins on the first Monday of May, and terminates at the end of July. Each student pays a matriculation fee of L.1.

Revenue.

The revenues of the university consist chiefly of a certain proportion of L.2500, payable by the city for the support of the university and schools, and of a grant from government, which amounts for the present year to L.2750. There are 49 foundations for bursaries attached to the university, the benefit of which is extended to 106 students. Their aggregate annual value amounts to L.1723. Three are of the annual value of L.100; the others vary from L.30 to L5, and under. They are nearly all in the gift of private patrons or public bodies.

Discipline

The professors exercise no superintendence over the students, except within the walls of the college. Delinquents are brought before the senate, and admonished by the principal; or, if guilty of a grave breach of discipline, are expelled. The students wear no academical dress, nor are they required to attend any particular place of worship. Accommodation for 200 is provided in one of the churches in the immediate neighbourhood of the college.

The number of matriculated students in 1859–60 was 1464; in arts, 647; divinity, 85; laws, 236; medicine, 496. Graduates in arts, 45 (A.B. 23, and A.M. 22); in divinity, 0; in laws, 16; in medicine, 57.

The following table contains a list of the professorships, with the date of their foundation, and the patronage:—

Chairs.	Date.	Patronage.
Principal	1585	Curators.
Humanity	1597	Lords of Session, Curators, Fac. of Advocates, Soc. of Writers to the Signet.
Greek	1708	Curators.
Mathematics	1674	Curators.

Dublin.

Chairs.	Date.	Patronage.
Logic and metaphysics	1708	Curators.
Moral philosophy	1708	Curators.
Natural philosophy	1708	Curators.
Rhetoric and belles-lettres	1762	Crown.
Practical astronomy	1786	Crown.
Universal history	1719	Faculty of Advocates and Curators.
Agriculture	1790	Lords of Session, Curators, and University Court.
Music	1839	University Court.
Technology	1855	Crown.
Divinity	1620	Curators.
Divinity and ecclesiastical history	1695	Crown.
Biblical criticism and biblical antiquities	1846	Crown.
Hebrew	1642	Crown.
Public law	1707	Crown.
Civil law	1710	Faculty of Advocates and Curators.
Law of Scotland	1722	Faculty of Advocates and Curators.
Conveyancing	1825	Curators, Dep. Keeper, and Society of Writers to the Signet.
Institutes of medicine	1685	Curators.
Dietetics, materia medica, and pharmacy	1768	Curators.
Medical jurisprudence and police	1807	Crown.
Chemistry and chemical pharmacy	1713	Curators.
Surgery	1831	Curators.
Practice of physic	1685	Curators.
Anatomy	1705	Curators.
Military surgery	1806	Crown.
General pathology	1831	Curators.
Midwifery and diseases of women and children	1726	Curators.
Clinical medicine	1741	
Clinical surgery	1803	Crown.
Botany	1676	Crown and Curators.
Natural history	1767	Crown.

IRISH UNIVERSITIES.

UNIVERSITY OF DUBLIN.

Ireland is represented by her native historians as being, in the sixth, seventh, and eighth centuries, the university of Europe; and the manuscript remains of Irish literature belonging to that period, which are still preserved in various libraries, strongly corroborate the statement. During the three succeeding centuries, little is known of the state of learning; and the subjugation of the country by Henry II. in the twelfth century seems to have extinguished the feeble spark which still burned. Soon after the beginning of the fourteenth century, a university was established by a bull from John XXII., in connection with the cathedral church of St Patrick's, which continued for some time to support a sickly existence.

Trinity College.

The present university was founded in 1591, through the exertions of Archbishop Loftus, who prevailed on the corporation of Dublin to appropriate for its support the ground and buildings of the dissolved monastery of All-Hallows, on Hoggin Green, in the eastern suburbs of the city, at that time valued at L.20 per annum. A charter was soon after obtained from Queen Elizabeth, incorporating the university under the name of "The Provost, Fellows, and Scholars of the College of the Holy and Undivided Trinity, founded by Queen Elizabeth, near Dublin;" and empowering it to accept such lands and contributions for its maintenance as any of her charitable subjects should bestow, to the amount of L.400 a year. This was the extent of the royal bounty; no funds were provided for the erection of buildings, or for the support of the members of the college. The liberality of the Irish gentry was appealed to by circular letters from the lord-deputy, and a sufficient sum of money was by this means raised to enable the archbishop to commence the buildings. The first stone was laid on the 13th of March 1591, and the college was opened for the reception of students January 9, 1593. The whole income of the university, including voluntary and temporary contributions, amounted in 1594 to the sum of L.174, 18s., and in 1601 it was increased by certain allowances granted by the queen to L.544, 13s. 4d. Such was the foundation of the University of Dublin; and on this scanty provision it had to struggle for existence, often reduced, by the non-payment of rents, to the very brink of dissolution, till the beginning of the reign of James I., when it was endowed by that monarch with lands in the province of Ulster, which have since become valuable, besides a pension of L.388, 15s. English, paid annually from the exchequer.

Dublin.

Original constitution.

By the charter of foundation, the body corporate was to consist of a provost, three fellows, and three scholars, with power to increase their number as the funds of the college permitted. To the provost and fellows was intrusted the power of enacting statutes for themselves, and of appointing such acts and exercises as they might consider necessary to qualify for degrees. To them also belonged the duties of tuition, the scholarships being intended as foundations for the maintenance of the poorer students. The provost and fellows constituted the only university convocation or senate recognised by the charter, and with them resided exclusively the power of conferring degrees. The fellows were to elect their provost on every vacancy of this office; and fellowships were tenable for seven years only after taking the degree of M.A. William Cecil, Lord Burghley, was nominated by the charter the first chancellor of the university, with a provision, that on all future occasions, the election of chancellor, vice-chancellor, and proctors, should belong to the provost and fellows.

In this, the original constitution of the university, many obvious defects soon began to show themselves. The election of a provost was a continual source of discord; and the authority of this officer being by the charter scarcely greater than that of the other fellows, was insufficient for the preservation of discipline in the college. The three fellows nominated by the charter were ecclesiastics, whose sacred duties prevented them from engaging in the actual labours of instruction; and accordingly, when the business of education really commenced, it was found necessary to obtain additional aid. The poverty of the society not admitting of their endowing permanent fellowships, an expedient was resorted to which afterwards led to an important alteration in the constitution of the college. About the year 1600 four *masters*, afterwards increased to seven, were appointed as lecturers of the junior classes, and, about 1610, were regularly constituted, by statute, probationer or junior fellows; from these the senior fellowships, instituted by charter, were filled up on every vacancy. About 1615, the number of senior fellows was fixed by statute at seven, and the number of probationer fellows at nine; the scholars, as at present, amounted to seventy. The junior fellows were to have no part in the government of the college, and were to be considered in every respect as *scholars*, except that they were recognised as college tutors, and employed in instructing others. This increase in the number of the fellows and scholars was most probably made soon after the income was augmented by the grants of King James I. Though productive of beneficial effects to the college, by increasing the number of its instructors, it was at first the occasion of some very serious difficulties. The junior fellows claimed for themselves an express right by the charter to have a voice in the government and elections of the college; which was resisted by the governing body, on the ground that the title of *fellows* had been conferred on them, not as a matter of right, but

Dublin. by courtesy and *honoris causa*, and that their rights, as determined in the charter, were those of scholars only. Accordingly, Bishop Bedell's statutes, framed in 1627, provided against the difficulty, by dividing the scholars into nine *socii scholares*, or probationer fellows, and seventy *scholares discipuli*, or scholars, commonly so called, as being still *in statu pupillari*.

Laudian constitution. The dissensions to which we have already alluded continued to increase, and at last rendered the interference of the legislature absolutely necessary. Accordingly Archbishop Laud, who had been elected chancellor of the university in 1633, and had lately completed a revision of the statutes of Oxford, as chancellor of that university, undertook to remodel the statute-book which had hitherto been in use in the University of Dublin. The new charter and statutes, after encountering the most violent opposition, were read and published in the chapel of the university on Trinity Monday, June 5, 1637, and the oaths prescribed to the provost, fellows, and other officers, administered by the archbishops of Armagh and Dublin, the new visitors of the college. The opposition was not however quieted by the promulgation of the statutes. After Laud had fallen from his power, and was no longer able to protect his favourites, a vigorous prosecution was commenced in the Irish Parliament against Bishop Chappel, the provost, by whose assistance the work of reformation had been carried into effect; but the rebellion of 1641, and the subversion of the British monarchy which so soon followed, diverted the attention of Parliament to more important matters. The clamour appears to have subsided during the commonwealth, when the university became nearly extinct, and it was not revived after the restoration. The Laudian constitution, with some slight modifications, has continued till the present day; and to it the university owes much of its celebrity and usefulness.

Alterations. The alterations made by the new charter in the constitution and government of the university were important, and had special reference to the dissensions which had been occasioned in the body by its former mode of government. The election of provost, and the power of enacting and repealing statutes, were taken from the fellows, and reserved to the crown. Fellowships, which had hitherto expired at the end of seven years after taking a master's degree, were made tenable for life. The nine probationer fellows were admitted members of the corporation, under the name of "junior fellows;" but the entire control, both as to discipline and finance, was vested in the provost and seven senior fellows, subject to the jurisdiction of visitors nominated by the crown, in whom the right of ultimate appeal was vested. In cases not provided for by the statutes, the provost and senior fellows were empowered to make new statutes not repugnant to those granted by the king, which new statutes were to be confirmed by the visitors, and to remain in force till the enacting body should think proper to rescind them. The election of officers, as chancellor, proctors, &c., was continued in the provost and fellows, the chancellor being permitted to nominate the vice-chancellor. The number of visitors was reduced from eight to two—viz., the chancellor, or, in his absence, the vice-chancellor, and the Archbishop of Dublin. A special clause provided that no person should profess or teach the liberal arts in any other place in Ireland, without a special license from the crown. The changes since made in the statutes have consisted principally in the repeal of certain clauses which were found to be inconvenient; the augmentation of salaries; the foundation of professorships; the transference of certain powers from the crown to the board; the opening up of some offices (formerly restricted to fellows), to all members of the university; and the regulation of the library: but few alterations have been made affecting the constitution of the college, except the foundation of additional junior fellowships by different sovereigns, whereby their number was increased from nine to seventeen. By a statute of Queen Victoria, dated on the 6th of May 1840, the statute of Charles I., enjoining celibacy on the fellows was repealed, and provision made for founding ten new fellowships, so that the number now is twenty-seven. The addition to the fellowships, according to this statute, was to be made by the annual election, at the accustomed time and place, of one new fellow in 1840, and in each of the next succeeding nine years, over and above the vacancies which might occur in the subsisting body. Of the ten additional fellows, only the four seniors for the time being were to be appointed tutors; but the remaining six were to enjoy "all the other rights, profits, and emoluments, and perform all other the duties and functions of junior fellows, and to be eligible to all other offices to which any junior fellows may now be elected or appointed." After the year 1849, when the number of additional fellows was completed, though no vacancy occurred in the body of fellows, there was still an annual election of one, who succeeded to the first vacancy, unless there were at the same time two or more such persons so elected, in which case the senior of them succeeded to the first vacancy. It was also ordained, "that after the year 1849, there should be no more than two persons elected, whether as fellows or candidate fellows, in any one year, whatever number of vacancies might occur in the body." By a Queen's letter recently obtained, the board are empowered to suppress four of the junior fellowships, by not electing to more than one, whenever it shall happen that two or more vacancies occur at once. The number of junior fellows will thus be ultimately reduced to twenty-three.

Dublin. Statute of Victoria.

James I., by his charter in 1613, granted to the provost, fellows, and scholars, the right of returning two representatives to the Irish Parliament. The Act of Union in 1800 restricted this number to one; but by the Irish Reform Bill, the original number was restored, and the right of election extended to all members of the university of twenty-one years of age, who at that time had, or who should thereafter obtain, a fellowship or scholarship, the degree of master of arts, or any higher degree.

Officers. The entire government of the university is vested in the following officers: the chancellor, who is elected by the senate from a list of three names submitted by the provost and senior fellows, and whose office is tenable for life; the vice-chancellor, nominated for life by the chancellor, and having the power to appoint a pro-vice-chancellor in special cases; the provost, appointed by the crown; the vice-provost, an annual officer, who is usually the first of the seven senior fellows; two proctors, chosen annually, one from the senior, and the other from the junior fellows, for regulating the forms for taking degrees; a senior lecturer, who takes charge of all matters connected with the public examinations; two deans and a censor, whose duty it is to superintend the performance of religious duties, and to inspect the details of moral discipline; a librarian with two assistants; a registrar, who performs the duty of secretary to the board; a registrar for the electors admitted under the reform act; an auditor; six university preachers; five evening preachers; and twenty-eight examiners; besides which there are special courts of examiners for moderatorships.

Board. The ordinary affairs of the college are managed by a board, consisting of the provost and senior fellows, who hold a meeting every Saturday. The provost must be in holy orders, and a doctor, or at least a bachelor in divinity, and not less than thirty years of age. The fellows are all bound to enter into priest's orders, except five; one of whom is elected *Medicus* by the provost and senior fellows; of the others, two are elected *Juristæ juris civilis*, and two *Juristæ juris Anglici*.

Senate. The senate of the university consists of the chancellor, or, in his absence, of the vice-chancellor, or pro-vice-chancellor, for the time being, and of all masters of arts, and doctors in the three faculties, who have their names upon the college books.

Caput. The CAPUT *Senatus Academici* is a council consisting of the chancellor, vice-chancellor, the provost, or, in his absence, the vice-provost, and the senior master *non-regent*, who is elected by the senate. The chancellor, vice-chancellor, and the provost are members of the caput *ex officio*. Every grace must first be submitted to the provost and senior fellows, and afterwards pass the caput, before it can be proposed

Dublin.

to the senate of the university in public congregation, and each member of the caput has a *negative* voice.

System of instruction.

The system of instruction is conducted by means of professors' and tutors' lectures, and periodical examinations. According to the statutes of Laud, all professorships were to be held by fellows. The provost was to appoint from the body of fellows, senior and junior, such a number as he thought fit, to be college tutors; and the fees paid by pupils, together with the emoluments of lectureships, professorships, and other offices, were to constitute the salaries of the fellows. At this period, the only professorship in the university was that of divinity, which however was not recognised as the regius professorship till the year 1761. Two professorships, of jurisprudence and medicine, were appointed by statute, and the fellows who devoted themselves to these professions were exempted from the obligation of entering into holy orders. The increase of students, by augmenting the duties as well as the emoluments of the tutors, has now broken in upon the original spirit of the statutes; and the increased value of the college lands has supplied the means of assigning to the senior fellows ample salaries without subjecting them to the necessity of acting as tutors. Some annual offices, with several professorships, which were formerly held exclusively by senior fellows, have recently been given up by them; and the emoluments thus set free, as well as the portion of fees on degrees, appropriated to the provost and senior fellows, have been transferred to the general funds of the college, on condition "that the same be employed for the advancement of learning and education." By recent regulations, some of the junior fellows now hold offices incompatible with that of tutor, and have consequently resigned their pupils; so that the number of tutors is limited to eighteen. It was not till the latter end of last century that the principle was recognised of having professors in the university who were not fellows. In 1761 a statute was passed, which obliged the regius professor of divinity, on his appointment to that office, to resign his fellowship; and in the same year the regius professorship of feudal and English law was founded upon the same condition, if filled by a fellow. In 1774, Provost Andrews bequeathed to the college an endowment for a professor of astronomy. A school of medicine was established by act of parliament in 1785, consisting of three professorships not tenable with fellowships; and besides these, two professorships of modern languages were founded in 1776. These, with the professorships of political economy, moral philosophy, biblical Greek, and most of the more recently founded professorships, can be held by persons who are not fellows.

The following is a table of the professorships and lectureships, with the date of foundation:—

Office.	Founded.
Regius professorship of divinity	1607
... ... of civil and canon law	1668
... ... of feudal and English law	1761
... ... of physic	1637
... ... of Greek	1761
King's lectureship in divinity	1718
Lord Donegall's lectureship in mathematics	1668
Royal astronomer of Ireland	1791
Smith's professorship of natural and experimental philosophy	1724
Smith's professorship of oratory and English literature	1724
... ... of mathematics	1762
... ... of modern history	1762
... ... of Hebrew	1637
Professorship of anatomy	1785
... of surgery (two)	1849
University professor of surgery	1852
Professorship of chemistry	1785
... of botany	1785
Lectureship in natural history	1816
Professorship of French and German	1777
... of Italian and Spanish	1776
Whately's professorship of political economy	1832
Professorship of moral philosophy	1837
... of biblical Greek	1838
University professorship of natural philosophy	1847
Professorship of ecclesiastical history	1850
... of Arabic	1856
... of Sanscrit	1856
... of Irish	1840
... of geology	1844
... of mineralogy	1845
... of civil engineering	1842
... of music	1764

The professorial system is in Dublin more largely combined with the tutorial than in either Oxford or Cambridge; and in late years has been worked with considerable energy. The education of the students in arts is intrusted exclusively to the junior fellows, whether tutors or non-tutors. The lectures for which resident students are liable are of two kinds—tutors' lectures, and honour lectures. The former are intended more particularly for those students whose previous preparation has not been carefully attended to, and who desire merely to pass on to graduation without seeking the distinctions of college life; while the latter are adapted to the wants of those whose scholarship is of a higher order, and who strive for the prizes which the university holds out with so liberal a hand. In order to secure small classes and efficient teaching, the resident students are divided into batches of about twenty-five, each batch being under the daily tuition (during term) of two of the fellows, one for classics, and the other for science. The University professors, and Erasmus Smith's professors, also lecture three times a week to certain classes of alumni.

Dublin.

Terms.

The academical year is divided into three terms, *Michaelmas*, *Hilary*, and *Trinity*. Those of Michaelmas and Hilary are followed each by a short recess; that of Trinity by a vacation of three months. Terms are kept, during the under-graduate course, either by residence and attendance on lectures, as at Oxford and Cambridge, or by answering at the examinations held for the purpose at the beginning of each term. Students of divinity, law, engineering, and medicine, are required to attend the lectures of the professors, and therefore reside either in the college or in the city. The under-graduate course consists of four years, in each of which the students are distinguished by the titles of junior and senior *Freshmen*, and junior and senior *Sophisters*. After taking his first degree, the student becomes successively a junior, middle, and senior *Bachelor*, when he is admitted to the degree of master of arts. A bachelor in divinity must be M.A. of seven years' standing; a doctor in divinity must be B.D. of five, or a master of arts of twelve. A bachelor in laws must have taken the degree of bachelor in arts, and must have completed two years in the study of law in the university (attending the prelections of the regius professor of civil law, and of the professor of feudal and English law); or must have passed an examination in the theory and practice of jurisprudence; or must have practised for six years in the law courts. A doctor in laws must be LL.B. of five years' standing. A bachelor in medicine must be B.A., and must have spent four years in the study of medicine; a doctor in medicine must be M.B. of three years' standing. A bachelor in music must be matriculated in arts, and must compose and perform a solemn piece of music before the university; a doctor in music must be Mus. B. of five years, and perform a similar exercise. The fees for B.A., are (for a pensioner) L.8, 17s. 6d.; for M.A., L.9, 16s. 6d.; for B.D., L.13, 15s.; for D.D., L.26; for LL.B., L.11, 15s.; for LL.D., L.22; for M.B., L.11, 15s.; and M.D. L.22.

Ranks.

The students are arranged in four ranks:—1. Noblemen, sons of noblemen, and baronets, styled *nobiles*, *filii nobilium*, and *equites*, the two first of whom are entitled to the degree of B.A. *per specialem gratiam*. 2. Fellow-commoners, who are entitled to the degree of B.A., with one term-examination less than pensioners. These two classes pay a high annual stipend, and high fees for B.A., and dine at the same table with the fellows in the commons hall. 3. Pensioners, who constitute the great body of the students. 4. Sizars, who have their commons free, and are exempted from annual fees. The number of sizars is limited to thirty, and admission is obtained after a very strict examination, held annually to supply vacancies, the endowment (about L.37 per annum) being tenable for four years. There are sizarships for classics, for mathematics, for Hebrew, and for the Irish language; classics, however, forming an element in the course prescribed for each. Each of the above ranks is distinguished by a particular dress.

Admission.

The mode of admission is by an examination, held in the public theatre of the college, once in every month, except August and September. The examinations in July, October, and November are public, the others private. The examiners for entrance are the junior fellows.

At the entrance examinations, candidates are tested in Latin and English composition; arithmetic; algebra (first four rules and fractions); English history; modern geography; and any two Greek and two Latin books, of their own selection, from the following course:—

Greek.—*Homer*, Iliad, books i., ii., iii.; *New Testament*, Gospels of Luke and John, and Acts of the Apostles; *Euripides*, Phœnissæ; *Sophocles*, Ajax; *Plato*, Apologia Socratis; *Lucian*, Walker's Selections; *Xenophon*, Anab. books i., ii., iii.

Latin.—*Virgil*, Æneid, books i., ii., iii., vi.; *Horace*, Odes; *Horace*, Satires and Epistles; *Sallust*; *Livy*, books iii. and iv.; *Terence*, Andrian and Heautontimorumenos.

Those who desire to compete for honours at entrance are examined on a subsequent day in passages from classical Greek and Latin authors not previously indicated; and also in general questions in grammar and history, and in Greek prose and Latin verse composition. Besides the honour of "first place" at entrance, prizes of the value of five pounds, and of two pounds, are awarded for excellence in each of the following subjects:—Greek verse,

Dublin. Latin verse, Greek prose, Latin prose, English literature and composition, and English history and modern geography. Premiums are also given for Hebrew. Those who enter after 21st March, and propose to go on with the junior freshman class, must pay a year in advance, instead of half a year, and their names must be on the college books on or before July.

Sizarship. The examination for sizarships is held annually, on days fixed by the Board, between Trinity Sunday and the end of Trinity term. This examination is conducted by papers. The course for classical sizarships is as follows:—*Homer*, Iliad; *Demosthenes*, Public Orations; *Euripides*, the four plays edited by Porson; *Xenophon*; *Horace*; *Virgil*; *Livy*, books i.–x., both inclusive. *Cicero's* Orations; *Terence*; also Greek and Latin grammar; ancient geography; Greek and Roman history; English prose composition; and Greek and Latin composition, prose and verse.

The following is a table of the half-yearly charges for undergraduates and bachelors, including tuition, but exclusive of rooms and commons:—

	Entrance, including the first Half-Year.	
Noblemen.....	L.60 0 0	L.33 12 0
Fellow-commoners..	30 0 0	16 16 0
Pensioner.....	15 0 0	8 8 0
Sizar	5 1 3	... ...

Tutors. Every student at his admission must select one of the eighteen junior fellows who act as tutors, to be his instructor, and the guardian of his interests during his academic life. A student is not *necessarily* taught by his own tutor; for in the lectures described hereafter the undergraduates are, by an agreement among the tutor fellows, assigned to lecturers according to the tastes of individual fellows, and the convenience of the university authorities. Each class numbers about twenty-five. The tutors during term deliver lectures on the following subjects:—*Mathematics*, for the junior and senior freshman classes; *logic* and *metaphysics*, for senior freshmen; *mathematical physics*, for junior sophisters; *experimental physics*, for junior and senior sophisters; *history* and *political economy*, for junior sophisters; *ethics*, for senior sophisters; *classics*, for the four undergraduate classes. Besides these, there are special lectures for the candidates for honours, by the honour examiners and their sub-lecturers, on the subjects of the extra honour course, in all the above departments; also for candidate moderators, by the university professors, and Erasmus Smith's professors; and in Hebrew for all students. Courses of lectures are also delivered to resident bachelors of arts, on subjects suited to their state of advancement and their prospects.

Courses. Freshmen are also required to attend weekly catechetical lectures. The course for *all* students is as follows:—*First year*, mathematics, Greek, Latin; *second year*, mathematics, logic and metaphysics, Greek, Latin; *third year*, logic and metaphysics, physics, Greek, Latin; *fourth year*, astronomy, ethics, mathematical physics, experimental physics, classics; but, in this fourth year, professional students are compelled to take only three of these courses, astronomy, ethics, and any *one* of the others which they themselves may prefer. Non-professional students must take *four*. An extended course of studies is prescribed for those who aspire to academic honours. These honours are awarded three times in the year during the first three years of the course, prizes of L.4 and L.2 being given at the Michaelmas examination, and parchment certificates on the other occasions. The limit to the number of *first honours* is one-fortieth of the entire class, and of *second honours* double the former. In the fourth year, the same system is continued, except that at the Michaelmas examination, senior and junior moderatorships, with gold and silver medals, are substituted for money prizes, the number awarded being decided as above. Moderatorships are attainable in (1.) mathematics and mathematical physics; (2.) classics; (3.) logics and ethics; (4.) experimental and natural science (including physics, chemistry and mineralogy, geology and palæontology, zoology and botany); (5.) history, political science, and English literature. At the examinations, senior and junior freshmen are accountable for the science taught in all the preceding terms from the beginning of the course; senior and junior sophisters, for the science taught from the beginning of the third or junior sophister year; but, except for honours at the degree examination, the science of the freshmen classes is not carried beyond the second year. To keep his class, a pensioner must have credit each year for one *examination* and one term of lectures, or for two out of the three examinations of his class, one of which must be the third or October examination, if he is either a senior freshman or a senior sophister. A senior sophister who may not have secured credit for his October examination, may qualify himself for his degree by answering in the same business at any subsequent examination of senior sophisters; and a senior freshman may repair the like omission in the same way at the first examination of the senior sophister year. Dublin.

Examinations. Each term commences with an examination, not only of the studies of that immediately preceding, but, with the exceptions already stated, of the substance of most of those which had been previously gone over. These examinations are of peculiar importance in the University of Dublin, from their effect upon the students generally, and because they constitute, to a very large proportion of those who graduate there, the only university education they receive. We have already alluded to that peculiarity of discipline by which residence is not enforced on under-graduates. Any student, unless he be a scholar, is permitted, at his own discretion, to prepare himself for the examinations without residing in the college or in the city; and on his being represented by his tutor as a resident in the country, no other academic duties are required of him. The expense of residence would be an insuperable obstacle to many who are at present in the university and therefore, by the admission of non-resident students, some part of the advantages of a university education is extended to a large number of individuals by whom, if residence were enforced, not even that part would be attainable. Thus, while five or six hundred students annually receive at Dublin all the advantages that residence and college discipline can communicate, about an equal number are induced to study, and are furnished with the means of attaining one at least of the objects proposed by a university education, namely, the power of acquiring knowledge. The examiners are the fellows. The students of the same class or year assemble together for examination, and are separated into *divisions* not exceeding forty, to each of which one examiner is assigned for each subject of that year's course. The examination of each class occupies four or more days—the first two days being devoted to the determination of *judgments*, and the remaining two or more to the separate examination of honour-men. The examiners of the first two days select from their divisions such as they deem qualified to become candidates for honours or prizes, and return their names to the senior lecturer. The examination of those who have not been selected for honours is then concluded; but on a third day the candidates selected for honours in science are examined by a separate court of examiners; on a fourth day, the candidates for honours in classics; and, on future days, those who seek honours in the other subjects of the term, each subject being assigned a separate day, and the examination, as in the former case, being conducted partly *viva voce*, and partly by written papers. At the conclusion of each examination, lists of the successful candidates for prizes, honours, or moderatorships, are made out by the senior lecturer, who is required to insert them in his book, and also to have them affixed to the college gates, and published in the newspapers. The successful candidates of each rank are arranged according to the order of their standing on the college books, excepting only the senior moderators, who, at the degree examination, are placed according to the order of merit.

Comitia. The Comitia, or commencements, for conferring degrees, are held three times a year—on Shrove Tuesday, on the last Wednesday in Trinity term, and on the last Wednesday in Michaelmas term. The grace of the house for a degree in any faculty must first be granted by the provost and senior fellows before it can be proposed to the caput. Those who have been admitted to a degree at the Board are then *presented* to the vice-chancellor and the whole university, at a public congregation, by the regius professor of the faculty in which the degree is to be taken; or if it be a degree in arts, by one of the proctors. If no member of the caput objects, the presenting officer *supplicates* the congregation for their public grace, and collects their suffrages; if the *placets* be the majority, the candidates kneel before the vice-chancellor, who confers the degree, according to a formula fixed by the university statutes.

Scholarships. There are two classes of scholarships, for merit (1.) in classics; (2.) in science. The examination for classical scholarships is held annually on Friday and Saturday of Ascension week, and on Monday and Tuesday of the week following; and that for science scholarships on Monday, Tuesday, and Wednesday of Ascension week. The examiners are the provost and senior fellows. Scholarships are open to all students, being or becoming members of the Established (*i.e.*, Episcopal) Church, and are tenable till the holder is entitled to the degree of master of arts. Students of higher standing are also permitted to become candidates, but an extended course of reading is required of them. The course appointed includes all the classics read for entrance, and in the extended course for under-graduates, to the end of the second examination of the

[1] In all the examinations, whether for pass or prizes, scholarships, sizarships, and such like, in which relative merit is to be ascertained, the judgments are given in *numbers*

Dublin.

junior sophister year; or, should the candidate be of higher standing than that of junior sophister (reckoned from the time of his entrance), to the end of the last examination which he might have answered had he proceeded regularly with his class. Candidates are also examined on part of the Aristotelian logic. The examination is conducted partly *viva voce*, and partly by papers. The scholars have their commons free of expense, and their rooms for half the charge paid by pensioners; they pay half fees for tuition, but are exempted from college charges or *decrements*, and receive from the college an annual salary. The number of these foundation scholars is seventy. But besides these there are non-foundation scholarships (founded in 1854), open to students of all religious denominations. The course, emoluments, and tenure of office are the same as in the other scholarships, but the holders of the non-foundation scholarships are not members of the corporation, and do not enjoy the university franchise. The entire value of a scholarship is rather more than L.50 per annum. There are also Biblical scholarships, Bedell scholarships (for Irish language), queen's scholarships, and royal scholarships, connected with certain endowed schools.

Fellowship examination.

The fellowship examination, when a vacancy occurs, is held by the provost and senior fellows (who may call in three of the junior fellows, being professors, to assist in the examination), on the Wednesday, Thursday, Friday, and Saturday after Ascension day; and on Wednesday, Thursday, Friday, and Saturday of the week following. The examination continues from nine to twelve A.M., and from two to five P.M. each day; and is conducted partly *viva voce*, and partly by papers, and in the English language. The income of a senior fellow, arising from various sources, is generally estimated at from L.1200 to L.1500 per annum; but it necessarily fluctuates according to the offices held. The emoluments of the majority of the junior fellows are derived entirely from tuition. The average income is about L.600, but some of the highest are much above that sum.

Church patronage.

The college has at its disposal twenty-one lucrative benefices in the northern dioceses, and the vacancies are supplied by the fellows, if they choose to accept of the presentation. By the late act for regulating the Established Church in Ireland, the archbishops of Armagh and Dublin were empowered to select a benefice, not exceeding the annual value of L.1000, out of each of the ten extinguished bishoprics; to which benefices, when vacant, they are to nominate a fellow or ex-fellow of the college. The incomes of the senior fellows arise partly from certain fees, and partly from the college lands. The provost derives his income partly from the general funds of the college, and partly from lands appropriated to his use. His whole income is about L.3500 per annum.

Studentships.

To encourage meritorious students, and to make some provision for those who, after graduation, desire to devote their time and energies to the cultivation of some branch of learning, which they may be called on to teach in the university, in the event of their becoming fellows or lecturers, fourteen *studentships* were founded by royal statute in 1859. These are open to candidates of all religious denominations, and are tenable for a period not exceeding seven years. The salary, which is fixed by the provost and senior fellows, is not to exceed L.100 per annum. Full power is vested in the provost and senior fellows to make all arrangements as to the election of candidates, the subjects of examination, and the number of studentships to be filled up every year. They have decided that two students shall be elected annually, one from the senior moderators in classics, and one from the senior moderators in mathematics and physics. If any individual holding a studentship be elected a fellow, his studentship thereupon becomes vacant.

Divinity. Engineering.

The divinity and engineering schools connected with Trinity College are specially worthy of notice, from the thoroughly practical nature of the system pursued in them, and from the energy with which that system is carried into operation. For details, see the Dublin University CALENDAR.

The number of first-year students matriculated in 1858–9 was 11 fellow commoners and 247 pensioners. Students on the books, December 1859, about 1400.

QUEEN'S UNIVERSITY.

Foundation.

In the year 1845, an act passed the Imperial Parliament "to enable her Majesty to endow new colleges for the advancement of learning in Ireland;" and in the end of the same year letters patent were issued, incorporating three such colleges, one in Belfast, one in Cork, and one in Galway, under the title of "Queen's Colleges." At the same time a president and vice-president were appointed to each college, and the six gentlemen thus selected were formed into the "Board of Queen's Colleges," for the purpose of drawing up the statutes, and arranging the system of education to be pursued in them. In August 1849, the professors were nominated, and the colleges were opened for the reception of students on the 30th October following.

Dublin.

The patent constituting the "Queen's University in Ireland," of which the institutions in Belfast, Cork, and Galway were to be affiliated colleges, was not issued till 1850. The seat of this university is in the city of Dublin, where all meetings of the senate for conferring degrees, and for other purposes, are held in a place fixed by warrant of the Lord Lieutenant. The control and government of the university are vested in a chancellor, vice-chancellor, and a senate of not more than twenty persons, three of whom are the presidents of the three colleges, for the time being, the other members to be nominated by the sovereign, and to be removable at pleasure. The vice-chancellor is elected by the members of the senate from their own number; the appointment, however, being subject to the approval of the lord-lieutenant of Ireland for the time being. His term of office is one year.

Chancellor and senate.

And, proceeds the patent, "we reserve to ourselves and our successors, and to those whom we or they may think fit to appoint for the purpose, to be the visitors of the said Queen's University in Ireland, with full power and authority to do all those things which pertain to visitors, as often as to us and our successors shall seem fit." A visitation is held every three years, or oftener, if necessary.

Visitors.

Powers of senate.

The chancellor and senate of the university have power to appoint and direct the examination for all degrees, to confer such degrees, to sign certificates for the same, and also to make such arrangements as may be expedient for examination for such university scholarships and prizes as may be hereafter founded. They have also power, with the approbation of the lord-lieutenant, to make such alterations in the course of studies as shall seem fit to them from time to time; but the several colleges are not in any way "under the jurisdiction or control of the university senate, further than as regards the regulations for qualifications for the several degrees in the faculties of arts, medicine, and law, the said colleges being only subjected to the charters, statutes, rules, ordinances, issued and approved, or hereafter to be issued and approved of" by the sovereign.

The colleges.

Each college is formed into a body politic and corporate under the name and title of "The president, vice-president, and professors of the Queen's College," Belfast, Cork, and Galway, respectively. The number of professors was at first fixed at twelve, but by a patent granted in 1849, leave was given to increase this staff to not more than thirty. The affairs of each college are managed by a council, consisting of the president, vice-president, and the four deans of faculty; viz. the dean of the literary division of the faculty of arts, the dean of the science division of the faculty of arts, the dean of the faculty of medicine, and the dean of the faculty of law; the dean being elected by the professors of each faculty from among themselves. The college council has power to make regulations for the government of the college in cases not provided for by the statutes, rules, and ordinances; also to arrange the courses of instruction to be pursued in the college, and to prescribe the matriculation, scholarship, and other examinations of the college: also to make regulations for the maintenance of discipline and good conduct among the students, in cases not provided for by the statutes, rules, or ordinances, and to fix the penalties and punishments which shall be attached to the violation of the same. The library and the museum, and the offices connected with each, are under the charge of the council, and the common funds for the maintenance, cleansing, heating, and lighting of the buildings are managed by it.

College council.

President.

Upon the president are devolved those duties which usually fall to the head of such an establishment. He is the mouthpiece of the college to the public—the medium of communication with the government—he presides at all college meetings—reports annually to the lord-lieutenant on the state of his college—he appoints the porters and servants, and regulates their duties—he visits the class-rooms, and remonstrates, when necessary, with negligent professors—he grants leave of absence to professors, and other officers of the college—he makes arrangements for the holding of visitations, and can call extraordinary meetings of the visitors, when necessary.

Vice-president.

The vice-president, besides the usual duties of such an office, has power to visit, at any time, any class-room, or hall, or office, in the college; he exercises a constant supervision over all departments, and especially has charge of the maintenance of discipline and order.

Professors.

Each professor, on his appointment, makes a declaration, that in all his engagements in the college he will refrain from making

Dublin.

any statement derogatory to the truths of revealed religion, or disrespectful to the religious convictions of any portion of his class.

There are thirty junior scholarships of L.24 each, which are awarded by examination to matriculated students of the faculty of arts, ten to students of the first year, ten to those of the second, and ten to those of the third. Besides which, there are two scholarships of L.20 each, awarded to engineering students, of the first and second year respectively; and four of L.15 each in the department of agriculture, two to students of the first year, and two to those of the second. Of the ten junior scholarships of each year, five are set apart for the literary division of the course, and five for the science division.

Scholarships.

There are six junior scholarships of L.20 each in the faculty of medicine, and three of the same value in that of law, two of the former and one of the latter being appropriated to students of the first, second, and third year respectively. All these scholarships are awarded by examination at the beginning of each session, and are tenable for only one year, but former holders of them are admissible for re-election by examination, in each successive year of the course. The junior scholars in arts, medicine, and law take charge of the rolls of the classes, note the attendance of students at lecture, and assist the professors in the arrangements for lectures; they pay the same fees *on behalf of the college* as other matriculated students, but a moiety of the *class fees* is remitted during their term of office.

There are ten senior scholarships of L.40 each, which are tenable for one year, and which are open to bachelors of arts of the Queen's University. *Seven* of these are given to the faculty of arts (one to classics and ancient history, one to modern languages and modern history, one to mathematics, one to natural philosophy, one to metaphysics and economical science, one to chemistry, and one to natural history); *two* to the faculty of medicine (one to anatomy and physiology, and one to therapeutics and pathology), and *one* to the faculty of law. The senior scholars assist the professors in the matriculation and class examinations, and in conducting the business of the special departments of literature or science to which their scholarships severally belong.

Students.

Beside the regularly matriculated students, there are private or non-matriculated students, who pay the usual class fees, and are permitted to attend any separate course of lectures without submitting to a preliminary examination. They cannot be candidates for scholarships or other prizes, and do not enjoy the other privileges of matriculated students.

Every matriculated student under twenty-one years of age must reside during the college terms either with parents or guardians, or with some friend or relative, to whom he shall be committed by his parents or guardians, and who shall be approved of by the president, or in some boarding-house, licensed and approved of by the president. Clergymen of the different religious denominations are appointed by the Queen, as deans of residence, to visit the boarding-houses, and take the superintendence of the moral and spiritual training of the students of their respective creeds. No clergyman is allowed to hold the office of dean of residence, unless he be approved of by the bishop, moderator, or constituted authority of his church.

Deans of residence.

Terms.

The college session is divided into three terms:—The first extends from the middle of October to the end of December; the second from the beginning of January to the beginning of April; the third, from the middle of April to the end of the first week in June.

Admission.

The mode of admission to the Queen's Colleges is by an examination held annually at the beginning of the first term. The students in the faculties of arts, law, and medicine, are examined in the English, Greek, and Latin languages, and the elements of history and mathematics. The examinations, both matriculation and others, are conducted partly *viva voce*, and partly in writing. Besides the above general matriculation examination, there is an additional matriculation examination in the second week of November, for those students who have not presented themselves at, or who have not passed, the general examination.

System of instruction.

All matriculated students are ranged in the following classes:—I. Those intending to proceed to the degree of A.B. and A.M. II. Those intending to proceed to the degree of M.D. III. Those intending to proceed to the diploma of elementary law. IV. Those intending to proceed to the degrees of LL.B. and LL.D. V. Those intending to proceed to the diploma of civil engineering. VI. Those intending to proceed to the diploma of agriculture.

For each of these classes there is a special course of study prescribed. Candidates for the degree of A.B. must attend three sessions at any one of the Queen's colleges. In their FIRST YEAR they must study the Greek and Latin languages, *three terms;* the English language, *one term;* the modern languages, *three terms;* and mathematics, *three terms.* SECOND YEAR, logic, *one term;* chemistry, *three terms;* zoology and botany, *three terms;* the higher mathematics, *or* Greek and Latin, *three terms.* THIRD YEAR, natural philosophy, *three terms;* history and English literature, *three terms;* physical geography, *one term;* metaphysics, *two terms;* jurisprudence and political economy, *one term* each. There are also special courses for the other departments, which will be found in the college calendar. The education in the Queen's Colleges is carried on by lectures, and by daily oral examinations in the class-room. There are general class examinations at the end of each session, in the subjects on which lectures have been delivered during that session. There are also supplementary examinations in the same subjects at the commencement of the following session, one or other of which must be passed before the student gets credit as having completed the session.

Colonial.

Degrees.

After completing the course of three years, candidates for the degree of A.B. are obliged to pass an extended examination in classics, mathematics, and some modern language, besides some departments of science chosen by each student from a specified list of subjects.

Bachelors of arts are admissible to the degree of master of arts at the expiry of one year from the time of their obtaining their junior degree, provided they have attended, for at least two terms subsequent to graduation, a course of lectures on some one of the subjects of the course of study which they may have selected. The degree is conferred after an examination in any one of four courses —(1.) Greek and Latin classic authors, prose composition in Greek, Latin, and English; a modern foreign language. (2.) English philology and criticism, logic, metaphysics, or (in place of metaphysics, at the option of the candidate) political economy and jurisprudence. (3.) Mathematical and physical science. (4.) Experimental natural sciences.

The degrees of M.D. and LL.B. are obtained on examination at the end of the fourth year from entrance. LL.D. may be gained by examination three years after LL.B. All these degrees are *bona fide* tests of merit, ascertained by a searching examination.

Fees.

For an arts' student proceeding to the degree of A.B. and A.M., the aggregate of fees for the first year is L.8, 10s.; for the second, L.8, 5s.; and for the third, L.5, 5s. The fees for other courses vary according to the number of classes required. The above charges include the fee for graduation.

Endowments.

The officers of the colleges are paid partly by a government endowment, and partly from the fees of the students. The salary of the president is L.800; of the vice-president (who is also a professor), L.500, besides fees; the professors of Greek, Latin, history, and English literature, mathematics, natural philosophy, logic, and metaphysics, L.250 each, besides the class fees. The professors of natural history, modern languages, mineralogy, geology, anatomy and physiology, L.200 each; the others L.150 or L.100, and all of course with class fees besides. The sum of money granted by parliament for the university in 1860 was L.2371; and for the colleges, L.4800.

The following are the number of the students (matriculated and non-matriculated) attending the three colleges in 1859–60.

	Arts.	Medicine.	Law.	Total.
Belfast	154	91	17	262
Cork	91	84	4	179
Galway	64	54	7	125

COLONIAL UNIVERSITIES.

Colonial Universities.

The following is a list of the universities and colleges established in the British colonies. In Canada West are the *University of Toronto*, under the government of a chancellor, vice-chancellor, and a council consisting of twenty-four members; and, in affiliation with it, *University College*, with a president, a vice-president, and ten professors. The *University of Trinity College*, Toronto, with a council and seven professors; the *University of Queen's College*, Queenstown, conducted by a board of trustees and thirteen professors; and *Victoria College*, Cobourg, with a senate, a board of trustees, and seventeen professors and tutors. In Canada East are *M'Gill's College*, Montreal, an incorporation consisting of the governors, principal, and fellows, and conducted by twenty-four professors; and the *University of Bishop's College*, Lennoxville, with a president, vice-president, chancellor, vice-chancellor, a board of trustees, and four professors. All these institutions have the power of conferring degrees. Besides these, there are in Toronto, *Toronto School of Medicine*, in affiliation with the university; *Knox's College*, a divinity school belonging to the Free Church of Scotland; *Canadian Congregational Theological Institute; Divinity Hall of the United Presbyterian Synod*, &c. &c. There are, besides, *King's College* at Fredericton, New Brunswick; and *King's College* at Windsor, and *Dalhousie College* at Halifax, Nova Scotia; all having the privilege of conferring degrees. A university has been established at *Sydney*, in New South Wales, and another at *Melbourne*, in Victoria or Port Phillip.

France.

FOREIGN UNIVERSITIES.

UNIVERSITY OF FRANCE.

University of France.

France, before the revolution, contained twenty-three universities, of which the most important have already been described. The others were those of Aix, Angers, Avignon, Besançon, Bourges, Bordeaux, Caen, Cahors, Dijon, Douai, Nantes, Orange, Pau, Perpignan, Poitiers, Pont-à-Mousson, Reims, Strasbourg, and Valence. These venerable institutions disappeared during the revolution, and the public education of the country was for some time left without any legislative support. After several unsuccessful attempts to establish a national system, an Imperial University was instituted by Napoleon I. in 1808, which, with some modifications, has survived the various changes of government which the country has since undergone. The *University of France* embraces the whole system of national education, and includes all the institutions for imparting instruction which are spread over the whole kingdom, from the lowest schools up to the imperial lyceums and the academies. The term is thus to be considered as synonymous with the French national system of education. The university is placed under the control of the minister of public instruction as president, with a vice-president, secretary, and a council consisting of twenty-nine members, to some of whom special duties of supervision are assigned. Subordinate to this council are the inspectors-general of the university, who are required to examine once a year the institutions of every description, each within a certain district assigned to him, and to transmit a report to the council. The university is composed of seventeen *academies*, each of which comprehends two, three, or more of the departments into which the kingdom is divided, and contains one or more *imperial lyceums*. The presiding officer of each academy is the rector, who is appointed by the minister of public instruction, and is assisted by a secretary and a staff of inspectors. The governing body of each academy has the superintendence of all the communal colleges, institutions, *pensions* (boarding schools), normal schools, or schools for the education of teachers, and primary schools within the district which the seminary comprehends. Besides the superintending body, the academy includes the teaching corps, or faculties; namely, the faculties of letters, sciences, medicine, law, and theology, all of which, however, do not actually exist in every academy. The faculties contain a variable number of professors, one of whom is dean, and a committee of whom examine candidates for degrees. The degrees conferred are those of Bachelor, Licentiate, and Doctor; and for the attainment of each a definite course of study is prescribed. There are, however, certain institutions which are not subject to the jurisdiction of the university; as the *Imperial College of France*, the *Museum of Natural History*, the *Ecole des Chartes*, *School of Oriental Languages*, the *French Institute*, and societies of all kinds for the advancement of knowledge.

The imperial lyceums, which represent the great public schools in this country, and receive pupils between the ages of seven and seventeen, are supported chiefly by the government; and the salaries of the professors are paid from the budget of the minister of public instruction. In each there is a regular staff of professors, and a course of instruction qualifying for the degree of bachelor of letters is afforded. The students are divided into two classes, the *internes* and *externes*, or boarders and day-scholars. The communal colleges, which represent the better class of our initiatory schools, are supported principally by the communes in which they are situate; some of them have endowments, but the majority depend chiefly for their support on the fees paid by the students. The professors or teachers receive small salaries.

France.

There are six faculties of *Catholic theology:* at Aix, Bordeaux, Lyon, Paris, Rouen, and Toulouse (those at Aix, Rouen, and Toulouse not being in operation); and two of *Protestant theology*: one of the Lutheran or Augsburg Confession, at Strasbourg; and another, of the Calvinist or Helvetic Confession, at Montauban, under the academy of Toulouse. The faculties of law are nine: at Aix, Caen, Dijon, Grenoble, Paris, Poitiers, Rennes, Strasbourg, and Toulouse. There are three faculties of medicine: at Paris, Montpellier, and Strasbourg; twenty-two preparatory schools of medicine and pharmacy: at Marseille, Besançon, Bordeaux, Caen, Rouen, Clermont, Dijon, Lille, Arras, Amiens, Grenoble, Lyon, Montpellier, Nancy, Reims, Poitiers, Tours, Limoges, Rennes, Nantes, Angers, and Toulouse; and superior schools of pharmacy at Paris and Strasbourg. The faculties of sciences and letters are in operation in all the academies, with the exception of that recently instituted at Chambéry.

In order to become a student in the faculty of law or theology, a person must have taken the degree of bachelor of letters; and a course of three years in either faculty is requisite to obtain the degree of bachelor; for the degree of doctor, four years; and to obtain the degree of doctor in divinity, the candidate must defend a final and general thesis. Candidates for the degree of doctor in medicine must have taken the degree of bachelor of letters, and also of sciences, and must complete a course of four years. The faculties of law and medicine at Paris are greatly distinguished.

The following table contains a list of the *Academies* which constitute the *University of France*, the number of territorial departments included in each academical district, the faculties, professors, and annual public expenditure on each academy, and the number of imperial lyceums and communal colleges which are under the supervision of each academy:—

Academies.	Departments.	Faculties.	Professors.	Annual Expenditure.	Imperial Lyceums.	Communal Colleges.
Aix	6	4	37	L.6,885	4	16
Besançon	3	2	21	3,132	1	14
Bordeaux	5	3	28	4,555	4	8
Caen	6	4	47	7,137	6	18
Clermont	6	2	17	2,904	3	14
Dijon	5	3	31	5,588	4	17
Douai	5	2	39	5,023	5	25
Grenoble	4	3	28	4,714	2	7
Lyon	4	3	31	4,680	4	6
Montpellier	5	3	52	12,635	3	11
Nancy	4	2	21	3,249	3	16
Paris	9	5	140	51,750	10	19
Poitiers	8	3	43	6,768	7	16
Rennes	7	3	52	7,395	7	16
Strasbourg	2	5	64	13,202	2	10
Toulouse	8	4	46	6,004	5	17
Chambéry	2	...	...	...	1	6
Total	89	51	697	145,621	71	236

Had space permitted, it would have been very desirable to give a short account of some of the great German universities; but, while admitting their claim to a notice in detail, we are reluctantly constrained to satisfy ourselves with the following statistical table, which embraces all the continental universities. The returns from which it has been compiled were obtained through the kindness of Lord John Russell, her Majesty's Secretary of State for Foreign Affairs, and may, it is believed, be relied on. We have pleasure in recording this additional proof of the interest which his Lordship has uniformly manifested in everything connected with the advancement of knowledge and social progress. We regret that no returns have been received from Russia, Spain, or Tuscany.

List of the Continental Universities (exclusive of that of France), with the date of Foundation, the number of Students and Professors, the Yearly Expenditure, &c., generally for Session 1858–59.

Countries.	Name.	Date of Foundation.	Students.						Teachers.				Yearly Expenditure.	Remarks.
			Theology.		Law.	Medicine.	Philosophy.	Total.	Professors.		Tutors.	Total.		
			Prot.	R.C.					Ord.	Ext.				
													L.	
Austria	Vienna	1365	29	200	1018	656	229	2132	85	...	23	108	...	Students pay, besides, a small matriculation fee, for lectures at the rate of 2s. an hour per week for the session. At Vienna there were also 167 private students: the Evangelical Theological faculty, founded there in 1818, is an independent State establishment. The Law faculty at Olmütz was abolished in 1855. Connected with Innsbruck University is a school of surgery, with 235 students.
,,	Cracow	1343	...	15	139	82	46	282	...	...	...	40	11,726	
,,	Prague	1348	...	91	587	241	207	1126	89	...	...	89	13,822	
,,	Pesth	1465	...	7	530	496	95	1191	36	16	17	69	12,212	
,,	Grätz	1586	...	57	225	...	30	312	20	5	11	36	5,800	
,,	Olmütz	1581	...	82	...	...	...	82	...	...	...	...	600	
,,	Innsbruck	1672	...	68	192	...	28	288	27	...	...	27	5,432	
,,	Lemberg	1784	...	210	320	...	50	580	29	...	...	29	5,724	
,,	Padua	1228	...	35	645	556	329	1568	45	...	...	45	14,170	Students pay a matriculation fee of from 2s. 1d. to 16s. 8d., according to their rank, on entering the university, and a like fee on joining any of the faculties; and on taking degrees,—for doctor, from L.12 to L.35; and for master, from L.4 to L.9, according to the faculty.
,,	Pavia	1361	...	...	496	360	204	1060	47	...	16	63	10,200	
Baden	Heidelberg	1387	93	...	238	136	97	564	31	18	27	76	9,510	The fees vary according to the number of hours per week and the nature of the class.
,,	Freiburg	1457	...	174	19	58	72	340	24	6	6	36	...	
Bavaria	Würzburg	1403	...	92	143	293	139	667	...	...	...	45	12,586	Students pay from 8s. to 15s. per session for each course of lectures.
,,	Erlangen	1743	300	...	100	114	47	561	...	...	...	47	9,000	
,,	Munich	1826	...	156	557	211	405	1329	...	...	...	110	12,232	Students pay from 12s. to L.2, 10s. per do. do.
Belgium	Brussels	1837	...	...	163	147	104	414	30	17	...	47	3,800	Matriculation fee, 12s.; annual fee for all the classes in each of the faculties, from L.8 to L.10. Theology is taught in the theological seminaries in connection with the several dioceses.
,,	Liège	1817	...	...	166	149	159	474	...	...	19	60	...	
,,	Ghent	1816	...	...	78	101	47	226	...	...	...	43	14,400	
,,	Louvain	1426	...	82	227	192	253	754	48	...	...	48	...	
Denmark	Copenhagen	1479	...	...	...	...	...	900	41	...	15	56	17,782	Students pay on matriculation, at Copenhagen, L.1, 2s.: at Kiel, 17s. 8d.; for private lectures from 8s. 10d. to L.1, 2s. per course. Students pay no fees.
,,	Kiel	1665	32	...	57	32	21	143	23	7	14	44	9,994	
Greece	Athens	1837	Gr. Ch.	24	263	162	67	516	...	...	...	45	5,670	
Hanover	Göttingen	1737	134	...	216	181	158	689	50	17	35	102	21,760	
Hesse-Cassel	Marburg	1527	78	...	36	69	14	247	32	14	10	56	13,600	Public lectures free; private instruction from 12s. to L.2, 10s. per session.
Hesse-Darmstadt	Giessen	1607	51	...	41	112	159	363	33	3	11	47	13,000	Matriculation fee, 16s.; other fees at the rate of 6s. an hour per week in the session.
Holland	Leyden	1575	158	...	219	95	39	511	28	...	...	...	11,700	The universities are supported by the State, the athenæums by the communes in which they are established. Besides an entrance fee and a fee on graduation, students pay for lectures from L.1, 5s. to L.2, 10s. per session.
,,	Gröningen	1614	61	...	81	30	11	183	21	...	...	...	7,000	
,,	Utrecht	1636	205	...	184	58	22	469	22	...	...	...	7,500	
,,	Amsterdam (Athenæum)	...	52	...	42	19	2	115	15	...	...	...	2,440	Fees, L.5 per annum for a course of four hours a week.
,,	Deventer (Athenæum)	...	3	...	7	2	20	32	7	...	...	...	1,030	Students pay annually at the rate of 10s. for each hour per week.
Ionian Islands	Corfu	1824	...	...	...	...	...	300	...	...	...	...	...	
Mecklenburg	Rostock	1419	35	...	59	35	...	...	...	...	...	34	...	
Modena	Modena	...	...	...	...	150	112	208	470	41	...	...	41	6,000	Fees for a complete course in any of the faculties from L.5 to L.17, 10s. Theology is taught in the theological seminaries.
Papal States	Bologna	1119	...	10	132	326	64	532	40	...	...	40	7,191	The theological course is followed, in the provinces, at the Episcopal seminaries; and, in Rome, at the schools of the Roman College, in those of the seminary of St Apollinaro, and in the College of St Thomas, under the direction of the "Preacher-Fathers." The fees paid by the students at all these universities amount to about L.4 a year.
,,	Rome	1303	...	13	349	175	161	698	50	...	...	50	7,913	
,,	Ferrara	1391	...	1	31	20	13	65	20	...	...	20	2,081	
,,	Perugia	1290	...	2	30	23	26	81	31	...	...	31	2,259	
,,	Macerata	1290	...	11	53	26	30	120	21	...	...	21	847	
,,	Urbino	1671	...	5	22	9	36	72	20	...	...	20	1,229	
,,	Camerino	1727	...	3	33	23	4	63	20	...	...	20	719	
Parma	Parma	1422	...	60	76	51	162	314	47	...	...	47	5,400	Fees,—a small entrance fee, and L.12, 12s. on graduation.
,,	Piacenza (Colleg. Sch.)	...	...	...	...	64	5	90	159	18	...	...	18	1,840
Portugal	Coimbra	1290	...	...	464	...	305	...	47	...	39	86	16,193	Fees from L.4, 4s. to L.5, 5s. per session. Attached to the university is a lyceum, with 12 professors and 53 students.
Prussia	Greifswald	1456	29	...	38	127	194	288	...	...	...	34	8,680	Public lectures free. Matriculation fee, 18s.; private lectures from 17s. to L.2, 15s. per session.
,,	Breslau	1702	101	178	141	112	238	770	...	...	...	51	12,740	
,,	Königsberg	1544	140	...	72	94	75	381	29	14	15	58	12,618	Public lectures free. Matriculation fee, L.1, 5s.; private lectures from 12s. to L.1, 16s. per session.
,,	Halle	1694	361	...	156	71	50	638	37	13	18	68	...	
,,	Berlin	1809	321	...	501	289	356	1467	29	41	57	147	...	Fees for private lectures, from 17s. to L.1, 14s. * Exclusive of 917 unmatriculated students from the military academy, &c.
,,	Bonn	1818	54	230	116	95	275	770	...	...	...	88	16,245	Fees for private lectures on an average 17s. for five hours a week per session.
Russia	Dorpat	1632	...	...	...	...	...	555	...	...	...	84	...	In each of the Russian universities there are four faculties:—1. a judicial faculty; 2. a historico-philological faculty; 3. a mathematical faculty; 4. a medical faculty, with the addition at St Petersburg of a faculty of oriental languages.
,,	Moscow	1755	...	...	...	...	...	1725	...	...	...	117	...	
,,	Kasan	1803	...	...	...	...	...	353	...	...	...	76	...	
,,	Charkov	1803	...	...	...	...	...	459	...	...	...	79	...	
,,	St Petersburg	1819	...	...	...	...	...	716	...	...	...	82	...	
,,	Helsingfors	1828	59	...	89	46	233	427	24	4	16	44	16,187	Matriculation fee 21s., and a very small fee for private lectures.
,,	Kiev	1833	...	...	...	...	...	906	...	...	...	96	...	
Sardinia	Turin	1412	...	3	628	495	255	1376	84	...	13	97	11,200	Students pay matriculation fees and fees on taking each examination, the total amount in the theological faculty being about L.25; in law, L.40; medicine, L.38; and philosophy, L.17.
,,	Cagliari	1606	...	19	66	86	23	194	27	...	...	27	3,280	
,,	Sassari	1766	...	17	47	72	...	136	22	...	...	22	2,560	
,,	Genoa	1812	...	1	217	111	95	424	37	...	11	48	7,468	
Saxe-Weimar	Jena	1558	...	...	...	...	...	380	37	14	7	58	...	
Saxony	Leipsig	1409	230	...	290	257	70	847	43	36	30	109	22,310	Fees for private lectures about 15s. a session, four hours a week.
Sicilies, Two	Naples	1224	...	...	...	...	...	1550	...	...	...	...	...	
,,	Catania	1445	...	3	238	173	194	603	36	...	...	...	3,000	The fees are paid on taking degrees, and vary in the several faculties from L.5 to L.24 in all.
,,	Palermo	1394	...	23	468	254	377	1122	50	...	...	...	5,828	
,,	Messina	1548	...	20	75	44	180	319	30	...	...	...	1,362	
Spain	Salamanca	1240	...	...	...	...	...	300	...	...	...	...	...	
,,	Valladolid	1346	...	...	...	...	...	1300	...	...	...	...	...	
,,	Valencia	1410	...	...	...	...	...	1600	...	...	...	...	...	
,,	Saragossa	1474	...	...	...	...	...	1100	...	...	...	...	...	
,,	Seville	1504	...	...	...	...	...	800	...	...	...	...	...	
,,	Granada	1531	...	...	...	...	...	810	...	...	...	...	...	
,,	Santiago	1532	...	...	...	...	...	1080	...	...	...	...	...	
,,	Oviedo	1580	...	...	...	...	...	450	...	...	...	...	...	
Sweden & Norway	Upsala	1476	173	...	251	181	846	1451	31	...	...	31	17,555	Students pay no fees for the lectures, but from L.1, 2s. 6d. to L.1, 7s. for matriculation. Private instruction is paid for at the rate of 6s. to 12s. per lecture term.
,, ,,	Lund	1668	84	...	120	68	338	610	28	...	18	46	21,584	
,, ,,	Christiania	1811	100	...	103	82	204	489	32	...	...	32	15,574	
Switzerland	Basle	1459	45	...	7	17	13	82	27	8	16	51	3,537	Students pay a matriculation fee of 14s., and from L.1, 1s. to L.2, 2s. for the lectures, according to the number of hours per week.
,,	Zurich	1834	27	...	26	62	12	127	44	...	17	61	4,850	
,,	Bern	1834	34	...	62	76	18	190	34	...	...	34	...	
Tuscany	Siena	1361	...	...	...	...	...	257	20	...	...	20	...	Since 1851, Siena has only had faculties of theology and law; and Florence only those of law and medicine.
,,	Pisa	1338	...	...	...	...	...	580	45	...	...	45	...	
,,	Florence	1438	...	...	...	...	...	218	...	...	...	...	...	
Wurtemberg	Tübingen	1477	174	141	134	130	80	669	44	6	12	62	9,450	Fees for a session of five hours a week, 9s. in theology and philosophy, and 19s. in law and medicine.

United States.

COLLEGES IN THE UNITED STATES.

To render our account of the seminaries for higher education as complete as possible, we have added, from the *American Almanac* for 1859, a list of the Colleges and Professional Schools in the United States. We have subjoined, from the same source, lists of the medical, theological, and law schools.

Colleges.

No.	Name.	Place.	Founded.	Instructors.	Students.
1	Bowdoin	Brunswick Me.	1794	10	196
2	Waterville*	Waterville "	1820	5	16
3	Dartmouth	Hanover N. H.	1769	11	249
4	University of Vermont	Burlington V. T.	1791	7	104
5	Middlebury	Middlebury "	1800	6	82
6	Norwich University†	Norwich "	1834	4	80
7	Harvard University	Cambridge Mass.	1636	24	409
8	Williams	Williamstown "	1793	9	224
9	Amherst	Amherst "	1821	13	221
10	Holy Cross§	Worcester "	1843	8	75
11	Tufts College	Medford "	1854	5	50
12	Brown University*	Providence R. I.	1764	10	205
13	Yale	New Haven Conn.	1700	24	447
14	Trinity†	Hartford "	1825	12	60
15	Wesleyan University‡	Middletown "	1831	7	151
16	Columbia†	New York N. Y.	1754	6	148
17	Union	Schenectady "	1795	14	78
18	Hamilton	Clinton "	1812	8	23
19	Madison University*	Hamilton "	1846	9	145
20	Hobart Free College†	Geneva "	1825	6	96
21	University of City of N. Y.	New York "	1831	16	138
22	University of Rochester*	Rochester "	1850	8	165
23	St John's§	Fordham "	1840	13	50
24	College of New Jersey	Princeton N. J.	1746	18	273
25	Rutgers	New Brunswick "	1770	7	106
26	Burlington†	Burlington "	1846	29	118
27	University of Pennsylvania	Philadelphia Penn.	1749	12	129
28	Dickinson‡	Carlisle "	1783	8	138
29	Jefferson	Canonsburg "	1802	10	222
30	Washington	Washington "	1806	6	103
31	Alleghany‡	Meadville "	1817	6	99
32	Pennsylvania	Gettysburg "	1832	7	60
33	Lafayette	Easton "	1832	6	100
34	Franklin and Marshall	Lancaster "	1836	6	90
35	University at Lewisburg*	Lewisburg "	1849	4	48
36	Polytechnic	Philadelphia "	1853	6	34
37	Delaware	Newark Del.	1833	6	50
38	St Mary's§	Wilmington "	1847	7	110
39	St John's	Annapolis Md.	1784	6	115
40	St Charles's§	Ellicott's Mills "	1805	4	122
41	Mount St Mary's§	Emmetsburg "	1830	24	126
42	St James's†	Washington Co. "	1842	15	59
43	Washington	Chesterton "	1783	5	70
44	Georgetown§	Georgetown D. C.	1792	21	245
45	Columbian*	Washington "	1821	8	66
46	William and Mary†	Williamsburg Va.	1692	6	64
47	Hampden-Sydney	Prince Ed. Co. "	1776	5	119
48	Washington	Lexington "	1782	6	93
49	University of Virginia	Charlottesville "	1819	16	419
50	Randolph-Macon‡	Boydon "	1832	6	76
51	Emory and Henry‡	Washington Co. "	1838	5	54
52	Rector*	Taylor Co. "	1839	3	50
53	Bethany College	Bethany "	1841	6	141
54	Richmond*	Richmond "	1840	6	93
55	Virginia Military Institute	Lexington "	1839	13	150
56	University of N. Carolina	Chapel Hill N. C.	1789	15	421
57	Davidson	Mecklenburg Co. "	1840	7	99
58	Wake Forest*	Forestville "	1838	5	76
59	Charleston	Charleston S. C.	1785	6	70
60	South Carolina	Columbia "	1801	8	202
61	Franklin	Athens Ga	1785	10	160
62	Oglethorpe	Milledgeville "	1838	5	97
63	Emory‡	Oxford "	1837	6	126
64	Mercer University*	Penfield "	1838	8	89
65	Wesleyan Female	Macon "	1839	9	180
66	University of Alabama	Tuscaloosa Ala.	1831	9	144
67	Florence Wesleyan‡	Florence "	1830	5	112
68	Spring Hill§	Spring Hill "	1830	20	30
69	Howard*	Marion "	1848	6	83
70	Oakland	Claiborne Co. Miss.	1830	5	70
71	University of Mississippi	Oxford "	1848	9	162
72	Mississippi College*	Clinton "	1851	5	48
73	Semple Broaddus*	Centre Hill "	1856	4	75
74	Centenary‡	Jackson La.	1845	9	102
75	Washington	Washington Co. "	1795	3	22
76	University of Nashville	Nashville Tenn.	1806	7	101
77	Franklin	Near Nashville "	1844	6	106
78	East Tennessee	Knoxville "	1806	...	...
79	Cumberland University	Lebanon "	1844	11	165
80	Jackson	Columbia "	1838	5	84
81	Union*	Murfreesboro' "	1848	6	150
82	Greenville	Greenville "	1796	2	20
83	Transylvania	Lexington Ky.	1798	8	25
84	St Joseph's§	Bardstown "	1819	16	...
85	Centre	Danville "	1823	5	180
86	Georgetown*	Georgetown "	1840	8	132
87	Kentucky Military Institute	Franklin Springs "	1846	9	153
88	Paducah	Paducah "	1852	6	18

Colleges—Continued.

No.	Name.	Place.	Founded.	Instructors.	Students.
89	Ohio University	Athens Ohio	1804	6	62
90	Miami University	Oxford "	1824	8	127
91	Franklin	New Athens "	1824	4	85
92	Western Reserve	Hudson "	1826	7	27
93	Kenyon†	Gambier "	1826	10	103
94	Denison*	Granville "	1832	5	47
95	Marietta	Marietta "	1835	6	50
96	Oberlin College	Oberlin "	1834	8	110
97	Ohio Wesleyan University‡	Delaware "	1842	8	142
98	Wittenberg	Springfield "	1845	6	46
99	Urbana University	Urbana "	1850	8	21
100	Antioch	Yellow Springs "	1853	13	105
101	Indiana State University	Bloomington Ind.	1830	6	115
102	Hanover College	South Hanover "	1832	8	73
103	Wabash	Crawfordsville "	1833	7	55
104	Indiana Asbury University‡	Greencastle "	1837	10	201
105	Illinois	Jacksonville Ill.	1830	7	70
106	Shurtleff*	Upper Alton "	1835	6	40
107	M'Kendree‡	Lebanon "	1835	8	28
108	Knox	Galesburg "	1837	7	56
109	St Louis University§	St Louis Mo.	1832	18	134
110	St Vincent's	Cape Girardeau "	1843	10	3
111	Masonic	Lexington "	1844	3	28
112	Univ. of State of Missouri	Columbia "	1839	9	39
113	St Charles‡	St Charles "	1837	6	50
114	University of Michigan	Ann Arbor Mich.	1837	14	276
115	St Philip's§	Near Detroit "	1839	4	30
116	Wisconsin University	Madison Wisc.	1851	7	30
117	Beloit	Beloit, Rock Co. "	1847	9	40
118	Lawrence University‡	Appleton "	1849	8	100
119	Milwaukee Female	Milwaukee "	1853	4	76
120	Iowa State University	Iowa City Iowa	1855	4	...
121	Iowa Wesleyan University‡	Mount Pleasant "	1855	9	...
122	Santa Clara§	Near San José Cal.	1855	16	153

Remarks.

The Colleges marked thus (*) are under the direction of the *Baptists;* thus (†), *Episcopalians;* thus (‡), *Methodists;* thus (§), *Catholics.* With respect to the Colleges which are *unmarked*, the prevailing religious influence of those that are in the New England States is *Congregationalism*; of most of the others, *Presbyterianism.*

By instructors in the above table is meant those connected with the undergraduates; and by *students*, except the Roman Catholic Institutions and a few of the colleges in the Southern and Western States, is meant *undergraduates*, or members of the four collegiate classes; not including such as are pursuing a professional education, or such as are members of a preparatory department. Some of the colleges above enumerated are not in full operation, and scarcely deserve a place in the table.

The above table shows the condition of the colleges near January 1858. Returns have not been received from several of the colleges to so late a date.

Medical Schools.

Name.	Place.	Founded.	Professors.	Students.
Maine Medical School	Brunswick, Maine	1820	9	55
New Hampton Medical School	Hanover, N. Hamp.	1797	5	49
Castleton Medical College	Castleton, Vermont	1818	7	104
Med. Dep. University, Vermont	Burlington, "	1821	6	49
Vermont Medical College	Woodstock, "	1835	8	91
Medical School, Harvard Univ.	Boston, Massachusetts	1782	6	104
Berkshire Medical School	Pittsfield, "	1823	5	103
Medical Institution, Yale Coll.	N. Haven, Connecticut	1813	6	29
College of Phys. & Surg., N. Y.	New York, New York	1807	6	219
Med. Institution, Geneva Coll.	Geneva, "	1831	6	15
Medical Faculty, Univ. N. Y.	New York, "	1831	9	300
Albany Medical College	Albany, "	1839	8	114
Med. Dep. Univ. Pennsylvania	Philadelphia, Penn.	1765	9	453
Jefferson Medical College	" "	1824	7	514
Med. Dep. Pennsylvania Coll.	" "	1839	8	140
Philadelphia College of Med.	" "	...	7	75
Med. School, Unniv. Maryland	Baltimore, Maryland	1807	6	100
Washington Medical College	" "	1827	6	25
Nat. Med. Coll., Columbia Coll.	Washington, D.C.	1821	8	17
Med. Dep., Georgetown College	" "	1851	9	31
Medical School, Univ. Virginia	Charlottesville	1819	4	113
Med Dep. Hampton, Sid. Coll.	Richmond, Virginia	1838	7	90
Winchester Medical College	Winchester "	...	5	...
Med. Coll., State of S. Carolina	Charleston, S. Carolina	1833	8	158
Medical College of Georgia	Augusta, Georgia	1830	7	115
Medical Dep., Univ. Louisiana	New Orleans, Louisiana	1835	8	222
Medical Dep., Univ. Nashville	Nashville, Tennessee	1850	8	419
Med. Dep, E. Tennessee Univ.	Knoxville, "	1856	8	...
Med. Dep., Transylvania Univ.	Lexington, Kentucky	1818	...	...
Medical Dep., Univ. Louisville	Louisville, "	1837	...	...
Med. Dep., West Reserve Coll.	Cleveland, Ohio	1844	6	160
Medical College of Ohio	Cincinnati "	1819	8	130
West. Coll. Homœpathic Univ.	Cleveland "	1850	8	62
Starling Medical College	Columbus, "	1847	8	124
Rush Medical College	Chicago, Illinois	1842	6	70
University of Michigan	Ann Arbor	1850	7	137
Medical Dep. of St Louis Univ.	St Louis, Mobile	1836	9	125
Medical Dep. of Missouri Univ.	Columbia "	1846	7	103
Medical Dep. State University	Keokuk, Iowa	1849	6	80
Medical Dep. State University	Madison, Wisconsin	1856	6	...

Unst ‖ Unterwalden.

Theological Schools.

Name.	Place.	Denomination.	Commenced Operation.	No. of Professors.	Students near 1857–58.
Bangor Theol. Seminary ...	Bangor,..... Me.	Cong.....	1816	4	40
Meth. Gen. Bib. Institute...	Concord,.....N. H.	Methodist...	1847	3	40
Gilmanton Theol. Sem.....	Gilmanton,... ,,	Cong.....	1835	3	23
N. Hampton Theol. Sem. ...	N. Hampton,.. ,,	Baptist.....	1825	2	36
Theological Seminary	Andover,.....Mass.	Cong.....	1807	5	110
Divinity Sch., Harv. Univ...	Cambridge,... ,,	Cong. Unit..	1816	2	17
Theological Institution.....	Newton ..... ,,	Baptist.....	1825	4	33
Theol. Dep. Yale College ...	New Haven,..Conn.	Cong.....	1822	4	22
Theol. Inst. of Connecticut.	East Windsor, ,,	,,	1834	3	17
Theol. Inst. Episc. Church..	New York,....N. Y.	Prot. Epis....	1817	5	58
Union Theol. Seminary.....	,, ,,	Presbyt.....	1836	5	106
Theol. Sem. of Auburn.....	Auburn,..... ,,	,,	1821	4	30
Hamilton Theol. Seminary..	Hamilton,.... ,,	Baptist	1820	3	24
Rochester Theol. Seminary.	Rochester,.... ,,	,,	1850	3	36
Hartwick Seminary	Hartwick,..... ,,	Lutheran....	1816	2	5
Th. Sem. Ass. Ref. Church..	Newburg, ... ,,	Ass. Ref. Ch.	1836	1	11
Th. Sem. Dutch Ref. Ch. ...	N. Brunswick, N. J.	Dutch Ref...	1784	3	25
Th. Sem. Presbyt. Church..	Princeton, ... ,,	Presbyt.	1812	5	153
Wittemburg Th. Seminary.	Gettysburg,.. Pa.	Evan. Luth..	1825	3	20
German Reformed.....	Mercersburg, ,,	G. Ref. Ch...	1825	2	18
Western Theol. Seminary...	Alleghany T., ,,	Presbyt.	1828	2	48
Theological School.....	Canonsburg, ,,	Asso. Ch.....	1792	2	33
Theological Seminary	Pittsburg,.... ,,	Asso. Ref....	1828	3	35
Western Theol. School	Meadville,.... ,,	Cong. Unit..	1844	4	17
Th. Dep. Lewisburg Univ...	Lewisburg,... ,,	Baptist	1856	1	15
St Mary's Seminary	Baltimore,.... Md.	Rom. Cath..	1791	6	27
Episc. Theol. School of Va..	Fairfax Co.,.. Va.	Prot. Epis...	1822	4	42
Union Theol. Seminary.....	Prince Ed. Co., ,,	Presbyt.	1824	3	20
Virginia Baptist Seminary.	Richmond,... ,,	Baptist	1832	3	67
Theological Seminary	Columbia,..... S. C.	Presbyt.	1828	4	40
Theological Seminary	Lexington,... ,,	Lutheran ...	1835	2	10
Furman Theol. Seminary...	Fairfield Dist., ,,	Baptist	1826	2	30
Th. Sem. of Mercer Univ....	Penfield,..... Ga.	,,	1844	2	10
Howard Theol. Institution..	Marion,..... Ala.	,,	1848	1	6
Western Bap. Theol. Inst...	Georgetown,. Ky.	,,	1855	2	10
Danville Theol. Seminary...	Danville,..... ,,	Presbyt.	...	...	...
Southwest Theol. Seminary	Maryville,....Tenn.	,, ...	1821	2	24
Theol. School, Cumb. Univ.	Lebanon, ... ,,	Cumb. Pres.	1855	2	33
Theol. Dep. St. Louis Univ.	St Louis,..... Mo.	Rom. Cath..	1829	4	14
Lane Seminary	Cincinnati,... Ohio	Presbyt.	1829	3	36
Theol. Dep. Kenyon College	Gambier, ... ,,	Prot. Epis...	1827	3	13
Th. Dep. West. Res. College	Hudson, ... ,,	Presbyt.	1830	3	14
Granville Th. Department..	Granville, ... ,,	Baptist	1832	2	8
Oberlin Theol. Department.	Oberlin, ... ,,	Cong.....	1835	3	24
Th. Sem. Ass. Ref. Church..	Oxford, ... ,,	Asso. Ref....	1839	1	12
Wittenberg	Springfield,... ,,	W. Lutheran	1845	1	6
Bibl. Dep. Ohio Wesl. Univ..	Delaware, ... ,,	Methodist...	1849	1	11
New Albany Th. Seminary.	Hanover,..... Ind.	Presbyt.	1832	3	15
Alton Theol. Seminary.....	Upper Alton, Ill.	Baptist	1835	...	...

Law Schools.

Unterwalden.

Name.	Place.	Founded.	Professors.	Students 1857–58.
Dane Law School, H. Univ.....	Cambridge, Mass.....	1817	3	146
Law School, Yale College.....	New Haven, Conn.....	1820	2	31
University of Albany.....	Albany, New York.....	1851	3	121
University of Pennsylvania.....	Philadelphia, Penn.....	1850	3	60
William and Mary College.....	Williamsburg, Virginia	1782	1	...
Law School, Univ. of Virginia....	Charlottesville ,,	1825	2	113
North Carolina University.....	Chapel Hill, N. Carolina	...	1	6
University of Louisiana.....	N. Orleans, Louisiana	...	3	...
Transylvania University.....	Lexington, Kentucky	...	3	...
University of Louisville.....	Louisville, Kentucky...	...	3	...
Cumberland University.....	Lebanon, Tennessee....	1847	3	188
Law School, Cincinnati Coll.....	Cincinnati, Ohio.....	1833	3	85
Indiana State University.....	Bloomington, Indiana	1840	1	18
Indiana Asbury University.....	Greencastle, ,,	1853	1	17
Hamilton College Law School...	Clinton, New York.....	1855	1	14
N. Y. State & National Law. S.	Poughkeepsie, N. Y.....	1845	4	119
University of Mississippi.....	Oxford, Mississippi.....	1854	1	16

(The following authorities have been consulted:—Bulaii *Historia Universitatis Parisiensis*; Crevier's *Hist. de l'Université de Paris*; Conringii *De Antiq. Acad. Dissert.*; Itteri *De Honoribus sive Gradibus Academicis Liber*; Middendorpii *Acad. Celebrium Universi Terrarum Orbis Libri VIII.*; Rebuffi *De Scholasticorum &c. Privilegiis*; Savigny's *Gesch. des Röm. Rechts im Mittelalter*; Meiners' *Geschichte der Hohen Schulen*; Hallam's *Middle Ages*; Hallam's *Lit. of Europe*; Berington's *Lit. Hist. of the Middle Ages*; Malden *On the Origin of Universities*; Sir W. Hamilton's *Discus. on Ed. and Univ. Reform*; Waddington's *Hist. of the Church*; Wood's *Hist. and Antiq. of the Univ. of Oxford*; Ayliffe's *Antient and Present State of the University of Oxford*; Chalmers' *Hist. of the Univ. of Oxford*; *Report* of the Oxford Univ. Commission; Oxford *University Calendars*; Dyer's *History of the Univ. of Cambridge*; Dyer's *Privileges of the University of Cambridge*; *Report* of the Cambridge University Commission; Cambridge *University Calendars*; London *University Calendars*; Durham *University Calendar*; M'Culloch's *Statist. Account of the British Emp.*; *Reports* of the Royal Commissions of Inquiry into the State of the Universities of Scotland; M'Crie's *Life of Melville*; *Munimenta Universitatis Glasguensis*; *Fasti Aberdonenses*; *Ordinances* issued by the Commissioners under the Universities' (Scotland) Act; *Quarterly Journal of Education*; *Report* of the Dublin Univ. Commission; Dublin *University Calendar*; Queen's *University Calendar*, &c. (G. F. and A. H. B.)

UNST. See SHETLAND.

UNTERWALDEN, a canton of Switzerland, and one of the three that formed the original confederacy; bounded on the N. by the Lake of Luzern, E. by the canton of Uri, S. by that of Bern, and W. by that of Luzern. Its length from N.E. to S.W. is 25 miles, its breadth 21, and its area 262 square miles. It is entirely a mountainous country; and is enclosed on every side but the north by branches of the Alps, diverging from the central group of St Gothard. One ridge, in which are the mountains Geisburg and Brünig, stretches along the southern border; another, containing the summits of Titlis (10,500 feet), Wallenstock, and Rothstock, each more than 8000 feet, divides it from Uri on the east; and a third, culminating in Mount Pilatus, (7000 feet), separates it from Luzern on the west. In the interior, the country is hilly rather than mountainous, and consists of two parallel valleys, sloping towards the Lake of Luzern in the north. Through the eastern of these flows the Engelberg Aa, and through the western the Sarner Aa, both falling into the Lake of Luzern. These are the only important rivers in the canton. Besides the Lake of Luzern, about a fourth part of which belongs to the canton, there are two others of much smaller size—that of Lungern, in which the Engelberg Aa rises, at the foot of the mountains in the south-east; and that of Sarnen, through which the Sarner Aa flows. The prevalent geological formation is chalk, in which a number of caverns occur. The soil is generally fertile; but as nearly the whole surface is occupied by mountains and hills, there is little ground fit for agriculture, and the canton is for the most part a pastoral country. Vines have been grown in some parts, but the wine is not good. The forests are extensive, stretching far up the mountain sides, and yielding valuable timber; while lower down there are plantations of chestnut-trees, and orchards yielding apples and pears. On the side of the Alps, at a great height, there is good pasture in summer, on which many cows are bred; and their milk is made into cheese, which is very highly esteemed in Switzerland and Italy. In the year 1854 Unterwalden contained 308 horses, 13,107 horned cattle, 4822 sheep, 7092 goats, and 4036 swine. In the same year there were 9100 milch cows in the country; and there were produced upwards of 21,000 cwt. of cheese, and 3500 cwt. of butter. The canton has no manufactures, nor is it favourably situated for trade. It exports cattle, cheese, butter, hides, and timber; and imports corn, wine, salt, manufactured goods, &c. It is divided into two parts, called *Obwalden* and *Nidwalden*, from their position above or below the forest of Kerns, near the centre. The capital of Obwalden is Sarnen; that of Nidwalden, Stanz. These two divisions form separate states, having distinct administrations; and they each send one member to the national council, and one to the council of states. The inhabitants of both are of German origin, and speak a dialect of that language. They are a simple, pastoral people, attached to their ancient customs, and bigoted in their faith, which is that of the Roman Catholic Church, under the jurisdiction of the Bishop of Chur. There are thirteen parish churches and five convents. The sovereignty is vested in the whole of the males above twenty, who assemble annually to appoint the government, and approve or reject the measures proposed by the legislature. The government thus appointed consists of a *landamman*, or president of the state, and an executive council. The people also appoint a legislative council. This account of

the government applies to both the states that form the canton; but they differ in the numbers of the different councils, and in other slight particulars. Unterwalden is required to furnish a contingent of 382 men to the national army. Pop. (1850) 25,138.

UPSAL or UPSALA, a city of Sweden, capital of a province of the same name, on the Sala, 47 miles N.W. of Stockholm. It is a fine old-fashioned town, and covers a considerable area of ground, the streets being generally wide and regular, and most of the houses having gardens attached to them. Many of the houses are of wood. The cathedral, though only of brick, is a very beautiful Gothic edifice, erected between 1258 and 1435. It is 330 feet in length by 140 in width, and has a fine west front flanked with towers. The interior is lofty and well proportioned, and contains tombs of Linnæus and various of the kings of Sweden. The university of Upsala was founded by Sten Sture in 1477, and has faculties of theology, law, medicine, and philosophy. In 1859 it had 31 professors, and was attended by 1451 students. Connected with the university are a library of about 130,000 volumes and 7000 MSS.; a museum, in the hall of which is a statue of Linnæus by Byström; a valuable cabinet of coins; botanic garden, and observatory. Upsala possesses few manufactures, and carries on but little external trade, the inhabitants being chiefly connected with, or dependent on, the university. It is the seat of an archbishop, who is primus of the kingdom. Pop. (1855) 8006. The laen, or province of Upsala, has an area of 2067 square miles, and a population of (1855) 90,828. It contains the iron mines of Dannemora, the largest and richest in Sweden.

UPTON-UPON-SEVERN, a market town of England, in the county and 10 miles S. of Worcester, on a cliff forming the right bank of the Severn, here crossed by a stone bridge of six arches. It is neatly built, and has an elegant modern parish church, with the Gothic tower of a more ancient building. The river is here navigable for vessels of 100 tons burden; and there are a wharf and a harbour for barges. Large quantities of cider are exported from this place. Pop. of the parish, 2696.

URAL, or OORAL, mountains and river. See RUSSIA.

URALSK, a town of European Russia, in the government and 155 miles W.S.W. of Orenburg, on the Ural. It is a large place, entirely built of wood, and surrounded by palisades and irregular ramparts. There are here five churches, several government offices, and various factories. Uralsk is the chief seat of the Ural Cossacks, and the residence of their *attaman* or chief.

URATEPE, or ORA TUBE, a town of Independent Turkestan, Bokhara, 90 miles N.E. of Turkestan. It is enclosed by high walls and a moat; and contains regular streets, earthen houses, and a number of mosques. The inhabitants carry on an important trade with Russia and Khokan.

URBINO, a town of the Papal States, one of the capitals of the delegation Pesaro-e-Urbino, 20 miles S.W. of Pesaro. It is fortified and defended by a castle; and, besides being interesting from its historical associations, and as the birthplace of Raphael, the town contains many fine buildings. The ducal palace is a magnificent specimen of the *cinque cento* style, remarkable not more for the richness of its decorations than for the taste displayed in it. The cathedral, and many of the other churches, contain valuable works of art; and Urbino has also a theatre, and one of the oldest academies in Italy. The house in which Raphael was born is marked by an inscription announcing the fact; but it is remarkable, that this his native town does not contain one of his pictures. Urbino has a large pin-factory, which employs several hundred hands. This town was formerly the capital of an independent duchy; and, in the fifteenth century was celebrated as the seat of learning and art. It was annexed to the Papal States in 1631, on the extinction of the ducal line. Pop. 12,000.

URE, ANDREW, a chemist of considerable repute, was born in Glasgow in 1778. After completing his literary education at the university of his native city, he subsequently studied medicine in Edinburgh, and took his degree of M.D. in Glasgow in 1801. He was appointed next year professor of chemistry and natural philosophy in the Andersonian Institution in the latter city; and in 1809 he took an active part in the establishment of the Glasgow Observatory, of which he was appointed astronomer on its completion. In 1813, he published a *Systematic Table of the Materia Medica*, and in 1818 he read a memoir before the Royal Society, on "New Experimental Researches on some of the leading doctrines of Caloric," which was subsequently published in the *Philosophical Transactions*, and which established his reputation as a natural philosopher. He published a very extensive and accurate *Dictionary of Chemistry* in 1821, and next year he published a valuable paper in the *Philosophical Transactions*, "on the Ultimate Analysis of Animal and Vegetable Substances." Passing over his translation of Berthollet's work on *Dyeing*, which he executed in 1824, and the *System of Geology*, published in 1829, in which the author advocates the exploded Noachian theory of the deluge, we come to 1830, when Dr Ure removed to London. In 1834, he was appointed chemist to the Board of Customs. His works on the *Philosophy of Manufactures* in 1835, and on *the Cotton Manufacture of Great Britain* in 1836, and especially his great *Dictionary of the Arts and Manufactures* in 1839, served to show what a rich field of materials he had fallen upon in London, and how ingeniously and simply he could explain whatever he took in hand. Ure was a fellow of numerous scientific societies, both British and foreign. He died in London on the 2d of January 1857.

URFÉ, HONORÉ D', author of the once famous pastoral romance *L'Astrée*, was descended from a noble Swabian family, and was born at Marseilles in 1567. He studied at the college of Tournon, and afterwards entered the army, where he fought bravely in the wars of Henry IV. The first part of his great work *L'Astrée* appeared in 1610, a second in 1612, and two more in 1618. This romance was run upon by the public, it was resorted to by the playwright, and it was studied by the painter, for upwards of half a century. D'Urfé wrote besides numerous epistles and fables. He died in 1625.

URI, a canton of Switzerland, and one of the three that formed the original confederacy; bounded on the N. by that of Schwyz, E. by those of Glarus and Grisons, S. by those of Ticino and Valais, and W. by those of Bern and Unterwalden. Length from N. to S., 32 miles; breadth, 19; area, 420 square miles. It comprises one of the most rugged and mountainous regions in Switzerland, and is so much secluded from the surrounding country that the only two ways of access to it are by the Pass of St Gothard in the south, and the Lake of Luzern in the north. St Gothard is the most celebrated, though not the loftiest of the mountains in the canton. In the west part of the canton is the Galenstock, the Sustenhorn, and the Urirothstock; in the south, St Gothard with its different peaks; in the east, the Scheerhorn, Windgelle, and Bristenstock; and in the north, the Ross-stock. Enclosed by these peaks and the ridges that connect them lies the principal valley of the canton, that of the Reuss, a river which rises in Mount St Gothard, and flows northwards into the Lake of Luzern. In its upper part this valley is narrow and rugged, but farther down it opens out into a small plain. Numerous small tributaries join the Reuss from both sides, flowing through a confused mass of valleys, ravines, and mountains. There is so little level ground that agriculture can hardly at all be carried on here; corn, rape, potatoes, and other vegetables

Ursinus.

are grown in the vales, but rather in gardens than in farms. But the country is naturally rich; and, besides some fine pastures, the canton contains large numbers of chestnuts, walnuts, and other trees. The chief support of the inhabitants is rearing cattle and sheep, and making cheese and butter. In 1854, the canton contained 6100 milch cows, 11,297 sheep, 12,982 goats, and 1480 swine; and produced more than 8500 cwt. of cheese, and nearly 1800 cwt. of butter. With cheese, cattle, hides, and some wool, the inhabitants are able to pay for the small portions of corn, iron, tobacco, wine, and colonial produce, which they use; and there is now scarcely any other trade. At one time, the road by St Gothard was much used for the transport of goods to and from Italy, and thus some money was brought into the canton; but the opening of new roads over the Simplon and by the Splugen has attracted much of that commerce into other channels. The government is a pure democracy; the sovereignty being in the hands of the General Assembly, consisting of all the males above 20. This body not only elects the *landamman*, or president, and other executive officers, but has a considerable share in the legislative functions. The religion of the people is the Roman Catholic, under the jurisdiction of the Bishop of Chur, and there are 16 parish churches in the canton. The language spoken is a dialect of German; as the inhabitants all belong to that race. Uri is represented by one member in the Council of States, and by two in the National Council of the Confederacy. Its contingent to the federal army is 236 men; but all the male inhabitants are drilled as soldiers, and form the militia. Pop. (1850) 14,505.

URSINUS, FULVIUS, an eminent Italian scholar, was born at Rome in 1529. He was the natural son of a scion of the noble house of Orsini, who, after educating him with great care, ultimately cast him off, together with his mother, in consequence of some foolish quarrel which time could not heal. The unfortunate mother was compelled to support herself and her child by begging; and her only consolation during long years of hardship and suffering was in the thought to which the growing genius of the youthful Ursinus gave life, that in future years he should become a man of fame, and that he should smooth the dying pillow of his aged mother. All this he realized to the full. First of all, he was appointed "clericus" in the church of St John in the Lateran; afterwards his industry and talents, combined with his amiable disposition, drew upon him the attachment of Canon Gentilio Delfini, who educated him thoroughly, and Ursinus subsequently became his successor. He was afterwards appointed librarian to two successive cardinals, and had ample leisure and abundant means to gratify his taste in the search after manuscripts and the purchase of articles for his archæological museum. At his death, which occurred at Rome in 1600, he forgot none of his benefactors.

Among his works are commentaries on various ancient authors, and original treatises on antiquarian subjects. Of the latter class are his *Familiæ Romanæ*, 1663; and his *Imagines et Elogia Virorum illustrium*, 1606. Castalio published a life of Ursinus in 1657.

URSINUS, ZACHARIAS, a German divine of considerable note, was born at Breslau on the 18th of July 1534. He studied at Wittenberg, where the friendship of Melanchthon was drawn out towards him by his zeal and industry. Having attended the conference of Worms with Melanchthon, he subsequently went to Geneva, and afterwards to Paris, where he studied the Hebrew language under Mercer. He was appointed rector of the Gymnasium Elizabethanum at Breslau in 1558; but the theological animosity of the Lutheran divines compelled him to retire to Zürich in 1560. Being chosen professor in the Collegium Sapientæ at Heidelberg, he was soon after made doctor of divinity, and received an order from the Elector-Palatine, Frederick III., to draw up the *Heidelberg Catechism*. This small work, which was subsequently received by the German Calvinists as the exposition of their creed, was fiercely attacked by Lutherans, and keenly defended by Ursinus. The Elector died in 1577, and as his successor could only tolerate Lutherans, Ursinus was obliged to quit Heidelberg in 1578. He soon received a professorship at Neustadt, where he taught with much acceptance until his death, which occurred in 1583. His *Opera* was published in 1587–89; but a more complete edition was published by his son, and his former pupils, David Pareus, and Quirinus Reuterus, 3 vols., 1612.

Uruguay.

URUGUAY, or BANDA ORIENTAL, a republican state of South America, bounded on the N. and N.E. by Brazil, S.E. by the Atlantic Ocean, S. by the River La Plata, and W. by the Uruguay river, separating it from the Argentine Confederation. It lies between 30. 5. and 34. 56. S. Lat., and 53. 10. and 58. 20. W. Long.; and is about 360 miles in length from N.W. to S.E., by 300 in extreme breadth; area 72,000 square miles. The surface is generally elevated and undulating, consisting of extensive plains intersected by ranges of hills of moderate elevation, and by gently sloping valleys. The principal river in the state is the Rio Negro, which divides it into two nearly equal portions. The southern portion is traversed by a range called the Cochilla Grande, which forms the watershed between the La Plata and the Rio Negro. It enters the state from the north-east, and, after running in a south-westerly direction for some distance, it divides into two branches which terminate in the west of the state. It sends off numerous ramifications, many of which terminate rather abruptly on the banks of the Paraguay and the La Plata. In the northern portion of the state is a range called the Cochilla del Hædo, which, entering from the north, proceeds southward for some distance, and then divides into a number of arms. The country is watered by numerous streams, but none of them are of great size except the La Plata and Uruguay, which form its south and western boundaries; the Rio Negro; and the Guary, which bounds it upon the north. Little is known of the geology of the country; the prevailing rocks, however, are granite, gneiss, limestone, and clay-slate. Gold and silver are said to be found, and copper has been successfully worked. The climate is mild, equable, and healthy, but during the winter a good deal of rain falls in the valleys and on the low plains. The winter extends from May to October; but very little snow falls, though frost is occasionally felt in July and August. The country is fertile, but is mostly covered with rich pasture, supporting immense herds of horses and cattle, which constitute the chief wealth of the inhabitants. Timber is scarce, and chiefly to be met with on the banks of the larger rivers. Though capable of easy cultivation, agriculture is almost entirely neglected. Wheat, maize, barley, rice, cotton, flax, hemp, pease, beans, melons, the sugar-cane, vine, &c., are grown. Few or none of these products find their way out of the country, the chief exports being hides, skins, hair, horns, bones, jerked-beef, and tallow. The manufactures are confined to rude articles for domestic use. Monte Video, the capital, is the centre of the foreign trade. The total number and tonnage of vessels that entered and cleared at the port in 1852, 1854, 1856, and 1858, were as follows:—

Years.	Entered.		Cleared.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
1852	518	107,586	498	102,281
1854	581	124,825	518	109,365
1856	718	122,061	673	124,453
1858	936	186,699	922	183,230

Uruguay River ‖ Usher.

The value of exports to the principal countries with which trade is carried on were, in 1858, as follows:—Britain and colonies, L.235,275; France, L.203,668; Spain, L.100,340; Sardinia, L.142,885; Belgium, L.89,967; United States, L.130,023; Brazil, L.196,266; Buenos Ayres, L.54,468.

Uruguay is an integral republic, having a president elected for four years, a senate of ten, and a representative chamber of thirty-nine members. For administrative purposes it is divided into thirteen provinces—viz., Monte Video, Maldonado, Canelonnes, San Jose, Florida, Colonia del Sacramento, Soriano, Paysandu, Salto, Tacuarembo, Carro-Largo, Minas, Durazno. Estimated population (1859) 215,000; Monte Video, the capital, contains about 35,000 inhabitants. The revenue of the state was, in the budget for 1856, estimated at L.426,500; the expenditure at L.656,100, The total public debt in 1854 was L.9,500,000.

Banda Oriental was, during the Spanish rule, the name of that portion of the vice-royalty of Buenos Ayres which lay to the east of the river Uruguay, and comprehended the present Uruguay and the territory formerly known as the Seven Missions. When Buenos Ayres declared itself independent of Spain, Banda Oriental formed a part of the new republic. In 1821, however, it was taken possession of by Brazil, and united with that state under the name of Provincia Cisplatina. By the treaty of 1828 between La Plata and Brazil, the northern portion of Banda Oriental, or the Seven Missions, was united to Brazil, and the southern and larger portion formed into the republic of Uruguay. Internal wars, however, and contests with Buenos Ayres, have almost ceaselessly disturbed the peace, and injured the prosperity of the state down to this time.

URUGUAY *River*. See PLATA, RIO DE LA.

URUMIYAH, or URMIA, a town of Persia, in the province of Azerbijan, in a wide and fertile plain, about 10 miles W. of the Lake Urumiyah. It is surrounded by a mud wall and a moat, and contains extensive gardens and some good houses; among which is that occupied by the American Mission. Urumiyah is said to be the birthplace of Zoroaster; and in the vicinity are several mounds supposed to have been used by the ancient fire-worshippers. Pop. about 12,000. The lake of Urumiyah, or Shahee, is 85 miles long by 20 broad. It has numerous islands, and its water is extremely salt.

USHANT, the most westerly of the islands off the coast of France, 26 miles W.N.W. of Brest. It is about 4½ miles in length, and almost entirely composed of granite, with steep and rugged coasts, accessible only at a few points. The island affords pasturage to a few sheep and horses, and contains some small villages, the inhabitants of which are employed in pilchard fishing. Pop. 2194.

USHER, JAMES, a distinguished archbishop of the Irish church, remarkable alike for the liberality of his sentiments respecting church government, and for the constant advocacy which Calvinism received at his hands, was born in Dublin on the 4th of January 1580. His family was founded in Ireland by an Englishman named Nevil, who took the title, as he exercised the functions, of usher to King John about 1185. His uncle on the father's side, Henry Usher, was Archbishop of Armagh from 1595 to 1613, and his uncle on the mother's side was Richard Staneyhurst, who became a Roman Catholic, and who translated four books of the *Æneid* into English hexameters, besides writing several theological and historical treatises, now almost entirely forgotten.

If there is anything in having distinguished ancestors, James Usher could obviously reap the advantage of it. He is said to have been taught to read by two aunts who had been blind from their cradle, and as soon as he had mastered that preliminary to all book-learning, he was sent to a school kept by two political emissaries of King James of Scotland—viz., Mr (afterwards Sir) James Fullerton, and Mr James Hamilton, subsequently created Viscount Claneboy. Usher used often afterwards to attribute every excellence in letters to which he had attained, to the superior instructions which he gained from those young Scots.

Uskup.

In 1593, Usher entered Trinity College, just opened the same year, and in 1598, having already attained a high academic distinction, he resolved to study for the church. He was, accordingly, created deacon and priest in 1600 by his uncle the forementioned archbishop, and was soon after appointed afternoon preacher in Christ Church, Dublin. Having made various visits to England, he had the good fortune to make the acquaintance of many distinguished men, and he usually spent the most part of his time at the great libraries of Oxford, Cambridge, and London. In 1607, he was chosen professor of divinity, and for the next thirteen years he devoted himself to the discharge of that office. In 1612 he took his degree of D.D., and published next year a work which he never completed, entitled *De Ecclesiarum Christianarum Successione et Statu*. Dr Usher had all along been a firm adherent of Protestantism under the Calvinistic form, so that with the looseness of his views on the divine right of Episcopacy, he was accused by his enemies of having leanings to Puritanism. Presbytery would have been perhaps a more exact designation for his creed, so far as it was known or could be stated. In time, however, this Puritanical notion was got wormed out of the head of the king, and Dr Usher was nominated to the see of Meath. In 1623, he was made a privy councillor of Ireland, and next year, while on a visit to England, he was chosen archbishop of Armagh and primate of all Ireland. He published, in 1631, *Godeschalci et Prædestinarianæ Controversiæ ab eo motæ Historia* (the first Latin book printed in Ireland); in 1632, *Veterum Epistolarum Hibernicarum Sylloge*; in 1638, *Emanuel, or a Treatise on the Incarnation of the Son of God*, an excellent performance; and in 1639, his highly celebrated *Britannicarum Ecclesiarum Antiquitates*.

In 1640, a band of rebels plundered his house at Armagh, and as he was then living securely at Oxford, where he had just published *Certain Brief Treatises*, it was judged advisable that he should not return to Ireland in the meanwhile, in the troubled state of that country. He lived for the most part, in future, with his son-in-law, Sir Timothy Tyrrell, at Cardiff, and with Lady Peterborough in London. Archbishop Usher published in 1644 an edition of the Epistles of Polycarp and Ignatius. In 1647, he gave to the world his *De Romanæ Ecclesiæ Symbolo*, which was followed next year by the learned *Dissertatio de Macedonum et Asianorum Anno Solari*; in 1658, Dr Bernard brought out Usher's *Reduction of Episcopacy to the Form of the Synodical Government in the Ancient Church*; in 1650–54, appeared his *Annales Veteris et Novi Testamenti*. Such constitute the chief works of Archbishop Usher. He died in his seventy-sixth year, at Ryegate in Surrey, on the 21st of March 1656. He left an only daughter to mourn his loss. Various additional works were gathered from his papers after his death. The life of the Archbishop has been written by Dr Richard Parr, and prefixed to a collection of his lordship's letters, dated London, 1686; it has likewise been written, in Latin, by Dr Bates, in the *Collectio Batesiana*, and by Dr Smith, in the *Vitæ Eruditissimorum*. A complete edition of the works of Archbishop Usher was some years ago published by the University of Dublin, in 17 vols., under the editorial care, first of Dr Elrington, and afterwards of Dr J. H. Todd.

USKUP, or SCOPIA, a town of European Turkey, capital of a sanjak, in Macedonia, at the confluence of the Uskup and the Vardar, 112 miles N.W. of Salonica. It has narrow and very dirty streets, a strong citadel with a Turkish garrison, numerous mosques, and Greek churches, and manufactures of leather. Pop. estimated at 10,000.

Usting ‖ Utah.

USTING, sometimes entitled VELIKI, or the Great, a town of European Russia, in the government and 230 miles N.E. of Vologda, at the confluence of the Suchona and the Jug, which form the Dwina. It is the see of an archbishop; and contains 3 cathedrals, 20 other churches, several convents, an exchange, and other public buildings. Soap, candles, hosiery, hardware, and jewellery are manufactured here; and there is an extensive trade. Pop. 7959.

USURY. See INTEREST.

UTAH, a territory of the United States of North America, lying between N. Lat. 37. and 42., W. Long. 105. 30. and 120; bounded on the N. by Oregon, E. by Nebraska, Kanzas, and New Mexico, S. by New Mexico, and W. by California. Length from E. to W. 720 miles, breadth 347; area, 187,923 square miles. It occupies the immense rocky table-land, that stretches from the Rocky Mountains on the east to the Sierra Nevada on the west. The former of these chains separates Utah from Nebraska and Kanzas, and the latter from California; and both rise in some places above the snow-line, and can only be crossed by a few difficult passes. The country lying between them is divided into two parts by the Wahsatch Mountains, a ridge stretching north and south, and rising from 4000 to 7000 feet above the surrounding country. West of this range lies what is called the Great or Fremont Basin, a region about 400 miles long from E. to W., and 250 broad, and inclosed on all sides by mountains, having on the E. and W. the Wahsatch Mountains and the Sierra Nevada, N. the Blue Mountains of Oregon, and S. a range that has received no name. This basin, which is from 4000 to 5000 feet above the sea-level, has its own system of lakes and rivers, with no communication whatever with the ocean. It contains several isolated mountains, and a chain called the Humboldt River Mountains, stretching from N. to S. about the centre of the country, and attaining a height of between 2000 and 5000 feet above the surrounding country. The eastern part of Utah, between the Wahsatch and the Rocky Mountains, is occupied by a vast and sterile valley. Through this valley flow the Green and the Grand Rivers, the former entering the territory from Oregon, and the latter rising in the Rocky Mountains within its borders. Both flow nearly parallel towards the S.W., and after entering New Mexico unite to form the Rio Colorado, which enters the Gulf of California at its head. The length of the Green River is about 400, that of the Grand River about 300 miles. These rivers drain the whole of the eastern valley of Utah, and receive many affluents from both sides. The valleys watered by these rivers form the only habitable parts of Eastern Utah. The Great Basin contains no large rivers, but many important lakes. Of the latter the most remarkable is the Great Salt Lake, towards the N.E. of the basin. It is about 70 miles long by 30 broad; and though it receives many rivers, among which are the Bear River from Oregon, and the Jordan from Utah Lake, it has no apparent outlet. Its waters are so salt, that no animal can live in it; and the evaporation that takes place in hot weather leaves a thick saline incrustation on the shores. The largest river here is the Humboldt, which falls into a lake of the same name towards the west of the basin. Not far from this, among the Sierra Nevada Mountains, is Pyramid Lake, so called from a singular pyramidal hill which rises in its centre to the height of 600 feet. Of the geological character of Utah little is known, but traces of volcanic agency are not unfrequent; and hot springs exist in various places. The climate is generally milder and drier than in the same parallels on the Atlantic, and the thermometer seldom rises above 100° in summer, or falls below zero in winter. Rain seldom falls between April and October. There is very little wood in the country, except on the mountains, where pines and firs are almost the only trees. The general sterility of the land is such that only a very small portion of the surface can ever be brought into cultivation. The Mormon settlements, however, which occupy the valleys along the western base of the Wahsatch Mountains, are, when well irrigated, very fertile; but much of the country is too far distant from any rivers to be successfully cultivated. In 1850, Utah contained 16,333 acres of cultivated land; producing 107,702 bushels of wheat, 210 of rye, 9899 of maize, 10,900 of oats, 1799 of barley, 332 of buckwheat, 44,128 of potatoes, 289 of pulse, 70 lb. of tobacco, 9222 of wool, 83,309 of butter, 30,998 of cheese, and 4805 tons of hay. Manufactures have as yet made little progress in this country; but they are steadily on the increase, and are indeed necessitated by the difficulty and expense of obtaining supplies of the necessities of life from abroad. Very little trade is carried on. Utah was acquired by the United States from Mexico by the treaty of 1848; and was erected into a territory in 1850. Its government is exactly similar to that of New Mexico. But the country is chiefly important in connection with the Mormonites, the first of whom arrived in the Great Salt Lake Valley in 1847. An account of the character and history of this singular sect is given in the article MORMONISM. Brigham Young, the head of the sect, was appointed governor of the territory; and the numbers of its inhabitants were rapidly increasing. But recent events seem to indicate that the Mormonites have not found even here a secure retreat. The discovery of gold in California led to the settlement of many emigrants not Mormonites in these regions; and the persecutions to which they were subjected resulted in disputes between the governor and the United States authorities. In order to put an end to these disturbances, the president despatched, in 1857, a detachment of the federal army against Young, who was treated as an open rebel. This expedition, having been detained to quiet the disturbances in Kanzas, was not able to resume the march for Utah till October 1857; and, owing to the inclemency of the weather, was obliged to spend the winter at Fort Laramie in Nebraska. In May 1858, the expedition had arrived at Utah, and Cumming, the new governor, reported to the president that Brigham Young had given up all thoughts of resistance, and consented to receive peaceably the federal authorities. The Mormonites are said to be moving in large numbers towards the south. The population of the territory in 1850 was 11,380; but more recently there were estimated to be 38,000 Mormonites in the Utah.

Utica.

UTICA, an ancient city of Africa, near the promontory of Apollo, at the west side of the Bay of Carthage, from which city it was 27 miles to the N.W. It is said to have been founded by a Tyrian colony, a few years after the foundation of Gades, and 287 before that of Carthage. With a good harbour, and in a fertile district, it rapidly rose in prosperity; and in the course of time threw off its allegiance to Tyre, and became an ally or dependant of Carthage. In the first two Punic wars, Utica adhered to the cause of her ally, but in the third deserted the losing side and submitted to Rome. It was in consequence made the capital of the Roman province of Africa after the destruction of Carthage, and became the most important city in this region. It was at Utica that Cato the younger, thence surnamed Uticencis, killed himself. Utica fell into the hands of the Vandals in 439; but its final destruction is due to the Saracens, who twice captured the town.

UTICA, a town of the United States of North America, New York, on the south bank of the Mohawk, 95 miles W.N.W. of Albany. It is regularly laid out, and for the most part well built of brick or stone. It contains about twenty churches of different sects, several schools, public libraries, banks, and a large state lunatic asylum. The manufactories include two cotton factories, woollen factories, iron foundries, tanneries, a manufactory of railway carriages, and one of locks. As the town stands in a fertile and

Utrecht || Utera.

populous district, and is connected with all the important towns in the vicinity by railways, canals, and roads, it is a place of considerable trade. Pop. (1850) 17,565, (1853) estimated at 20,000.

UTRECHT (anc. *Trajectum ad Rhenum*, or *Ultra-Trajectum*), a town of Holland, capital of the province of the same name, on the old Rhine, at the point where the Vecht branches off from it, 21 miles S.E. of Amsterdam. It is oval in shape, and traversed by two canals, which are crossed by numerous bridges. Unlike most Dutch towns, it stands on a site where the ground is elevated considerably above the level of the river, and thus it commands a wide prospect over a rich and well cultivated country. Under the quays which line the sides of the canals there are large cellars, used partly as dwellings and partly as storehouses and manufactories. The town is well built, but has an antique appearance, and many of the houses are in the Gothic style. The streets are more regular, the squares more spacious, and the canals fewer, than in the other towns of Holland. The cathedral of St Martin, built in 1382, must have been originally a magnificent edifice, larger than York minster; but it is now in a very dilapidated condition. Only the choir, transepts, and tower remain; and the last has been entirely separated from the body of the church by a terrible storm in 1674, which threw down the nave. The choir is used for Protestant worship, and it has some fine carved pillars and interesting monuments. Utrecht contains 14 other churches, among which are 4 belonging to the sect of the Jansenists, who have their head-quarters here, and indeed now hardly exist anywhere but in Holland. Their numbers are about 5000, under an archbishop of Utrecht and bishops of Haarlem and Deventer; and they hold the doctrines of St Augustine, and deny the infallibility of the pope, but still consider themselves as belonging to the Roman Catholic Church. The first confederation of the Dutch provinces was formed in 1579, in a room of the old town-hall; and in another many of the preliminaries of the celebrated peace of 1713 were agreed to. A new and handsome town-hall, however, has been built in 1830. There are also here a government-house, court-house, mint, picture-gallery, barracks, arsenal, and prison. The university, founded here in 1636, has 22 professors, and in 1858–9, 469 students. Its buildings are plain; but it has a valuable library, a museum, botanic garden, and observatory. Utrecht is also distinguished for the excellence of its schools, and has several literary and scientific societies, hospitals, &c. The most important manufactures of the town are those of cotton, linen, and silk, cloth, carpets, leather, soap, and arms. Dyeing, bleaching, sugar-refining, and boat-building are also carried on. There is an active trade, chiefly in corn, cattle, and the produce of the manufactures. Utrecht was formerly fortified, but the ramparts have been formed into fine promenades; and to the east of the town is an avenue called the *Maliebaan*, or Mall, consisting of eight rows of trees, about half a mile in length. Pop. 50,000. The province of Utrecht, bounded on the N. by the Zuyder Zee, E. and S. by the province of Gelderland, and W. by that of Holland, has an area of 536 square miles, being the smallest in the kingdom. It is a rich and well cultivated region, watered by the Rhine and its branches; and as the surface is not so low and flat as the most of Holland, it enjoys a mild and healthy climate, free from the excessive moisture that prevails in other parts of the country. The chief towns are Utrecht and Amersfoort. Pop. (1859) 162,249.

UTRERA (the ancient *Iliturge*) a town of Spain, Andalusia, province of Seville, and 16 miles S.S.E. of the city of that name. The streets are wide, and kept clean by running streams, and the houses are generally well built. It was once very flourishing, and subsequently fell into decay; but within the last few years it has been much improved. Many of its inhabitants are landed proprietors and rich farmers, who cultivate the valuable estates around. Utrera is also a military point of importance, being on the high road between Madrid and Cadiz, and possesses a ruined castle of the Moors. It possesses numerous churches and convents, some of the former being remarkable edifices, and one of the latter being long frequented by numerous devotees during a festival which lasted for eight days from 8th September, but which has now very much fallen off. There are also a town-hall, prison, cavalry-barracks, and various hospitals. The chief manufactures are soap, leather, and starch. The country around is very fertile, and here the famous Andalusian bulls are reared in great numbers. Not far from the town are the rich salt marshes of the Guadalquivir. A considerable trade in horses, cattle, and grain is carried on. Pop. about 15,000.

Uttoxeter || Uzès.

UTTOXETER, a market-town of England, in the county and 12 miles N.E. of Stafford, on a gentle slope near the right bank of the Dove, which here separates Staffordshire from Derbyshire, and is crossed by a fine stone bridge of six arches. The streets are generally straight, diverging from a market-place in the centre; and the most of the houses are well built of brick. The parish church is a handsome stone building, recently rebuilt, with the exception of the ancient spire, 179 feet high; and there are also places of worship for Roman Catholics and various dissenting sects. Uttoxeter has a free grammar school, a national school, almshouses, &c. There are some manufactures of leather, ropes, and hardware; and an extensive trade in agricultural produce is carried on, facilitated by the Caldon Canal, which terminates here. Pop. 3468.

UXBRIDGE, a market-town of England, in the county of Middlesex, 17 miles W.N.W. of St Paul's, London, on the Colne, here crossed by two good bridges. It extends about a mile along the road to Oxford, and is for the most part well built. The market-house consists of a good brick structure, supported by wooden pillars; and the parish church is an ancient edifice built of brick and flint. Uxbridge has a British school, school of industry, literary society, savings bank, flour-mills, malt-works, and a brick-field. A considerable trade in corn is carried on, and the Grand Junction Canal unites the town with London. In the time of the civil war, a fruitless negotiation for peace between the king and parliament was carried on at Uxbridge, and the house is still standing where the conferences were held. Pop. 3236.

UZ, a region and tribe mentioned in Scripture (Job. i. 1, Jer. xxv. 20, Lam. iv. 21), and now generally supposed to have occupied the south of Arabia Deserta, between Idumæa, Palestine, and the Euphrates. The tribe seems to have been descended from Uz the son of Aram (Gen. x. 23), although its origin is by some referred to Huz the son of Nahor (Gen. xxii. 21), or to Uz the Horite, son of Dishan (Gen. xxxvi. 28).

UZÈS, a town of France, capital of a cognominal arrondissement in the department of Gard, is situated on the right bank of the Auzon, an affluent of the Gard, 12 miles N.N.E. of Nimes. It stands on the declivity of a hill from which issues the fountain of Eure, the waters of which were in ancient times conducted to Nimes by the *Pont du Gard*. Uzès was the seat of a bishop till the sixteenth century, when the bishop, clergy, and most of the inhabitants embraced Protestantism. The chief public buildings are the old episcopal palace and a castle, the former residence of the dukes of Uzès, the latter bearing a considerable resemblance to the Bastile of Paris. Uzès is the seat of a court of primary jurisdiction and a communal college, and has manufactures of silk, hosiery, coarse woollens, leather, and paper. Pop. (1856) 6315.

V.

V
||
Vaccination.

V or v, is properly a consonant, and as such is placed before all the vowels; as in *vacant, venal, vibrate,* &c. Though the letters v and u always had two sounds, they had only the form of v till the beginning of the fourth century, when the other form was introduced, the inconvenience of expressing two different sounds by the same letter having long before been observed. In numerals V stands for five; and with a dash added at top, thus, $\overline{V}$, it signifies 5000. (See ABBREVIATIONS).

VACCINATION, (from *vacca*, a cow), is the artificial production of a disease, originally obtained from the cow (cow-pox), by bringing the matter of that disease in contact with the living human body.

To Dr Edward Jenner we are indebted for the discovery of vaccination. His attention was first directed to the subject by the popular belief which existed in Gloucestershire, where he resided, that those who were infected with matter from the sores on the udder of the cow, were ever after secured from the contagion of small-pox. It was not, however, till the 14th of May 1796, that he made it the subject of direct experiment, by taking matter from the sore on the hand of a dairymaid who had contracted cow-pox from the udders of her master's cows, and applying it, by means of two superficial incisions, to the arm of a boy. Pustules somewhat similar to those of small-pox, but darker in their hue, and filled with a limpid fluid, were produced, and became surrounded with an erysipelatous or red circle, but the whole died away, leaving on the inoculated part scabs and subsequent eschars, without producing any other inconvenience. On the seventh day after the operation, the boy complained of some uneasiness in the arm-pit; on the ninth he became chilly, had headach, loss of appetite, and was otherwise indisposed, and passed a restless night, but was well by next day. As the object of the experiment was to ascertain whether the cow-pox gave immunity from the small-pox, he was on the 1st of July inoculated with small-pox matter, but no disease was produced; and the same result was obtained when this was repeated some months afterwards. Numerous experiments of the same kind were afterwards made; and they ended in establishing the fact that the matter of cow-pox protected the human body from being acted on by the infection of small-pox, while it was itself a mild and safe disease, exciting little more constitutional disturbance than what resulted from the local sore.

Dr Jenner accounted for this singular fact, by asserting that cow-pox was nothing else than small-pox modified, or deprived of all its noxious qualities, by having passed through the system of the cow; and that the disease in the heel of the horse, called grease, which he showed was capable of producing the vaccine vesicle in the cow, was also but a variety of the same disease. In fact, he at first regarded both small-pox and cow-pox as originally derived from the horse.

The publication of such an interesting fact did not fail to excite general attention; and accordingly, the very same year in which Dr Jenner's *Inquiry* made its appearance, Dr Pearson published the results of his investigations, which tended to confirm the opinion advanced by Dr Jenner as to the anti-variolous powers of the cow-pox. In two points alone did he dissent. He regarded cow-pox and small-pox as two very different diseases, and denied that the cow-pox could be produced by the matter of the diseased heel of the horse; and he was supported in his opinion by the inquiries of Sir Isaac Pennington, the arguments of Dr Parr, and the experiments of Dr Woodville and of Mr Simmons.

Vaccination.

Other experimentalists were, however, much more successful in confirming the opinion of Dr Jenner as to the analogy or rather identity of the disease of the horse's heel and the cow-pox. Mr Tanner succeeded in communicating the cow-pox to the cow, by inserting on the udder some liquid matter taken from the diseased heel of the horse; and the experiments of Mr Lupton and Dr John Loy corroborated the same fact. Dr Loy, indeed, found that even the equine matter produced in man as perfect vaccine vesicles as that derived from the cow itself, and afforded equal protection from the infection of small-pox. These conclusions have been confirmed by subsequent experimentalists both in this country and on the continent, so that it is now to be regarded as an established fact, that grease and cow-pox are the same complaint, modified by the constitution of the animals in which they occur.

Dr Woodville of the London Small-Pox Hospital lent his aid to ascertain, by direct experiment on a large scale, whether the introduction of the mild disease, cow-pox, was worthy of the encomiums bestowed upon it by Dr Jenner and Dr Pearson, and whether it really guarded the system from a subsequent attack of that loathsome and fatal disease, the small-pox. The results of these experiments were published in 1799, by which time he had vaccinated six hundred individuals. In most of these cases, small-pox inoculation had been performed at a subsequent period, to test the efficacy of the protective power of the cow-pox, but not one of them took the small-pox. An anomalous occurrence, however, showed itself in nearly three-fifths of the patients vaccinated at the Small-Pox Hospital. Pustular eruptions, more or less numerous, resembling those of small-pox, appeared on various parts of the body, in some cases maturating much in the same way as the pustules do in that disease, in others fading away without proceeding to the formation of matter. Dr Jenner, at the time when the circumstance occurred, endeavoured to explain it, by supposing that it was owing to some peculiarity in the air which these patients breathed, or to a contamination of the original cow-pox matter with small-pox. That it could not be owing to contamination with small-pox matter, Dr Woodville showed from the fact, that the same matter, when employed for the vaccination of individuals out of the Small-Pox Hospital, did not produce these same pustular eruptions; and some of the identical matter sent to the country, and used in vaccinating one thousand individuals, only produced pustular eruptions in two cases. Dr Woodville, therefore, very justly drew the inference, that the cases vaccinated at the Small-Pox Hospital differed from those vaccinated elsewhere, in being placed in the centre of a variolated atmosphere, to the action of which the pustular eruption was to be ascribed; a statement which was in a manner proved at the time by the fact, that though at first nearly three-fifths of all the cases vaccinated showed pustular eruptions, yet the eruptions afterwards diminished so much, that of the last hundred cases which he published in his first *Reports*, only seven were thus affected. Subsequent observation has shown that this was in reality the true explanation of the fact.

Dr Woodville considered small-pox and cow-pox as very closely allied in their nature, indeed, "to a very principal point essentially the same," and consequently recommended the general adoption of cow-pox, as an effectual preservative from the infection of small-pox, as perfectly safe and free from danger, and incapable of being propagated by infectious effluvia. This last he considered a very strong circumstance in its favour, since small-pox, even in its mildest form, as produced by inoculation, tended greatly

Vaccination.

to swell the bills of mortality, by spreading the infection from the sick to the healthy.

It was during the progress of Dr Woodville's experiments at the Small-Pox Hospital that the merits of vaccination began to be appreciated, and the practice of it generally introduced into all parts of this country; and the publication of his observations in 1800 may be regarded as marking this epoch. At this period, indeed, the efficacy of vaccination as an anti-variolous agent was so generally admitted, and the practice so universally adopted, that, in the course of a few months, its benefits were extended to many thousand persons in all parts of this island, and matter found its way to France, Italy, Germany, Holland, Turkey, most of our colonies, and the United States of North America. Numerous were the publications, in all languages, announcing the success of the practice; and almost every one agreed in this, that it gave as perfect protection from the infection of small-pox as if the individual had once had the natural or inoculated disease.

Many of the partizans of vaccination, however, went much farther than this, and asserted that those who had once gone through the vaccine disease, were at no subsequent period of their lives liable to take small-pox. When, therefore, cases of small-pox did occur after vaccination, they endeavoured to explain away the fact, by asserting that it was not true small-pox, or that the individual had not gone through the true, but a spurious vaccine disease. This was, indeed, claiming for vaccination a power which was not possessed by any other disease. There is a class of diseases which usually occur but once during the course of life, but though a second attack is not a common occurrence, still it is every now and then met with; and there are very few medical men of any standing in their profession who have not met with cases of second attacks of measles, scarlet fever, small-pox, typhus, &c. Dr Thomson of Edinburgh, in his work on the Varioloid Epidemic of 1818, was the first to point out this clearly with regard to small-pox; and had the circumstance been duly attended to when vaccination was first introduced, it would have prevented much of the controversy which has since arisen. It was unreasonable to expect from vaccination a protective power greater than that afforded by small-pox itself; and yet it was from the advocates of vaccination advancing this doctrine—a doctrine apparently borne out by the perfect immunity afforded to so many thousands vaccinated in all parts of Europe on its first introduction—that others, who had seen cases of small-pox after it, were led to deny altogether its anti-variolous power, or at least to affirm that it only gave immunity from the disease for a very limited number of years.

It was not, however, till the year 1818, that the true value of the protective powers of vaccination was properly understood. During the years 1816–17–18, small-pox raged epidemically in various parts of Europe, and attacked both the vaccinated and variolated, as well as those who had neither had cow-pox nor small-pox. Chicken-pox was at the same time extremely prevalent, and the phenomena of the two diseases were found to be frequently and generally interchanged. Dr Hodenpyl of Rotterdam, Dr Thomson of Edinburgh, and MM. Berard and De Lavit of Montpellier, who all described this epidemic, agreed in regarding small-pox and chicken-pox as the same disease, which could be shown to originate from the same source. But the most important fact, and the one most interesting to humanity, was the ascertaining the comparative mortality of small-pox, when it attacked these three classes:—1st, the vaccinated; 2d, the variolated, *i. e.* those who had small-pox; and, 3d, those who had neither been vaccinated nor had small-pox. The conclusions at which these different writers arrived were nearly the same. Of those who had neither had cow-pox nor small-pox, 1 out of every 4 who were seized with the disease died; of those who had small-pox naturally, or by inoculation, 1 out of every 25 to 1 in 75 died; while of those who had been vaccinated, and were afterwards seized with small-pox, not more than 1 in 330 cases died: thus showing the great superiority of vaccination even to the small-pox itself, in protecting the system from the fatal effects of a second attack. Nor is it difficult to understand how this should happen. Small-pox is a disease not only very fatal, as proved by its cutting off a fourth of all whom it attacks, but it disfigures or renders infirm from an eighth to a tenth of those who recover. Its action is besides found to develop any latent disease, but particularly any scrofulous tendency which may exist in the constitution, and is thus indirectly the cause of death to a much larger portion of the human race than what at first sight appears. It is not, therefore, to be wondered at that small-pox, attacking for the second time a constitution thus enfeebled, should cause a much greater proportion of deaths than takes place when it occurs after vaccination; for no fact is more firmly established than this, that vaccination neither develops any latent malady, nor engenders a predisposition to any particular disease.

Vaccination.

The fact above mentioned, of the comparative mortality of the three classes,—viz., the vaccinated, the variolated, and the non-vaccinated, has been, since 1818, repeatedly demonstrated. One of the most accurate and interesting details, and one which ought to set the point for ever at rest, is that given by M. Bousquet in his *Traité de la Vaccine*, as having occurred at Marseille during the epidemic small-pox of 1825. The population of Marseille, amounting to 40,000, might be divided into three classes, of which the respective numbers stood thus: 30,000 vaccinated; 8000 neither vaccinated nor variolated; and 2000 variolated—that is, who had the small-pox either naturally or by inoculation. Of the 30,000 vaccinated, about 2000 were seized with the prevalent small-pox epidemic, of which number 20 died, or 1 for every 100 affected. Of the 2000 variolated, 20 were attacked, and 4 died, or 1 in every 5 cases. Of the 8000 non-vaccinated, 4000 were affected, and of this number 1000 died, or 1 out of every 4 cases. From this it follows, that one-half of the non-vaccinated, 1–15th of the vaccinated, and only 1–100th of the variolated took the disease. But such was the difference in the comparative severity of the attack in the vaccinated and variolated, that while the variolated part of the population were cut off in the proportion of 1 out of every 500, the vaccinated part of the population only lost 1 out of every 1500; or, in other words, of an equal number of variolated and vaccinated cases, 3 variolated died from the second attack, for every one who died of the disease after vaccination.

Many similar instances might be quoted, all of them demonstrating the very great security to the individual, and the saving of life to the community, afforded by the introduction of vaccination. This is a subject, indeed, which has engaged the attention of political economists; and as it has been calculated that in Britain alone, before the introduction of vaccination, no fewer than 30,000 were annually cut off by small-pox, equivalent to 95,000 with the present population, while in France the deaths from that cause amounted to 85,685, and proportionally large numbers occurred in other parts of Europe and America, the saving of life effected by this invaluable discovery must be immense.

Though the benefits of vaccination were thus clearly proved, the public confidence in it has been attempted to be shaken by raising the outcry that the vaccine virus, if it really possesses anti-variolous powers, loses them as life advances; so that, at the end of a few years, those vaccinated individuals are as liable to an attack of small-pox as if they had never been affected by the disease. It is fortunately an easy matter to trace such an opinion to its

Vaccination.

true sources—namely, to a disbelief in the fact that small-pox can occur twice in the same individual, and to a disbelief in the identity of small-pox and cow-pox. Those holding such opinions as these see everything through the mist of prejudice, and represent every instance of the occurrence of small-pox after vaccination as an additional proof of the correctness of their theory, shutting their eyes to the facts daily happening around them, that a second attack of small-pox is not only by no means a very rare occurrence, but that it is a much more dangerous and fatal disease than small-pox after vaccination, cutting off at least three times as many victims.

As the first of these objections has, it is conceived, been satisfactorily shown to rest on no solid grounds, we are next to examine whether the second stands on any better foundation.

Every writer who has opposed vaccination, whatever may have been his other grounds of objection, has constantly set out with the proposition, that there are certain diseases which occur but once in the course of life, and which effect some unknown change on the constitution, rendering it unsusceptible of a second attack of the same disease. As they regard small-pox and cow-pox as two distinct diseases, they cannot imagine how the one disease should guard the human frame from the ravages of the other; and an eminent physician, whose powerful writings, in his younger days, did much to uphold such a theory, and to spread doubts among the people generally as to the efficacy of vaccination, but who lived to become one of vaccination's most able defendants, the late Dr G. Gregory of the Small-Pox Hospital, London, declared that "vaccination is not small-pox, but just the reverse—the antagonist principle." In order to answer such an objection, all that is requisite is to show that small-pox and cow-pox are really identical, the latter only modified by having passed through the system of the cow, as originally advanced by Dr Jenner, the father of vaccination.

It was announced so early as 1802, by Professor Viborg of Copenhagen, that at Berlin small-pox was communicated to the cow by inoculation; but the details of these experiments do not appear to have reached this country, and all attempts to repeat them have failed. It was not till 1830 that any detailed account of successful experiments of this kind were published, when Dr Sonderland of Barmen announced that he could produce the true vaccine disease in the cow at pleasure, by covering the animal with the blankets from the bed of a patient who had died of small-pox, and by hanging them up around it, that it might breathe the effluvia arising from them. In a few days, he says, the animal became sick, and pustules appeared on the udder and other parts, precisely similar to the cow-pox vesicles, and filled, like them, with lymph. This lymph, transferred to the human subject, he found to produce the genuine vaccine vesicle, together with the usual constitutional disturbance, and to protect the individual from the small-pox virus or contagion. In fact, such a change was effected on the small-pox matter, during its transit through the system of the cow, that it was converted from a virulent and fatal into a mild and safe disease.

The announcement of this curious experiment incited others to repeat it, though without success; and it was not till 1839 that Mr Robert Ceely, surgeon to the Buckinghamshire Infirmary, succeeded in proving the identity of the two diseases, by communicating small-pox by inoculation to the cow, and finding it produce the true cow-pox disease. He, however, failed to communicate small-pox to the cow after the manner found successful by Dr Sonderland. Mr Ceely inoculated heifers with the matter of small-pox, and found it to produce genuine vaccine vesicles, which ran their course like the natural or inoculated cow-pox, and furnished limpid lymph for vaccination. The lymph was employed in vaccinating many children, and differed in no respects from that obtained from the natural cow-pox vesicle of the cow. It ran the same course when introduced by punctures on the arm; did not give rise to any eruption on the skin, any more than primary vaccine lymph; and afforded equal protection against small-pox, as found by exposing the children to the small-pox effluvium, and also by inoculating them with small-pox virus; in fact, it did not in any respect differ from ordinary vaccine lymph, as obtained from the natural vaccine vesicle. Mr Badcock of Brighton established the same facts; and from 1840 up to the present day, has been able to keep up a fresh stock of vaccine lymph from cows artificially infected by him.

Vaccination.

Nothing could be more satisfactory than the results of such experiments, for they proved, beyond the possibility of a doubt, that small-pox and cow-pox are but varieties of the same disease. It is, therefore, no longer to be regarded as an anomaly, that cow-pox should protect the system from an attack of small-pox, but it is in beautiful accordance with what has been generally admitted to be a law in nature, that certain diseases, once undergone, generally protect the system from a subsequent attack.

The chief objections to vaccination having been, it is hoped, answered satisfactorily, it only remains to show that the protective powers of vaccination do not wear out of the system as life advances, *any more than those of small-pox itself.* This is a most important inquiry, as nothing is more likely to prove hurtful to the cause of vaccination, and render the public careless of securing to themselves its benefits, than the belief that they would require to submit to revaccination every ten or fifteen years, and that at no period of their lives they could with certainty reckon on escaping the small-pox.

The old, and now exploded theory, that cow-pox was not small-pox, but its antagonistic principle, led to the conclusion that its protective powers wore out of the system after a certain number of years; and this seemed to be so far borne out by the fact, that occasional cases occurred where small-pox attacked in after-life a person who had been vaccinated during childhood. Several governments acting on this belief, but having perfect confidence in the anti-variolous power of cow-pox, began about thirty years ago to revaccinate all the men in their standing armies, and the effect has certainly been nearly quite to banish small-pox from among them. Knowing, however, as we do now, that cow-pox and small-pox are in reality the same diseases, the former being merely deprived of all its virulence by having previously passed through the constitution of the cow, the results of these revaccinations proves extremely interesting, inasmuch as they not only afford a most unlooked for confirmation of the identity of the two viruses, but also the still more startling fact, that *the protective power of small-pox itself wears out of the system, in a certain proportion of cases, as life advances, in nearly the same exact proportion as that of cow-pox itself.* Thus, in all these armies, a certain proportion of the men were found to have been previously vaccinated, while no inconsiderable proportion had passed through the natural small-pox and escaped with their lives. Now, if we take the susceptibility of the constitution to revaccination as a kind of test by which we may conclude that the person who could be re-vaccinated (either after cow-pox or after small-pox) might have been seized with small-pox were he exposed to its contagion, then we have these revaccinations proving the fact that, after a certain number of years, the same proportion of those who have once previously had the natural small-pox become susceptible to a second attack as those who have been vaccinated; so that once having passed through all the dangers of the natural unmodified disease, the person, at the end of twenty-five years for instance, had no better security against a second attack than the person who

Vaccination.

had been protected by the mild cow-pox. Thus, in the Wirtemberg army, it was found, on revaccinating the whole men, that in every 100 vaccinated after small-pox, 32 succeeded, 26 were modified, and 42 failed; but in every 100 vaccinated after cow-pox, 34 succeeded, 25 were modified, and 41 failed. By this test, then, whatever protection small-pox gave against a recurrence of that disease, cow-pox also gave, but with this immense superiority, that the cow-pox did not endanger life, did not engender scrofulous disease, did not disfigure the countenance, nor cause deafness and blindness, nor cut off 1 in every 4 to 8 afflicted by it, with all of which small-pox is chargeable. It would, however, be false reasoning to assume that all who are susceptible of being revaccinated would be liable to take small-pox naturally; and the small proportion of such cases which do occur, whether after vaccination or after natural small-pox, do not invalidate the general law, that a person who has once been properly vaccinated, or has once escaped with his life from the natural small-pox, *in general* remains protected against a subsequent attack. It is a known and well established fact, that certain individuals, who have had the natural small-pox in infancy or youth, may again be seized with the same disease in after-life, and that such second attacks are always much more dangerous to life than small-pox after vaccination. Almost every medical man has met with cases of this kind; but, not to multiply instances, the late Dr Thomson of Edinburgh narrated 85 such cases of second attacks of small-pox which occurred in his practice, and Heine records 57. It is vain, therefore, nay, it is silliness, to expect that the modified disease cow-pox will give greater security to the person from a subsequent attack of small-pox than small-pox itself. All that can reasonably be asked is, that vaccination shall give as great security against a subsequent attack of small-pox as if the person had passed through small-pox itself; and this, the accumulating evidence of the last sixty years most thoroughly proves that it does if it be properly performed, and with good lymph.

Of late years, in consequence of the increase of small-pox among some of the populations of Europe, the question of the protective powers of vaccination has been again keenly agitated, and a mass of most valuable information has been published by the government of this country, through the agency of the Epidemological Society and of the Board of Trade. (See parliamentary papers, *Small-Pox and Vaccination*, No. 434, Session 1853; and *Papers relating to the History and Practice of Vaccination*, 1857.) This agitation has resulted in establishing more fully than ever the protective powers of vaccination against a subsequent attack of small-pox, and fully authorises the conclusion that *vaccination, properly performed, presents almost absolute security against death by small-pox.* The numerous facts collected have also demonstrated that small-pox is on the increase, not from any failure in the protective power of vaccination, but from the ignorant masses of the population, either through culpable carelessness or ignorance, rejecting its benefits. Wherever individuals have taken the trouble to ascertain, by house to house visitation, the proportion of the population actually protected by vaccination, they have expressed surprise, not that small-pox was prevalent, but that it was so rare, seeing such a large mass of the population was unprotected from its ravages. In this country the statistics of recruiting give the nearest approximation to the actual condition of our adolescent population as to vaccination, and by these it appears that 71 per cent. only of the recruits, from 1844 to 1851, bore distinct marks of vaccination on their arms, while 22 per cent. had already had small-pox, and 6½ per cent. were wholly unprotected, and ready to fall victims to the first epidemic of small-pox which should arise. If only 71 per cent., then, of the adult population is protected by vaccination, need it surprise any one that small-pox still continues a virulent disease among us? These unprotected persons not only voluntarily sacrifice their own lives, but they endanger the lives of all around them, as, if once seized with the disease, they will constitute the focus of a circle for the propagation of the disease. It is to prevent reckless or infatuated persons acting thus that various foreign governments have passed stringent laws for the enforcement of vaccination; but in this country, so great has been the dread of interfering with the liberty of the subject, that little that is effectual has been done as yet. The first great step towards this was taken by the British Parliament, in 1841, passing a legislative enactment, making inoculating with the small-pox unlawful, and encouraging the local authorities in England to provide gratuitous vaccination to the poor. It had been clearly shown that inoculation, though it diminished the chances of death to the patient, acted as a focus of infection to all around, and actually caused the general fatality of the disease to be greater than when no inoculation was practised. The act of 1841 was followed by one in 1853, rendering the practice of vaccination compulsory in England, but it also failed to secure all the benefits which a good vaccination act might have attained, through causes which need not be enlarged on. Now, however, that the public attention is fully directed to the subject, it is to be hoped that no unnecessary time will be lost in securing to England, to Scotland, and to Ireland, the benefits of a vaccination act suitable to each country. (J. S—K.)

Vaga ‖ Vaillant.

VAGA, Perino del, or more properly Pierino Buonaccorso (Perino, or Pierino being the diminutive of Piero, the Florentine form of Pietro), was a very distinguished painter of Italy, and was born at Florence in 1500. Having lost his parents in early youth, he was reduced to great shifts by the pinchings of poverty. He found a kind protector in the painter Andrea de' Ceri, who, attracted by the lad's noble appearance and the quickness of his powers, took him into his service and taught him his art. Giving great satisfaction to a Florentine named Vaga, with whom he subsequently worked, he took the youth to Rome and introduced him to Giulio Romano and Penni, who were accustomed to call him by the name of his master, by which he is now known. Raffaelle, having heard of Piero's eminent abilities, appointed him to assist Giovanni da Udine in the arabesques and stucco-work of the loggie of the Vatican. So great satisfaction did his work give to those interested in the progress of the Vatican, that Pierino was subsequently chosen to execute some of the fresco designs of Raffaelle. These works of Pierino's are among the best painted in the loggie. His designs greatly resembled those of Michael Angelo, and in his colouring he imitated much the manner of Raffaelle. In the opinion of Vasari, he was the best Florentine designer after Michael Angelo, and the ablest of all Raffaelle's scholars. He painted numerous works not only in Rome, but in various other cities of Italy, and he may fairly be called the founder of the Genoese school. On the sack of Rome, in 1527, Del Vaga went to the latter place, where he engaged in decorating the new palace of Prince Doria. The subjects of those works of art were for the most part drawn from heathen mythology; and his greatest painting, in the judgment of Soprani, is that of "Jupiter destroying the Giants." His "Creation of Eve," in the church of San Marcello in Rome, is generally considered the best of all his pieces executed in that city. Previous to his death, nearly all the great works in painting were committed to his care. Incessant application, combined with too great a fondness for the pleasures of the tavern, hastened his death, which occurred in 1547, in his forty-seventh year.

VAILLANT, Jean Foy, to whom, according to Voltaire, France was indebted for the science of medals, and

Vaillant. Louis XIV. for one-half of his cabinet, was born at Beauvais on the 24th of May 1632. At the age of three he lost his father, and the charge of his education was undertaken by one of his maternal uncles. This uncle, who belonged to the magistracy, and who had destined him for his successor, died after bequeathing him his name and a part of his fortune; and being thus left to follow his own inclination, he relinquished the study of law for that of physic, and took a doctor's degree. He engaged in practice at Beauvais, but was accidentally drawn into a new department of study, which he prosecuted with great ardour during the remainder of his life. A farmer of that vicinity had found a great quantity of ancient coins, and Vaillant at first inspected them in a cursory manner; but perceiving that they bore a reference to events either forgotten or inaccurately detailed by historians, he was induced to resume their examination with deep attention, and he succeeded in explaining them with a facility which is generally the result of long experience. Having afterwards made a visit to Paris, he became known to Seguin, eminent for his numismatic skill, and astonished him by the extent of his knowledge. He was introduced to other men of learning; and the minister Colbert proposed to employ him in travelling to collect medals for the royal cabinet. He accepted of the offer, and after travelling into Italy, Greece, Egypt, and Persia, he returned with so many medals as made the king's cabinet superior to any in Europe. In one of his voyages, in 1674, the ship was taken by an Algerine corsair. After a captivity of nearly five months, he was permitted to return to France, and received at the same time twenty gold medals which had been taken from him. He embarked in a vessel bound for Marseille, and was carried with a favourable wind for two days, when another corsair appeared, which, in spite of all the sail they could make, bore down upon them within the reach of cannon shot. Vaillant, dreading the miseries of a fresh slavery, resolved at all events to secure the medals which he had recovered at Algiers, and therefore swallowed them. But a sudden change of the wind freed them from this adversary, and cast them upon the coast of Catalonia; and after expecting to run aground every moment, they at length fell among the sands at the mouth of the Rhone. He reached the shore in a skiff, but felt himself extremely incommoded with the medals he had swallowed, which might weigh altogether five or six ounces. He had recourse to two physicians, who were a little puzzled with the singularity of his case: however, nature relieved him from time to time, and he found himself in possession of the greatest part of his treasure when he arrived at Lyon. Among his collection was an Otho, valuable for its rarity. He was much caressed on his return; and when Louis XIV. gave a new form to the *Academy of Inscriptions* in 1701, Vaillant was first made associate, and then pensionary. In the course of his researches he had twelve times visited Italy, and twice England and Holland. He was successively married to two sisters; having obtained a dispensation from the pope, upon condition of working for some time as a common labourer at the church of St Peter's in Rome. He died on the 23d of October 1706, in the seventy-fifth year of his age.

Vaillant possessed great knowledge and skill as an antiquary, and published various works, of which the following are the most important:—*Numismata Imperatorum Romanorum præstantiora a Julio Cæsare ad Posthumum et Tyrannos.* Paris, 1674, 4to. Paris, 1694, 2 tom. 4to. Romæ, 1743, 3 tom. 4to. This last edition contains additions and improvements by Baldini; and a supplement was published under the title of *Jos. Khell ad Numismata Imperatorum Romanorum a Vaillantio edita Supplementum.* Viennæ, 1757, 4to. *Seleucidarum Imperium: sive, Historia Regum Syriæ, ad fidem Numismatum accommodata.* Paris, 1681, 4to. Hag. Com. 1732, fol. *Numismata Ærea Imperatorum, Augustorum, et Cæsarum in Coloniis, Municipiis, et Urbibus jure Latino donatis, ex omni modulo percussa.* Paris, 1688, fol. *Numismata Imperatorum, Augustorum, et Cæsarum, a Populis Romanæ ditionis Græce loquentibus ex omni modulo percussa.* Paris, 1695, 4to. Amst. 1700, fol. *Historia Ptolemæorum Ægypti Regum, ad fidem Numismatum accommodata.* Amst. 1701, fol. *Nummi Antiqui Familiarum Romanarum, perpetuis interpretationibus illustrati.* Amst. 1703, 2 part. fol. *Arsacidarum Imperium: sive, Regum Parthorum Historia, ad fidem Numismatum accommodata. Achæmenidarum Imperium: sive, Regum Ponti, Bosphori, et Bithyniæ Historia, ad fidem Numismatum accommodata.* Paris, 1725, 2 tom. 4to. This posthumous work was published by Charles de Valois, of the Académie des Inscriptions. Valais.

VALAIS (Germ. *Wallis*), a canton of Switzerland, bounded on the N. by those of Vaud and Bern, E. by those of Uri and Ticino; S.E. and S. by the Sardinian monarchy, and W. by Savoy. Its length from N.E. to S.W. is 57 miles; its breadth 37, and its area 1658 square miles. It consists chiefly of a long valley, traversed by the Rhone, and bounded on each side by chains of the Alps,—the Bernese Alps on the N., the Pennine on the S., and the Lepontine on the S.E. The Lepontine and Bernese Alps are connected, at the E. extremity of the canton, with the group of St Gothard, by the Gallenstock, Furka, and Matthorn, and in a glacier near this point the Rhone takes its rise. These ranges, which bound Valais, present some of the loftiest pinnacles of the Alps; among which are, in the Pennine Alps, Monte Rosa, the second mountain in Europe, 15,540 feet high; Mont Cervin, or Matterhorn, 14,748 feet; and Great St Bernard, 11,011 feet; in the Lepontine Alps, Furka, 14,040 feet; and in the Bernese Alps, Finsteraarhorn, 14,116 feet; and Jungfrauhorn, 13,720 feet. The slope of the Bernese Alps towards the south is much more steep than that of the Pennine and Lepontine chains to the north; and hence, as they all send out minor branches, forming transverse valleys; those to the south of the main valley are considerably longer than those to the north of it. The Rhone flows at first in a S.W. and then in a N.W. direction, entering the lake of Geneva at its eastern extremity. It receives numerous affluents from the valleys on either side, some of which are upwards of 20 miles in length. The level ground in the valley of the Rhone is very small, being only from a quarter of a mile to 3 miles in breadth. About half the surface of the canton is estimated to consist of high mountains and glaciers; and of the remainder a large portion is occupied with narrow valleys, and hills of less but still considerable elevation. These vales differ very much in their character; some of them are stony and marshy, and others sterile; but some have valuable meadows and land, which, when cultivated, yield abundant crops. Where the elevation is not very great, the mountain-slopes are covered with extensive forests, the timber of which is largely used for fuel and for building. Maize and wines, with pomegranates, figs, mulberries, and other fruits of warm regions, grow in the lower parts of the country, while higher up the productions of colder climates flourish. There are few places where within such narrow limits the most opposite kinds of climate and vegetation are to be found. The heat in summer is often excessive, but violent and sudden changes are frequent, and to them is partly attributed the prevalence of fevers and of cretinism in the country. The principal source of wealth to the canton are the pastures on which large numbers of cattle and sheep are reared. Valais contained, in 1854, 4565 horses; 55,270 horned cattle of all kinds, including 21,000 milch cows; 44,507 sheep, 24,383 goats, and 9351 swine. The corn grown is chiefly barley and oats; and it is, in general, sufficient for the home consumption. In some of the valleys wine of excellent quality, and in others cider, is made. Mines of iron, copper, lead, silver, and zinc, exist in the canton. There are no manufactures, except of articles for domestic use, which each family provide for themselves. But the transit trade is pretty active, on account of the canton being situated near the great lines of communication across the Alps. The in-

Valckenaer

habitants are partly of German, partly of French, and partly of Italian origin, and speak corrupt dialects of these several languages. They are almost all of the Roman Catholic church, and public education is entirely in the hands of the Jesuits. The canton forms the diocese of Sion or Sitten, and has 107 parishes and 9 convents. The country is divided into 13 districts, called *dixains;* each of which has its separate council for the management of local affairs, and sends four members to the diet or legislature of the canton. The executive council of seven members is appointed by the diet. The suffrage is vested in all the male inhabitants above the age of eighteen. Valais is represented by two members in the council of states, and by four in the National Council of Switzerland; and it is bound to furnish a contingent of 1280 men to the army of the confederation. The capital is Sitten, a small town of 3516 inhabitants, on the Simplon road. Pop. (1850) 81,559.

VALCKENAER, LUDWIG KASPAR, one of the ablest scholars of the eighteenth century, was born at Leeuwarden in Friesland, in the year 1715. He prosecuted his academical studies at Franeker and Leyden, and at an early age distinguished himself by his uncommon skill in ancient literature. The first appointment which his learning procured for him was that of conrector of the gymnasium of Campen; and in 1741, after he had recommended himself by some very erudite publications, he succeeded Hemsterhusius in the Greek chair at Franeker. With this, in 1755, was united the professorship of Greek antiquities. In 1766 he was called to the University of Leyden; where, with the chair of the Greek language and Greek antiquities, he also held that of the history of his native country. In this honourable station he continued for nearly twenty years, in the enjoyment of a very high and well-earned reputation. He formed many excellent scholars, and eminently contributed to maintain the credit which the university had acquired as the first seminary of Greek literature. He died on the 15th of March 1785, in the seventieth year of his age.

Valckenaer possessed a masterly acquaintance with the entire compass of the Greek language and literature. He was an acute and sagacious critic, and he displayed no mean talents as a Latin orator. We subjoin a list of his principal works:—

De Ritibus in Jurando a veteribus Hebræis maxime ac Græcis observatis. Franequeræ, 1735, 4to. *Specimina Academica.* Fran. 1737, 4to. *Ammonius de adfinium Vocabulorum Differentia. Accedunt Opuscula nondum edita,* &c. Lugd. Bat. 1739, 4to. *Euripidis Phœnissæ.* Fran. 1755, 4to. *Euripidis Hippolytus,* &c. *Accedit Diatribe in Euripidis perditorum Dramatum Reliquias.* Lugd. Bat. 1768, 4to. The Diatribe, which is very able and elaborate, was published separately in 1767. *Theocriti, Biones, et Moschi Carmina Bucolica, Græce et Latine. Emendavit variisque lectionibus instruxit.* Lugd. Bat. 1779, 8vo. He had published ten idyls of Theocritus in 1773. *Ti. Hemsterhusii Orationes, quarum prima est de Paulo Apostolo. L. C. Valckenari tres Orationes, quibus subjectum est Schediasma, Specimen exhibens Adnotationum Criticarum in Loca quædam Librorum Sacrorum Novi Fœderis. Præfiguntur duæ Orationes Joannis Chrysostomi in Laudem Pauli Apostoli, cum veteri versione Latina Aniani, ex. cod. MS. hic illic emendata.* Lugd. Bat. 1784, 8vo. Schedius was the editor of his *Observationes Academicæ, quibus via munitur ad Origines Græcas investigandas, Lexicorumque Defectus resarciendos.* Traj. ad Rhen. 1790, 8vo. These observations are accompanied with the prelections of Van Iennep De Analogia Linguæ Græcæ. The following posthumous work of Valckenaer was published by his son-in-law Luzac: *Callimachi Elegiarum Fragmenta, cum Elegia Catulii Callimachea.* Lugd. Bat. 1799, 8vo. J. A. H. Tittmann published *Davidis Ruhnkenii, L. C. Valkenarii, et aliorum, ad Joh. Aug. Ernesti Epistolæ. Accedunt D. Ruhnkenii Observationes in Callimachum, et L. C. Valckenarii Adnotationes ad Thomam Magistrum.* Lipsiæ, 1802, 2 tom. 8vo. *Diatribe de Aristobulo Judæo, Philosopho Peripatetico Alexandrino.* Lugd. Bat. 1806, 4to. *Opuscula Philologica, Critica, et Oratoria, nunc primum conjunctim edita.* Lipsiæ, 1809, 2 tom. 8vo.

VALCKENAER, JAN, son of the above, was successively professor of law at Franeker, Utrecht, and Leyden, and was likewise known as an author. He was a strenuous adherent of the popular party, in opposition to the house of Orange; and he acted a conspicuous part in the public affairs of the eventful era to which he belonged. He became a member of the legislative body of the new republic; and the Batavian directory sent him on a diplomatic mission to Spain. When Bonaparte had divulged his intention of incorporating the kingdom of Holland with the French empire, Valckenaer was despatched to Paris in order to remonstrate against such a measure. His eloquence was, however, ineffectual; and, on his return, relinquishing all connection with politics, he betook himself to a delightful retreat in the vicinity of Haarlem, where he died on the 19th of January 1820, at the age of sixty-two.

Valdai ‖ Valdenses.

VALDAI. See RUSSIA.

Locality and name.

VALDENSES, WALDENSES, VALLENSES, VALDESII, VAUDES, or VAUDOIS, a community of Christians in the Cottian Alps, well known under these names, whether used as a territorial or ecclesiastical distinction.

The Valdenses formerly peopled a continuous and extensive mountain-tract of country both in France and Italy, in the provinces of Dauphiné and Provence, and in Piedmont, when these provinces were under one sovereignty; but, reduced by a long series of persecutions, they are now confined to the three valleys of Perosa, San Martino, and Lucerna, on the Italian side of the mountains, in the dominions of the King of Sardinia.

In these beautiful valleys, extending up the slopes of Mount Viso and Mount Genèvre, and lying between the rivers Pelice and Clusone, which come to a point of junction a little before they fall into the Po, the remnant of the Valdenses still have their existence as an established church of regular organization. They have endowments of land, churches, schools, and institutions peculiar to themselves; they have a liturgy of their own; they are recognised by the laws of the country to which they belong, and protected by treaties and compacts with the Protestant powers of Europe. It has not been accurately determined at what time or how they obtained the appellation of Valdenses, under which they have been known since the twelfth century, and which, from the resemblance in sound and orthography, has been erroneously thought to identify their derivation with that of the disciples of Valdo, the Lyonese reformer. From the circumstances of the times, and, from the fact that the fugitives from Lyon took refuge[1] with them as with a people of similar religious tenets, they come into historical notoriety under the name of Vaudois and Waldenses contemporaneously with Valdo; but traces of them, as a body of subalpine Christians, protesting against the errors of Rome, are found in ecclesiastical records of a much earlier date.

The traditional antiquity of the Valdenses.

That the Cottian Alps have been inhabited by a relatively pure association of Christians from time immemorial, who have testified for the truth upon the same articles of faith as the Protestant churches of modern times, is a tradition not unsupported by documentary evidence, but still open to discussion. The Valdenses of these regions maintain that they are descended from a race, who peopled the same villages, and professed the same gospel, in the first centuries of the Christian era. "We have inherited our religion," say they, "with our lands, from the primitive Christians." This is no modern pretension, put forth since the Reformation; for the same language, as to their antiquity, was held by their ancestors, not only after the time of Valdo, but in the age before that reformer, to whom their origin is sometimes imputed.

[1] Errorem eorum bibentes et serentes. Stephen de Borbone, apud Eckhart. *Scrip. Ord. Præd.* vol. i, p. 192.

Valdenses.

The author of the *Nobla Leyczon*,[1] A.D. 1100; Moneta,[2] who wrote against the alleged heresies of his day, and died in 1240; and Reinerus,[3] the inquisitor, whose treatise was completed in 1250,—all bear witness that the religionists mentioned by them, under the appellations of *Vaudès* and *Lombardi Pauperes*, and whom we are led to identify with the Valdenses, professed, in those times, to trace their religious genealogy and characteristics to the primitive ages.

Tenets of the Valdenses.

The inquirer, who would make himself master of the religious character of the Valdensian church, must take care not to be led out of his way in search of it. He must confine his attention to one particular locality,—that is, the subalpine territory lying between Mount Genèvre and Mount Viso. It has been the mistake of many writers and readers to ask among the heretics of all times and places for the creed of the Valdenses. But, if we would do them justice, and ascertain the articles of faith really maintained by them, we should look to three periods of time for this information.

The *first* is the present period.

The *second* is a point of time immediately before the Reformation.

The *third* is the age immediately before that of Valdo. The authorities to be consulted for the religious opinions of the Valdenses at these periods, are, 1. the public acts of synod, and the liturgy of the Valdensian church, as it now exists; 2. the account given of the Valdenses by Claude Seyssel, archbishop of Turin, after his visitation of the diocese in 1517; and, 3, that admirable monument of faith, hope, and charity, called the *Nobla Leyczon*, alleged to have been written in the year 1100. These represent the Valdenses as rejecting image-worship, the invocation of saints, the necessity of auricular confession, the obligations to celibacy, papal supremacy and infallibility, and the doctrine of purgatory; as professing to take Scripture for the only rule of faith; and believing in the holy Trinity, in original sin, in the atonement and mediation of Christ alone, in justification by faith, in the two sacraments of baptism and the Lord's Supper, and in the apostolical ordinance of holy orders.

History of the Valdenses.

The misrepresentations of friends and enemies, and the destruction of their documents in the course of numberless persecutions, render it a hard task to disentangle Valdensian history from the confusion under which it lies. Notwithstanding all that has been written on the subject, we still want evidence of a more convincing and irresistible nature, as to their origin,[4] succession, and progress. There are provoking uncertainties attending the inquiry; but amidst all the clouds in which it is involved, one bright truth gleams strongly out of the darkness, even from the time when the Valdenses came first into notoriety and conflict. The little Christian flock has been indestructible, in defiance of those who strove to be its destroyers, and, like the flaming bush, it has burned, but has not been consumed. Neither executions nor arguments, neither violence nor calumnies, have prevailed for its extinction. To what can this be attributed? Not to the protection of situation only, not to accidental causes, but, under the Divine blessing, to the stronghold which the sanctity of truth has upon the sympathies of men, in spite of their angry passions. The Valdenses found favour with their sovereigns, and obtained immunities, privileges, and pledges of security, from time to time, which could not have been forced from the strong by the weak, and never would have been conceded to fanatical or rebellious subjects. The very fact of their existence is an attestation to the purity of their faith and conduct, and a refutation of those who reproached them with gross errors. He who has made darkness his secret place, has mysteriously preserved them; and astonished the pride of Christian orthodoxy, by making a fold for these few sheep in the wilderness, from whence they might rebuke error, and bear witness to the truth.

Valdenses.

It is in vain to pretend to reduce the annals of the Valdensian church to any thing like connected history, till we descend to the period when persecution brought it into notice. We may, it is true, pick up a few materials relating to the country, and to the general aspect of religion, from the early documents which have come down to us, but these are scanty and unsatisfactory. For example, we learn that the Cottian Alps received the gospel in the second century, and that Irenæus, bishop of Lyon, made himself master of the Celtic language, that he might minister among the mountaineers; that facilities of intercourse between the subalpines and the inhabitants of the plain were secured by good roads leading through the centre of the valleys now called Protestant, in the direction of Mount Genèvre, Oulx, and Fenestrelle; that the village of St Secondo, in the valley of the Clusone, is so called from a martyr of that name in the year 120; that Crisolo, near Rora in Val Lucerna, was the place of St Geoffrey's concealment before his martyrdom in 297; and that, during the persecution of Diocletian, many Christians of the Theban legion found refuge in these regions.[5] We know that a hundred years afterwards, Ambrose of Milan, whose diocese extended to the Alps, complained of his mountain-clergy refusing to become celibates, on the plea of ancient custom;[6] and that Vigilantius made the Cottian Alps the place of his sojournment,[7] when he opposed himself to the errors of the church; because there he was received with kindness by professors of Christianity, who refused to adopt the observances of *monachism*, prayers for the dead, saint and relic worship, and other superstitions, which were creeping into practice.[8] Again, after an interval of more than 400 years, we find, that doctrines, called by Jonas of Orleans and Dungalus,[9] *the heresy of Vigilantius*, were still cherished here, and that Claude, bishop of Turin, "that bright and golden tinge in the chain of Cisalpine Protestantism," gave the sanction of his episcopal authority to opinions which the Gallic reformer of the fourth century had been reviled by Jerome for propounding. Claude found two parties in his diocese, one of which favoured his schemes of church reform; and after his death (according to the authority of Dungalus) it was called the sect of Claude. Thus it is certain that Vigilantius, and after him Claude, left disciples in these parts,[10] just where we are looking for them; but we have no ground

---

[1] See MS. volume in the library of Geneva, and *Choix des Poesies des Troubadours*, par Raynouard, vol. ii. pp. 73–102.

[2] *Moneta contra Catharos et Valdenses*, lib. v. p. 405, edit. Ricchini, Romæ, 1743.

[3] Reinerus de Sectis Antiquorum Hæreticorum, c. 4, *Bib. Patr.* vol. iv.

[4] On the origin of the Valdenses some curious materials for conjecture will be found in the history of the Gothic Christians of the fifth century, and their relics in France and Italy. Salvianus, *De Gub. Dei*, l. 7, Alcuin in his *Epistles*, and Theodolphus, three hundred years later, speak of the purity of their lives, while they allude to the imperfections of their notions in relation to church observances.

[5] See "Storia delle Alpi Marittime," published in *Hist. Patr. Mon.*

[6] *De Officiis*, lib. i. cap. 50.

[7] *Hieron. Opera*, vol. iv. p. 279; Epist. 37, aliter 53.

[8] Mr Faber (see his very learned Inquiry into the *History of the Vallenses*, p. 227) thinks the Valdenses may have been called Leonists from this Vigilantius, the *Leonist* or native of *Lugdunum Convenarum*.

[9] See Dungali Epist. adv. Claud. and Jonæ Aur. Episc. Epist. adv. Claud. in *Bib. Pat.* vol. iv. p. 536, and vol. v. pp. 153–163.

[10] It is curious to observe how, from Philastrius, who died in 387, down to Ratherius, who died in 974, and again, from Peter of Clugny, who wrote in 1127, to the Reformation, *mountain-districts* are stated to have been the *latibula*, or places of security, where nonconformity with the dominant church lurked.

Valdenses. for maintaining that the Valdenses were in a state of secession from the provincial bishops of France or Italy, within whose dioceses they were situated, at either of the periods to which we have just referred, the fourth and the ninth centuries. In those days, and for two or three hundred years after Claude, the truth might be held, and public testimonies for the truth might be given, and protests against the errors of Rome might be made, without the necessity of separation from the church called catholic; witness the great Iconoclastic question which agitated Christendom in the ninth and tenth centuries. There is reason, therefore, to believe that, until a much later period, congregations of the Cottian Alps may have continued to maintain a purer faith than that of Rome, without leading to any proceedings in those parts which could be called acts of schism on the one side, or of persecution on the other.

The accusing and remonstrating voice within the church, and not open secession from her, may have distinguished the Valdensian from the Romanist for a series of ages; and the political condition, as well as the natural position, of the territory to which he belonged, may have proved his security. There was no occasion for him to separate, so long as he was not compelled to do violence to his conscience; so long as the civil rights enjoyed in Ostrogothic and feudal Italy protected him.[1] In some parts of the south of France, as well as in the Cottian Alps, opinions were held at variance with those of the great body of the church, without bringing the dissidents into violent collision with it. There the Gothic Christians, to whom Alcuin addressed an epistle of expostulation,[2] professed their disbelief in the virtue of auricular confession and sacramental absolution, and remained unmolested; and there the Christians of Narbonne, in 820 (if we interpret rightly the metrical[3] description of Theodulphus, bishop of Orleans), had an ecclesiastical system of their own, which savoured of religious principles very different from those held at Rome, without being denounced as schismatics. Until the Bishop of Turin, acting upon the system introduced by Innocent III., obtained the authority of the Emperor Otho in 1210 to persecute the Valdenses, we have no instance of any public act of oppression committed in the Piedmontese valleys of the Alps against religious freedom. Up to that time the strongholds of nature, and the protection of the Lombard law,[4] which, in its code of personal legislation, permitted every man to choose the national law under which he would be governed, gave the people in these Alpine fastnesses privileges of which even pontifical tyranny could not deprive them, and offered a permanent settlement to the assertors of primitive Christianity, who, while they protested against superstitious novelties, communicated with the established clergy, as Wesleyan Methodists now profess to do, and vindicated their claim to be considered members of the church of Christ. The mass of historical documents which the commission at Turin has published since 1836,[5] exhibits too many marks of suppression not to excite our fears that much information relating to the "Evangelical Valleys of Piemont" has been withheld. Enough has, however, been brought to light to satisfy us that the political condition of the Cottian Alps, and of the people whom some ecclesiastical writers are fond of deriding under the term "brutæ gentes Alpium" (between the age of Claude and the first public persecution of the Valdenses), was exactly such as to secure religious objectors from molestation, and to justify the language which the Valdenses have invariably held in all their petitions to their sovereigns, when their religious liberties have been threatened—"We have asserted our right to enjoy liberty of conscience," "da ogni tempo," "da tempo immemoriale," from time immemorial. "Is it not extraordinary," says the historian Leger, "that it has never once happened that any one of our princes or their ministers should have offered the least contradiction to their Valdensian subjects, who have again and again asserted in their presence, 'We are descended from those who, from father to son, have preserved entire the apostolical faith in the valleys which we now occupy. Permit us, therefore, to have that free exercise of our religion which we have enjoyed from time out of mind, before the dukes of Savoy became princes of Piemont?'" Valdenses.

The supreme authority of the princes of the house of Savoy was not fully established in Piedmont until the middle of the thirteenth century (before that time the emperors of Germany exercised all the rights of suzeraineté), and it is a curious fact, that the house of Savoy arrived at absolute power by means of the public confidence which it enjoyed, in consequence of its equitable government, and faithful adherence for many ages to compacts made with its subjects. These compacts were the origin and the preservatives of the religious liberties of the Valdenses. "We are obliged to tolerate heresy in the valleys of our realm," was the confession of a duke of Savoy in 1602.[6] It was a matter of solemn stipulation, recorded in the ancient charters and documents recently published at Turin, that the inhabitants of certain townships, communes, and villages, should remain in the undisturbed possession of their accustomed rights and franchises; and some of the very communes and hamlets which are now the dwelling-places of the Valdenses are named among those entitled to such privileges.

In allusion to these immunities of the Valdenses, based on *Charter*,[7] Archbishop Seyssel made the following bitter complaint: "It has contributed not a little to the toleration of their heresy, that it has never wanted persons to protect and favour it, and among those especially who ought to be the guardians of the Christian religion, inasmuch as they rule and reign over provinces and kingdoms."[8]

We have no well authenticated record which will enable us to say when the feeble tie was broken, which still kept the Valdenses in communion with the provincial bishops of Turin and Embrun, while they protested against Romish corruptions. Sclopis, a Piedmontese writer on jurisprudence, of great celebrity, who has made it his business to search into the history of the laws and customs of his country, declares that he cannot assign any period to the first appearance of schism in the subalpine valleys, nor can he discover the origin of the name *Valdenses*.[9]

It is probable, however, that being excommunicated at the beginning of the thirteenth century, after their reception of the followers of Valdo, they were then obliged for the first time to constitute ministers of their own out of the clergy, whose orders were derived from the national churches of France and Italy, and who espoused their cause. That they had originally the form of an episcopal

[1] These immunities were of a very ancient date. See the privileges granted to Gothic and other unorthodox soldiers by Justinian, 523, xii. Cod. de Hær.

[2] Alcuini *Epistola* 26, aliter 71, at Gothos.

[3] See Theodulphi *Paræsis ad Judices.*

[4] See Guizot's *Lectures on European Civilisation*, lecture 3. In Germany as well as in Lombardy there was a succession of Christian congregations, with more or less of orthodoxy, who must have been connected with the sectarians of whom Evervinus complained to S Bernard in 1140. "We and our fathers," said they, "are apostolical in our doctrine and life."

[5] *Historiæ Patriæ Monumenta.*

[6] *Raccolta degl' Editti delli Duchi di Savoya*, p. 24.

[7] Especially those of 1448, 1466, 1473, 1499, and 1509; cited in Raccolta, p. 5.

[8] Cl. Seyssel adv. Val. fol. 8.

[9] See Sclopis, *Storia del. Antic. Legis. del Piedmonte*, p. 487.

Valdenses. church, with clergy of different orders (although their discipline is now Presbyterian, very much resembling that of the Church of Scotland),[1] appears both in an ancient MS. which speaks of *regidors*,[2] or *leaders* of the flock, as well as of priests; and in the direct and plain evidence of Claude Seyssel in 1520, who speaks tauntingly of persons whom they called their *bishops* and *priests*, and challenges them to show from what lawful source of authority, from what church, and from what province they, who boasted of their apostolical descent, derived their orders and succession.[3]

The fiercest declaimers against Valdensian schismatics might find some extenuation for a people who were forced into secession; first, by the corruptions and spiritual neglect of the clergy of the dominant church; and, secondly, by excommunication. Every ecclesiastical history makes mention of the utter depravity of most of the Romish clergy of the tenth, eleventh, twelfth, and thirteenth centuries; and we gather from the first volume of the *Piedmontese Historical Documents*, published in 1836, that at one time nearly all the ecclesiastics of the Cottian Alps fled from before the Saracen invaders, and never returned to their parishes; and at another time that there was a wreck of churches (*naufragatis ecclesiis*) and destitution of pastors throughout the whole diocese of Turin. Endowments for parochial service were transferred to monasteries at a distance, and villages were left without regular pastoral superintendence. One charter states that a third of the whole mountain-territory between Mount Cenis and Mount Genèvre was made over to a distant convent. Another consigns no less than half of all the lands lying between Pignerol and Col Sestrières to an abbey at Pignerol. A third despoils the whole of Val Guichard of its rents, for the enrichment of a fraternity of monks in another part of the country, in the plains on the banks of the Po. All this must have contributed to produce that state of spiritual destitution which ultimately led to and warranted separation; and when the severance was once completed, the hierarchy of Rome could never re-establish its authority over those valleys of Piedmont which are now called Protestant. They were so free from Romish intrusiveness at one period, that Vincentius Ferrerius, the Dominican, who preached to the Valdenses in the year 1405,[4] reported to the principal of his order that they had not heard the voice of a minister of the church for thirty years before; and Claude Seyssel declared a century afterwards, that so entirely had they been abandoned by priests and bishops, that no prelate but himself had dared to approach them within the memory of man.

The transfer of property in the valleys, to monasteries and convents, was the first step that led to persecution. The possession of lands in signoralty carried with it certain rights of jurisdiction, which enabled the monastic bodies to exercise temporal as well as spiritual tyranny. They acquired the power of holding local courts for the adjudication of all criminal causes, co-extensive with that which had been originally conferred on the feudal proprietors for the protection of the people of their domains; so that the very privileges which were favourable to religious liberty, while they were exercised by lay superiors, became dangerous to the vassals of estates, in process of time, when they were made over to ecclesiastics. The commencement of the thirteenth century is the era from which we Valdenses. date those horrible atrocities with which religion has been insulted, and humanity outraged, to appease the offended majesty of Rome. Innocent the Third, and Dominic, the father of the Inquisition (the seraphic spirit of Dante's commendation) divide the honour of having let loose fire and sword against those who presumed to question the dogmas of the Vatican, in two new forms, impiously called "missions of peace and good will." The one was the crusade against the Albigensis, which swept multitudes from the face of the earth in open warfare; and the other was the institution of a secret tribunal, which had its informers and its executioners everywhere, and, as an "act of faith," condemned thousands, after the mockery of a trial, to expire in the flames, or to linger out life in a dungeon. But though some martyrs were dragged to the stake from the vicinities of the Cottian Alps, nearest to the plains of Piedmont on the one side, and to the cities of Dauphiné on the other, yet the more secluded of these regions continued to be secure asylums until the end of the fourteenth century. The communes of Fressinière and Argentière, in the diocese of Embrun, on the French side of the mountains, were then ransacked for victims, in obedience to a papal bull.[5] Whole families were sacrificed, and others were obliged to flee to the very edge of the glaciers for safety. But it is remarkable, that although a similar bull was issued against the nonconformists of the valleys of Lucerna and San Martino on the Italian border, no means were there found of putting the exterminating commission in execution. Again and again the temporal sovereigns of the Piedmontese Valdenses received mandates from Rome to draw the sword against them, and to "crush the serpent," but they would not. Even when the persecuting storm of 1400 extended from Dauphiné to the Italian valley of Pragela, which was then under the dominion of France, the adjoining valleys of Lucerna and San Martino heard the pontifical thunder, but were unscorched by its lightning.

At length the memorable bull[6] of Innocent VIII., which gave unlimited powers to Albert de Capitaneis to carry confiscation and death throughout the whole of those parts of the sees of Embrun and Turin which were infected with heresy, precipitated a host of armed enemies upon the mountain-retreats of the Valdenses. The edict of Iolanta, the regent-mother, during the minority of the Duke of Savoy, in the year 1476,[7] in which she called on the authorities of the province of Pignerol to assist the inquisitors in compelling heretics, and especially those of Val Lucerna, to come into the bosom of the church, is one of the first state papers which indicate a departure from the mild and tolerant principles on which the house of Savoy had hitherto acted. But the sanguinary torrent rolled through these valleys, without forcing any of the inhabitants into the arms of Rome. Some subsequent edicts of the dukes of Savoy,[8] speak of their Valdensian subjects, not under the obnoxious appellation of heretics, but under the gentle and more courteous term of *Religionists*, and call them "men of the valleys," "beloved and faithful vassals," whom they recognised as privileged persons, entitled to immunities and franchises, by virtue of ancient stipulations.[9]

State policy, disputes with France, and the necessity of conciliating the borderers, when a band of gallant soldiers

---

[1] In the middle of the sixteenth century several changes were effected in the government of the Valdensian church. The principal authority rests with ecclesiastical officers called the Table, consisting of the moderator, the moderator-adjoint, and the secretary, assisted by two lay members. These are elected by the Synod, which is held every five years, in the presence of a royal commissioner. The moderator presides at ordinations. Pastors are nominated by parishes, subject to the approbation of the Table and confirmation of Synod.

[2] "Eslagistan Regidors del Poble, et Preires en lors Officiis." See Morland's *Churches of Piedmont*, p. 74.

[3] The episcopal form of church government was retained by many other separatists from Rome, in Italy and Germany. See Reiner and Stephen de Borbone.

[4] See Præf. Ricchini ad Monetam, p. xvi.

[5] This and the document next quoted are published in the works of Morland and Leger.

[6] Printed in the works of Morland and Leger.

[7] *Raccolta degl' Editti del Piemonte*, p. 1.

[8] Those of 1499 and 1509.

[9] *Raccolta degl' Editti di Savoia e del Piemonte.*

Valdenses. was required for the defence of the frontier, often operated in their favour, in the moment of danger; and even at times when the sovereigns of the principality consented to their destruction, the lords of the soil became their advocates. Thus, in the year 1553, when the havoc which was made among the nonconformists of Provence and Dauphiné,[1] reached the valleys of Piedmont, it would have been more fatal, had not Blanche, countess of Lucerna, interposed in behalf of her dependants.

In 1560, the dark cloud which had long been gathering over the mountain-church, burst upon it with all its fury; and never did the majesty of truth and innocence stand out more brightly to view, than during the tempests of persecution, which raged at intervals for the next hundred years and more.

The subalpine communities, which had been placed under papal interdicts, saw themselves exposed to the hostile power of the French king on one side, and to that of the Duke of Savoy on the other. They were commanded by edicts to banish their ministers and schoolmasters, to abstain from the exercise of their own forms of worship, and to attend the services of the Romish Church. They refused, and orders for confiscation, imprisonment, and death, were launched against them. Hundreds perished on the scaffold, or at the stake; and the villages swarmed with brigands, who, under the name of officers of justice, plundered the wretched inhabitants, and haled them to prison, until the dungeons were choked with victims.

The population of the valleys still remaining faithful to the religion of their forefathers, the sword was openly unsheathed, and the scabbard thrown away. An armed force, commanded by a chief whose name was in terrible contrast with his character, the Count de la Trinité, poured into the proscribed territory. But a spirit stronger than the sword upheld the Valdenses, and an arm more powerful than that which assailed them fought on their side. The villages near the plains were deserted; the women, the children, the feeble, and the aged, were sent for refuge to the heights of the mountains, to the rocks and to the forests. Every man and boy who could handle a weapon planted himself against the invaders, and a successful guerilla warfare was carried on by small brigades of peasants against the veteran troops who were let loose upon them. Greater exploits, and instances of more enduring fortitude, were never recounted than those which have immortalized the resistance offered by the Valdenses to their oppressors. It must, however, suffice to say, that the history of the Valdenses, from the year 1560 to the close of the eighteenth century, is a narrative of sanguinary struggles for existence, with very few intervals of repose.

If the churches of the valleys had an intermission of suffering under one reign, they were driven to desperation in another. The years 1565, 1573, 1581, 1583, and the period between 1591 and 1594, are memorable as dates of religious and civil conflict.

In 1595, the Duke of Savoy smiled upon his Protestant subjects; in 1596 and 1597 he persecuted them. From 1602 to 1620, a series of edicts,[2] some threatening, and others indulgent, kept the Valdenses in a state of perpetual suspense and agitation; but the tenor of the most alarming of these, which confined them within certain limits, proves that they had rights and privileges, within those limits at least, which nothing but the importunity and the misrepresentations of the Romish hierarchy could induce their sovereigns reluctantly to violate.

Of the twenty years that followed, almost all were distinguished by some act of cruelty or oppression. In 1640,[3] the appointment of an English envoy at the court of Turin, and his occasional residence at La Tour, the principal village of the Valdenses, shed a ray of transient sunshine over this afflicted people; but this was shortly followed by a hurricane of persecution similar to that of 1560, and unutterable atrocities were committed by the soldiery employed to enforce the destroying edict of 1655. That year would have seen the last of the Valdenses, had not all the Protestant powers of Europe interposed, especially England, whose supreme ruler, Oliver Cromwell, under the influence of Milton, became their protector. Valdenses.

In 1686, Victor Amadeus, the young duke of Savoy, instigated by the courts of France and Rome, and ambitious of succeeding where his ancestors had failed, sent an overwhelming body of troops into the valleys of Lucerna, Perosa, and San Martino, to compel the inhabitants to go to mass. During three years and a half, the exercise of the ancient religion of the Valdenses had to all appearance ceased in Piedmont. Those who would not conform were obliged to flee for their lives. But the return of eight hundred Valdensian exiles in 1689,[4] who marched from the borders of the Lake of Geneva to their native mountains, for the recovery of their rights, was signalized by incidents unsurpassed in the history of providential and romantic events, and was crowned with success. At this critical juncture, a quarrel arose between the King of France and Victor Amadeus, which induced the latter to take this heroic band and the scattered remnant of his Protestant subjects into favour. "Hitherto," said he, "we have been enemies, but from henceforth we must be friends; others are to blame more than myself for the evils you have suffered." This happy turn in their affairs was followed by treaties between the English and Piedmontese governments, in the reigns of William the Third and Queen Anne, articles of which were meant to secure to the Valdenses the undisturbed exercise of their religion within certain territorial limits.[5] From that period to the present, Great Britain has been empowered, by virtue of solemn compacts, to interpose for their protection, and their churches ought to have had rest.

But the wrongs of the Valdenses were not yet at an end, and their sovereigns, under their new title of kings of Sardinia, forgot to be generous and just. Again and again these sufferers have had to contend not only against petty injuries and harassing grievances, but also against absolute oppression. By an act of open violence, the valley of Pragela was dragooned into conformity with Rome, in the year 1727, on the diplomatic pretence, that this region was not included in the articles of treaty which secured toleration within defined boundaries. The English ambassador at Turin remonstrated, and urged the sacred engagements which guaranteed toleration and safety to the Protestants of Piedmont, but he was not properly supported by his government at home, and the objects of his sympathy cried for redress in vain.[6]

During the French empire of Napoleon, when the iron crown of Italy was placed on the head of the Corsican, the Valdenses enjoyed equal rights and privileges in common with the rest of their countrymen. But, at the restoration of the house of Savoy to the kingdom of Sardinia, four days after the king had taken possession of his palace at Turin, they were replaced under their former disabilities, and bare toleration only was conceded to them.[7] The restored prince

---

[1] Gilles, p. 39. [2] See *Raccolta degl' Editti.* [3] Gilles, *Hist. Eccles. des Vaud.* p. 567.
[4] See *Rentrée glorieuse des Vaudois*, par H. Arnaud, and Translation by H. D. Acland.
[5] See Gilly's *Waldensian Researches*, p. 555.
[6] See the correspondence of Mr Hedges with the Duke of Newcastle, published in Dr Gilly's *Waldensian Researches*, pp. 539, 540.
[7] A very able pamphlet was published in 1829 by Count Ferdinand dal Pozzo, late Maître des Requêtes, and First President of the

Valdepenas || Valdivia.

acknowledged, on more occasions than one, "the constant and distinguished proof which the Valdenses had ever given to his predecessors of attachment and fidelity;" and bore this testimony to their merit: "I know I have faithful subjects in the Vaudois; they will never dishonour their character." But still he listened to evil counsel, and the yoke was again placed upon their necks. In 1832, the measures adopted against the Valdenses were so threatening, that the British parliament took up their cause; and extracts of the treaties between Great Britain and the dukes of Savoy and kings of Sardinia, were ordered by the House of Commons to be printed, on the motion of Sir R. Inglis, with the correspondence of the British minister at Turin, relative to the treatment of the Protestants in Piedmont in 1727.[1] (In 1860, the 25,000 Valdensian Protestants enjoy, by public enactment, perfect freedom of conscience.) The difficulties with which the Valdenses have now to contend are, poverty, and reduced numbers, being confined to limits which do not produce subsistence for more than a very limited population.

There still exist three copies of the ancient Valdensian version of the New Testament. In the public library of Grenoble, the Codex, No. 488, is a relic of the thirteenth century. It is a manuscript on vellum, a small 4to, containing, in the following order, the four Gospels, the Epistles of St Paul, St James, St Peter, St John, and St Jude, the Acts of the Apostles, the Apocalypse, the Proverbs of Solomon, Ecclesiastes, Wisdom, Ecclesiasticus, and the Song of Solomon; all in the Piedmontano-Provençal dialect of the Valdenses. In the library of Trinity College, Dublin, a transcript of the same version, on parchment, is preserved, which is said to have been written in 1522. In the public library of Zürich, there is also to be seen a copy of an ancient Valdensian translation of the New Testament, which differs in some degree from the two above mentioned, but is believed to have been written between the years 1350 and 1400. This manuscript is thus described:—"Codex MS. Novi Testamenti Valdensis, C. $\frac{1}{108}$ chartæus, sæculi xiv. formæ 12. nunc constans foliis DIII." (W. S. G.)

VALDEPENAS, a town of Spain, New Castile, in the province of Ciudad-Real, and 30 miles E.S.E. of the town of that name. It is a large straggling town, and is chiefly celebrated for its excellent wine, made from the vines in the vicinity transplanted from Burgundy. The liquor is kept in caves and in huge *tinajas* or jars, and when removed is put into goat and pig skins. This town was sacked by the French in 1808. Pop. about 11,000.

VALDIVIA, a seaport town of Chili, capital of a province of the same name, is situated at the mouth of the river Valdivia, and at the head of one of the finest harbours in South America, in lat. 39. 49. S.; long. 73. 18. W. The chief articles of export are timber and firewood, leather, hides, cheese, potatoes, and hams; of import, sugar, coffee, and different kinds of coarse cloth. In 1857, eight English vessels of, in all, 550 tons, two German of 400 tons, and sixteen Chilian of 3273 tons entered the port. The foreign exports in that year amounted in value to L.1752, home exports to L.32,781; the foreign imports to L.586, home imports to L.68,079. The Chilian government has been fostering here a German colony, which is in a prosperous condition. Pop. of town about 10,000. The province is fertile and well watered by numerous rivers, but the greater part of it is still covered with nearly impenetrable forests of Chilian cedar. The climate is damp but healthy. The apple-trees introduced by the Spaniards are now plentiful, and cider forms an article of exchange. Pop. about 30,000.

Valdo.

VALDO, or WALDO, PETER, (or VALDES as he is termed in contemporary documents) is usually described as the Lyonese reformer of the twelfth century. As to the place and date of his birth, and the events of his earlier days, contemporary and documentary history is silent; but tradition states that he was born in a place which, by some, has been called Vaud, Vaux, Vaudram; by others Walden and Val-Grant. There is still a village near Lyon called Vaux, and another in the mountain-region, between Mount Dauphiné and Briançon, called Vaux de Rame. The first authentic mention of the Gallic reformer appears in the *Chronicle* of Laon, under the year 1173. He is there introduced to our notice as a citizen of Lyon, who, having amassed considerable wealth by usurious practices, had his conscience alarmed in a very remarkable manner. One Sunday in the year 1173, hearing a Troubadour in the streets of the city reciting passages from the Romaunt called the *Life of Alexis*, Valdo invited him home, and listened with earnest attention to the whole of the poem. The narrative made a deep impression on the mind of Valdo, of which the Troubadour[2] failed not to take advantage. Moved by the serious discourse of his guest, Valdo went the next morning to unburthen his mind to a priest of great reputation in the city, and consulted him as to what he should do for the attainment of Christian perfection. "If thou wouldest be perfect," was the answer, "Go, sell all thou hast, and give to the poor." Valdo resolved to obey the injunction to the very letter. He converted his property into money; he placed his two daughters in the convent of Fontevrault;[3] he distributed largely to the poor; he fed all who came to him three days in the week; and on the festival of the assumption of the Virgin Mary, he publicly proclaimed his intention of abandoning the service of mammon for that of God, and invited his fellow-citizens to follow his example. His wife, alarmed by these proceedings, implored the archbishop of Lyon to check the imprudent zeal of her husband, and that prelate and his suffragan, the bishop of Bourg-en-Bresse, gave Valdo some advice upon the occasion. Nothing, however, could damp his ardour; he persevered in his system of self-denial, and gained over a number of followers, who imitated his example by embracing voluntary poverty, and by ministering bountifully to the wants of the poor.

A severe famine, which desolated the whole of Gaul at this time, gave them full opportunities of exercising the virtue of almsgiving, and they did so to the very utmost. Forming themselves into a fraternity, under the name of "Poor Men of Lyon," Valdo and his disciples at first made themselves conspicuous by the sanctity of their lives only, but they soon began to attract further notice, by rebuking the rapaciousness and corrupt manners of the ecclesiastical and monkish orders. But though he was one of the most eminent of early reformers, he was not the first to rouse Christendom from her unholy slumbers; for we have the testimony of Bernard of Clairvaux, Peter of

Imperial Court of Genoa, entitled *The complete Emancipation of the Vaudois advocated.* In this the author maintains, that by the treaty of Paris, May 31, 1814, the Valdenses were put in possession of all the rights acquired by the inhabitants of Piedmont under the French dominion, and that, in violation of these rights, there are no Protestants now in Europe in so low and degraded a position as they.

[1] See *Orders of the House of Commons*, 15th May 1832, and *Returns to an Address to his Majesty*, dated 24th January 1832.

[2] In those days many of the jongleurs and wandering troubadours often combined the several characters of pedlars, poets, and religious instructors. They were a privileged order, whose harp, and song, and news, obtained for them admission into the castles of the barons and the houses of the citizens. They would oftentimes begin by diverting their hearers, and, after touching some string which roused devout feelings, they would launch into sacred subjects, produce transcripts of Scripture, and converse on the deepest points of sacred truth.

[3] In Poitou. A fraternity, called "The Poor of Christ," was settled here in 1103, under the government of a woman; an institution which has been severely attacked by Bayle.

Valdo. Clugny, and Evervinus of Cologne, who flourished between 1120 and 1150, to prove that, in that age, zealous and holy men were to be found, who declaimed against the vices and errors of the clergy, and proposed schemes of reformation.

By degrees, Valdo and the "Poor Men of Lyon" took upon themselves to exhort and to admonish, in fact to preach both in public and private. "Cœperunt paulatim," says the *Chronicle* of Laon, "tam publicis quam privatis admonitionibus sua et aliena culpare peccata." This was no slight matter of exasperation to a powerful body of men, whose priesthood was disgraced by priestcraft; but another proceeding of the reformer called forth their fiercest animosity. Valdo employed his time and property in the translation and circulation of Scripture in the vernacular tongue of the country; and the manner in which he set about his work attests the soundness of his judgment, as well as the devotedness of his zeal. In the first place, he obtained the assistance of three eminent scholars, who had a critical acquaintance with the sacred writings; Bernard of Ydros, who was afterwards held in great estimation by the Dominican order; Stephen of Ansa or Empsa, eminent as a grammarian and linguist, who was promoted in course of time to a benefice in the city of Lyon;[1] and John of Lugio,[2] a biblical scholar of high reputation, who became the head of a religious congregation in Lombardy. The latter was the only one of the three who remained faithful to the cause of Valdo, and the silence of the two former, after they deserted him, as to any spots in his moral character, is a strong attestation in his favour. Stephen translated into the Gallo-Provençal language, John examined authorities and corrected the translations, and Bernard transcribed the version so prepared for the use of the copyists, who were to multiply copies for general circulation. But not satisfied with these means for procuring correct translations of the Bible, Valdo also collected sentences of the ancient fathers, particularly of Ambrose, Augustin, Gregory, and Jerome,[3] in illustration of the books of Scripture, of which copies were to be made; and these, too, he put in circulation to serve as notes or comments for the help of his Scripture readers. This being done, the master and his disciples committed many passages of Scripture to memory, and thus armed with the Word of God, they went forth into the streets and houses of Lyon, and into the villages of the neighbourhood, and delivered the gospel message with so much ardour and success, as largely to increase the number of their adherents. In some few places the churches were open to them by consent of the secular clergy; and where they could not have access to the sanctuaries, they preached and expounded Scripture in the streets and highways. It is uncertain how many books of the Bible were translated and circulated by the Lyonese Reformer, and the Poor Men of Lyons. Walter Mapes says, that the volume of Valdo which was presented to Pope Alexander, contained the text and a gloss of the *Psalms*, and *of many books* of the Old and New Testament. Reiner leads us to believe that the whole of the New Testament was circulated by them in the vulgar tongue. Stephen de Borbone speaks only of *many books* of the Bible, without designating them. The effect produced by the gospel tidings, as they were delivered by these new expounders, was felt like an electric spark throughout the whole of the province and diocese of Lyon. The common people heard them gladly, for now, for the first time in their lives, they listened to preachers who spoke in the language of Scripture, and pointed to the sacred page in confirmation of every doctrine which they urged.[4]

After persevering in this course for five years, Valdo found that the increasing enmity of the monks and clergy of Lyon had become dangerous to him. In 1178, he therefore took the bold and honest step of going to Rome, to make his views known to the sovereign pontiff Alexander III., and to request the papal sanction to his proceedings. In fact, he asked the pope to recognise his fraternity of the "Poor Men of Lyon" as an ecclesiastical order of authorised preachers, and licensed circulators of Scripture. Never did the founder of a religious community experience a better reception from prince or pontiff. The pope embraced Valdo, "Valdesium amplexatus est papa, approbans votum quod fuerat voluntariæ paupertatis," &c., says the faithful narrator whom we have before cited.[5] He approved of the order of the "Poor Men of Lyon," as professors of voluntary poverty; but while he gave them a limited license as preachers, he forbade them to exercise it without the especial permission of the regular priesthood. Up to this period, the conduct of Valdo and his disciples had been irreproachable even at Rome, or the pope would not have shown him such favour. In fact, all his proceedings hitherto had been strongly characteristic of one who acted as a dutiful member of the holy Catholic church. It was a church-legend which first made a serious impression upon him; it was to a priest that he first went for spiritual counsel, after his conscience had been awakened. The adviser whom he next consulted was a bishop; so closely did he observe the canon of Ignatius, "nihil sine episcopo." He placed his daughters in a convent; an act which savoured of the most rigid adherence to ecclesiastical customs. The holy book on which the church builds its faith was his constant study; and his chosen fellow-labourers in the work of transcribing and translating were members of the sacerdotal order. So blameless was his career, and so conscious was he himself of the purity of his motives, that he sought, as we have shown, an interview with him who was called the supreme Head of the Church, and was received with indulgence and honour. The childlike submission and meekness of this exemplary Christian were carried to such an extent, that for a time he obeyed the pope, and forbore to preach, except on the terms imposed upon him. At length, however, his ardent zeal, sharpened by the opposition of the clergy, who hated the spirituality and fervour which condemned their own negligence, could no longer be restrained, and he preached without their permission. He and his disciples were commanded by episcopal authority not to speak at all, nor preach in the name of Jesus: They however persevered, and from disobedience, says one of our historical witnesses, they fell into contumacy, and from contumacy, into the penalty of excommunication.[6] The fearful sentence, which was meant to deprive them of all the ordinances of religion, to exclude them from the church and the altar, to deny baptism to their children, burial to their dead, marriage to their betrothed, and to banish them from Lyon, was passed by John de Bellesmains, archbishop of Lyon, in 1181. Pope Lucius confirmed the excommunication in 1184. In the Lateran council of 1215, the same dread sentence was again fulminated against all who should embrace their doctrines, or receive them into their houses. They were driven ignominiously from their homes; and seeing no hope of producing a reformation in the bosom of the imperious church, out of which they had been cast, or of being received back into it, without doing violence to their consciences, Valdo and his followers had no other alternative than to form themselves into a community, in which persons, selected from their own body, were appointed to

[1] Stephen de Borbone, *apud Echart Scrip. Ordinis Prædicatorum*, vol. i. p. 192.
[2] Reinerus de Cath. c. 6; and Polickdorf, c. 1.
[3] See Monèta *contrà Valdenses*, lib. v. c. 1.
[4] Chronicle of Laon. See Bouquet, vol. xiii. p. 680.
[5] Ibid.
[6] Stephen de Borbone, *ut supra*.

Valdo.

perform the offices of religion, and administer the sacraments.[1]

The "Poor Men of Lyon," exiled from their native city, found refuge in the secluded parts of Provence and Lombardy, and were hospitably received there by persons who held kindred opinions. The document which states this points to religious communities on each side of the Cottian Alps, to the territorial Valdenses of ecclesiastical history, whose situation providentially enabled them to maintain in safety opinions at variance with those of Rome. A remarkable passage in the authority which gives us this information adds, that the exiles imbibed the errors of these subalpine heretics, and became, when they mingled with them, the most determined enemies of the church.[2]

From this time the "Poor Men of Lyon" and the Valdenses (territorially so called) of the Cottian Alps became mixed up in ecclesiastical history, as if they were one and the same. But the former, after their exile from Lyon, were never gathered together in any one district or province as a distinct people, but were scattered among the nations; and those who embraced their tenets sometimes adhered to them openly, sometimes secretly, but never in sufficient numbers or local strength to constitute a church. When or where Valdo died remains in obscurity, but his name was given to almost every sect who protested against papal usurpation.

The persecutions which, for two hundred years, swept Europe of all who were called Valdenses, except in the subalpine territories, were an outrage upon humanity, and have fixed an indelible stigma on the Church of Rome. Stephen de Borbone relates, without a breath of compunction, that he was present when 80 of Valdo's sect were condemned to the flames; and Albericus the chronicler states the number to have been 182, and speaks of it as a sacrifice of a sweet-smelling savour acceptable to the Lord, —"Holocaustum placabile Domino." But with all the animosity of the early persecutors of Valdo and his disciples, they have not recorded one well authenticated accusation of immorality against them; and it is a singular attestation to the moral and religious character of Valdo, that none of those calumnies, which were afterwards circulated by Roman Catholic writers, were advanced against him during his lifetime. Walter Mapes, who was present at Rome when Valdo appealed to the pope, indulges in a vein of irony against the Valdesii, and ridicules them as a parcel of "houseless,"[3] "bare-footed," "indigent," and "illiterate idiots," unworthy of notice; but utters not a word against their morality. On the contrary, he admitted that they preserved the faith, and were ready to die for the sake of the Lord Jesus Christ."

The earliest calumniator of "the Poor Men of Lyon," *Alanus insignis theologus*, who inveighed with the utmost severity against them, said nothing worse of their founder than that he presumed to preach without inspiration or literature, to call himself an apostle without a mission, and a teacher without learning.[4]

Moneta,[5] who wrote a history of the Valdenses of Lyon, within half a century after their first appearance, speaks of a certain man named Valdesius, from whom they derived their origin, without casting any stain upon his moral fame; and though Moneta was an inquisitor, the bosom friend of Dominic, and condemned heretics to the flames, and wrote forty folio pages in defence of persecution, yet he admits that the Valdenses still respected the validity of Romish ordination, received the Old as well as the New Testament, and did not give reins to licentiousness.

Valence ‖ Valencia.

Peter, the monk of Vaux Sernay,[6] who wrote in 1217, and was clamorous for the total extinction of the Albigenses by fire and sword, mentions the name of *Waldius*, the founder of a sect of heretics called *Waldenses*, without a syllable of reproach; and states the principal errors of those schismatics to have been "an affected imitation of the apostles, refusal to take an oath, denial of the power of the magistrate to inflict the punishment of death, and presuming, because they were sandal-wearers,[7] to celebrate the eucharist without episcopal ordination."

Reiner,[8] whose work bears the date of 1250, has no charge to bring against Valdo, and no other against his followers than their separation from, and hostility to, the Church of Rome, their use of Scripture in the vulgar tongue, and the estimation in which they held those of their sect who embraced a life of poverty, and believed in justification by faith. (W. S. G.)

VALENCE, a town of France, capital of the department of Drôme, in a fertile plain on the left bank of the Rhone, 65 miles S. of Lyons, and 143 N. by W. of Marseilles. It is an irregularly built place, surrounded with ancient walls and towers, and consisting of narrow winding streets, lined with mean houses. The principal building is the small old cathedral, which contains a monument by Canova to Pope Pius VI. There are also a citadel, court-house, theatre, barracks, a public library of 1000 volumes, and various schools. The manufactures consist of silk and cotton cloth, hosiery, gloves, ropes, leather, cutlery, and pottery; and there are also breweries, dyeworks, marble-works, and ship-building docks. A suspension bridge across the Rhone leads to a district producing the much-esteemed St Peray and Hermitage wines; and wine, brandy, silk, oil, fruit, and paper, are the chief articles of trade. Valence is connected by railway with Paris, Lyons, and Marseilles. Pop. (1856) 14,514.

VALENCIA, a province of Spain, bounded on the N. by those of Teruel and Castellon de la Plana, E. by the Mediterranean, S. by that of Alicante, and W. by those of Albacete and Cuença; area, 3672 square miles. The surface is very much diversified; for along the coast it is for the most part low and level, while in the interior it is occupied by the lofty, rugged, and generally bare mountains, which form the eastern boundary of the table-land of New Castile. These mountains send off shoots, which in some places reach nearly to the sea; and the central part of the province is finely diversified with hills and valleys. The principal rivers are the Quadalaviar and the Jucar; the former of which enters the province from the N.W., flows S.E., and falls into the sea at Valencia; while the latter, further to the south, flows eastward, and, after receiving the Cabriel and the Magro, also falls into the Mediterranean. The soil is very rich, producing large crops of rice on the lower grounds, and on the hills and slightly elevated ground, wine, oil, excellent fruits, mulberries, on which large numbers of silk-worms are reared, and excellent pastures for sheep and goats. Cattle and horses are few, and the supply of corn is hardly more than sufficient for the home consumption. In some parts there are valuable marble quarries, and forests yielding abundance of timber. Pop. (1857) 606,608. The old province of Valencia, which was once a

[1] From all we can collect, this was not done until after very mature deliberation and consultation with religious persons in other countries, whose eyes had been opened to the corruptions of the Latin church. Moneta, the most dispassionate of all their accusers, states that Valdo "ordinem habuit ab universitate fratrum suorum," and that a Lombard separatist was his authority for this statement. Moneta *contra Valdenses*, lib. v. c. 1.

[2] See Stephen de Borbone, *ut supra*.

[3] See Gualt. Map. MS. Bodl.

[4] Liber secundus Alani insig. Theol. contra Vald. p. 175, edit. Par. 1612.

[5] Moneta *contra Valdenses*, lib. 5.

[6] Petri Monachi *Hist. Albig.* p. 8, edit. Trever. 1615.

[7] The Greek ritualists inform us that the sandal was a mark of sacerdotal dignity. Some very curious mistakes have occurred from the terms Xabatati and Sabatati applied to the followers of Valdo. The term is derived from *sabot*, a sandal.

[8] Reinerus de Sectis Antiq. Her. c. 4, 5. *Bibliotheca Patrum*, vol. iv.

Valencia. separate kingdom of that name, comprehends the modern provinces of Valencia, Alicante, and Castellon de la Plana.

VALENCIA, the capital of the above province, in a beautiful plain on the south bank of the Guadalaviar or Turia, 3 miles above its mouth, and 200 E.S.E. of Madrid. It is nearly circular in form, and is enclosed by an ancient wall, $2\frac{1}{2}$ miles in circuit, 30 feet high, and 10 feet broad, flanked by numerous towers, and entered by eight gates. The river, which is here reduced to a scanty stream by irrigation, is crossed by five wide bridges, having from ten to thirteen arches. The streets are for the most part narrow, crooked, and unpaved; but of recent years some broad and handsome streets have been laid out on the site of demolished churches and convents. Most of the houses are tall, flat-roofed, and very gloomy in appearance. The cathedral, built in 1262, on the site of a Roman temple of Diana and of a Moorish mosque, is not at all remarkable for its architecture, as it was originally Gothic, but has been modernized and spoiled by additions in the Corinthian style. The interior, however, is richly ornamented with sculptured marble, stained glass, and gilding; and contains some magnificent paintings by Spanish masters. The isolated belfry of the cathedral, 162 feet high, commands a wide and beautiful view of the town and vicinity. Of the numerous other churches in the town, the greater number are by no means distinguished for taste or beauty, but some contain fine paintings and other works of art. Near the cathedral stands the episcopal palace, which once had a large and valuable library, to a great extent destroyed during the French occupation of the town, and now only partially restored. Besides 14 parish churches, Valencia contains numerous convents, of which some have been suppressed, though many still remain. The university, founded in 1410, and attended by about 1600 students, occupies a large and handsome building, and has a valuable though not very extensive library. The number of professors is about 70, and the university is especially distinguished for the study of medicine. Valencia has also 6 colleges, and a number of inferior academies and schools. A picture-gallery, formed from the collections of the suppressed convents, has been established in one of them, called *Carmen*. It contains 600 or 700 paintings by Ribaltar and other artists of the Valencian school. Among the public buildings of the town, besides those already mentioned, there are a noble Doric edifice, where the court of justice sits; a large modern custom-house; a theatre; a poor-house; a palace, built by Charles III. for the knights of the order of Montera; and a citadel, built by the Emperor Charles V. to defend the city against the attacks of Barbarossa. Outside the walls there are a botanic garden, a bull-ring, a public promenade called *La Gloriata*, and a fine avenue leading down to the port of El Grao. The principal manufacture of Valencia is silk; and the town is also celebrated for its coloured tiles, especially blue, called *azulejos*. Linen and woollen cloth, hats, leather, paper, and glass, are also made here. The town is well supplied with fish, flesh, fruits, and vegetables, and enjoys a mild and agreeable climate. It has some commerce; but this is much impeded by the want of a good harbour, there being only a small roadstead in the river at El Grao, and another outside, which is very much exposed. Corn, rice, silk, saffron, oranges, and almonds, are the chief articles of export; while iron, hardware, timber, linen, and colonial produce, are imported. The town is ancient, having existed in the time of the Romans, under whom it had the rank of a colony. It afterwards fell into the hands of the Goths, from whom it was taken by the Moors in 714 A.D. From the Moorish sway it was rescued in 1094 by the Cid, from whom it is sometimes called *Valencia del Cid*. The Moors once more got possession of it in 1101, but were compelled finally to relinquish it in 1238. In 1808, the French made an unsuccessful attempt to capture it; but in 1812 they succeeded, and held it till June 1813. Valencia has several large and populous suburbs. Pop. (1857) 106,435. Valencia ‖ Valla.

VALENCIA, a town of Venezuela, capital of a province in the department and 80 miles W.S.W. of Caraccas, near the western shore of the lake of Valencia, or Tacarigua. It covers a large space of ground, and is generally well built, containing a parish church in the principal square. As it stands in a fertile region, and is connected by good roads with Caraccas and Puerto Caballo, Valencia is a place of considerable trade. Pop. 16,000.

VALENCIENNES, a fortified town of France, capital of an arrondissement in the department of Nord, 27 miles S.E. of Lille, at the confluence of the Rhonelle and the Scheldt. It presents, on the whole, a gloomy appearance, for the streets are very narrow and crooked, though the houses are for the most part well built. The most remarkable buildings are the town-hall, partly in the Italian and partly in the Gothic style, formerly adorned with a belfry, which fell to the ground in 1843; the church of St Géry; a handsome theatre; public library of 18,000 volumes; and the academy of painting, sculpture, and architecture. It is the seat of law-courts, a college, hospital, custom-house, arsenal, and barracks. The town is defended by a citadel constructed by Vauban. The most celebrated manufacture of Valenciennes is the lace to which it gives its name; but it also produces cambrics, lawn, muslin, hosiery, leather, beet-root sugar, toys, and earthenware; and has bleachfields, dyeworks, and an active trade in corn, timber, and coal. Valenciennes was the birthplace of the historian Froissart and the painter Watteau. It was taken in 1793, after a siege of six weeks, by the allied English and Austrian armies under the Duke of York. Pop. (1856) 20,905.

VALENTIA. See KERRY.

VALENTINIANS, a sect of Christian heretics, who sprung up in the second century, and were so called from their leader Valentinus. The Valentinians were only a branch of the Gnostics, who realized or personified the Platonic ideas concerning the Deity, whom they called *Pleroma* or *Plenitude*.

VALERIUS FLACCUS, CAIUS. SEE FLACCUS.

VALETTA. See MALTA.

VALLA, LORENZO, or LAURENTIUS, the greatest Latin scholar of his time, was born at Rome, according to Drakenborch, in 1407, but other authors date his birth some five or six years later. He was the son of a distinguished lawyer, and was educated in his native city under the charge of Aurispa. Valla subsequently taught rhetoric at Pavia, Milan, and Naples, with great acceptance. He was fortunate enough, while resident in the latter city, to gain the friendship of king Alphonso I., who subsequently saved him from the flames of the Inquisition, to which he was condemned for having maintained some heretical doctrine in a theological dispute with his opponents Beccadelli, Facius, and Poggio. While at Naples, the fame of Valla as a scholar and critic was greatly extended. Going to Rome, he became a canon of St John in the Lateran, but his literary and theological brawls compelled the pope to order him from Rome. He was the first to attack the accuracy of Livy at a time when he had as well have impugned the memory of the apostle Peter. He subsequently successfully justified himself before his holiness, and was appointed professor of rhetoric at Rome with a handsome salary. His works, which are partly critical and partly historical, are much sought after by scholars. His life was imbittered by the slanderous literary warfare which he waged against his opponents. He died at Rome in 1457 or 1465. Niebuhr the historian discovered his tomb in an out of the way part of the city of Rome, and caused it again to be replaced in the church of St John, Lateran. A detailed account of the life of Valla is given by Drakenborch in the 7th volume of his edition of *Livy*.

Valladolid. VALLADOLID, a province of Spain, Old Castile, bounded on the N. by those of Leon and Palencia, E. by those of Burgos and Segovia, S. by those of Avila and Salamanca, and W. by that of Zamora; area, 2984 square miles. It is throughout a flat country, except where a few hills interrupt the uniformity of the surface; and it belongs to the basin of the Douro, which flows from E. to W., and within the limits of the province receives from the N. the Pisuerga. The other rivers of the province are of smaller size, and the most important of them are the Duraton, Cega, Eresma, Zapardief, and Trabancos, joining the Douro from the south; the Egulda, joining the Pisuerga, from the east; and the Valderaduey, with its affluent the Seguillo, which cross the extreme north-west of the province, and join the Douro from the N. near Zamora. The country watered by these rivers is of great fertility, and produces corn, so excellent in quality and abundant in quantity, that it is sometimes called one of the granaries of the peninsula. Besides the ordinary kinds of corn and pulse, the province produces hemp, flax, fruits, red and white wine, oil, madder, &c. Some of the hills are covered with fine forests of oak and other timber, which is used for building, for firewood, and for making charcoal. The pastures are extensive; and large numbers of horses, cattle, and sheep are reared; while honey, wax, and silk are also among the productions of the country. The woollen fabrics made here were once highly esteemed; but this branch of industry has now very much declined, and the only manufactures at present in the town are those of paper, earthenware, leather, and hats. Some trade is carried on, facilitated by the canal of Castile, which traverses the province. Pop. (1857) 244,033.

VALLADOLID, a town of Spain, capital of the above province, on the left bank of the Pisuerga, at its confluence with the Esquiva, which flows through the middle of the town, 100 miles N.W. of Madrid. The site is a small valley, enclosed on all sides by rugged and steep though not very high hills. The town is surrounded by walls, and entered by four principal gates. It contains some imposing streets and squares; but has, on the whole, a very dull and deserted aspect. There is here an ancient palace, as Valladolid was before Madrid the residence of the court; but it is not very remarkable except for a splendid staircase and two fine quadrangles. The cathedral, begun in 1585, would be, if completed according to the original design of Herrera, a magnificent specimen of Greco-Roman architecture: but it has never been finished; and the only one of the four towers that was completed, having fallen to the ground in 1841, has never been rebuilt. The interior is still very fine, though it has been injured by incongruous additions, and deprived of many of its rich ornaments and plate by the French. Two of the finest specimens existing of Gothic architecture are to be seen at Valladolid, the convent of St Paul, with its magnificent sculptured portal, and the Dominican college of St Gregory, now used as the residence of the governor. Both of these were very much injured at the command of Bonaparte, but enough still remains to show what their former beauty must have been. The college of Santa Cruz, a fine classical building, contains a collection of paintings and sculptures from the suppressed convents, and has some of great value, though many of them are worthless. Another convent, San Benito, also remarkable for the beauty of its architecture, is now used for barracks. Besides those that have been suppressed, Valladolid has still many convents, sixteen parish churches, and several chapels. The university, founded in 1346, is one of the best in Spain: it excels chiefly in law, and has, about 1300 students. Among the other public buildings of the town are the court-house, town-hall, theatre, various schools and academies, a public library of 14,000 volumes, general and military hospitals, lunatic asylum, and poor-house. Along the banks of the rivers there are several public walks, adorned with trees and fountains. The principal articles manufactured here are silk cotton and woollen cloth, paper, leather, hats, earthenware, silver-work, and jewellery. A considerable trade is carried on in wine, oil, and silk, which are produced in the vicinity. Valladolid was called by the Romans *Pincia;* but when the Moors conquered Spain they changed its name to *Belad-Walid,* or the Land of Walid, whence comes the modern name. Under Charles V. and Philip II. it was a prosperous city, and the capital of the kingdom; but from the time that the court was removed to Madrid it began rapidly to decay. In December 1808, it was taken and sacked by the French; and in the January following Bonaparte resided here for some days, and caused the destruction of many fine buildings and works of art. At Valladolid Columbus died in 1506, and here Philip II. was born. Pop. (1857) 41,913.

Valladolid de Mechoacan ‖ Van.

VALLADOLID DE MECHOACAN. See MEXICO.

VALLS, a town of Spain, Catalonia, in the province and 12 miles N.N W. of Tarragona, in a plain watered by the Francoli. It is an antique, well built town, defended by ancient walls and towers, and entered by five gates. It has several good squares, but no very striking public buildings; the chief of them being a town-hall, church, and several convents. There are also here various schools, an hospital, and a prison. Valls is a thriving town, and manufactures woollen and cotton cloth, silk, leather, brandy, soap, &c. It has also several dyeworks, oil and flour mills, distilleries, and brick-kilns. The French here defeated the Spaniards in 1809, and afterwards sacked the town; but they suffered a defeat themselves near the same place in 1811. Pop. 16,084.

VALOIS, HENRI DE, or HENRICUS VALESIUS, one of the most eminent scholars and critics of the seventeenth century in France, was born at Paris of a noble family, in September 1603. His greatest work was the *Greek Ecclesiastical Historians* in 3 volumes. He died May 1676, and his life was written by his brother Adrian.

VALPARAISO, the principal seaport of Chile, is situated in a bay on the Pacific coast, Lat. 33. 1. S. Long. 71. 41. W. The harbour is well sheltered, except from the northerly gales, which only occur at intervals during the months of May, June, July, and August, and affords good anchorage. The town has risen rapidly in importance since the era of the independence of Chile. Its population has increased from 14,000 in 1820 to 70,000 at the present time. The principal commodities exported are the precious metals to a limited extent, copper, grain, flour, hides, and wool. The grain and flour are chiefly exported to Peru, occasionally to Australia, and sometimes to Great Britain. The wheat grown in Chile is of most excellent quality. Great Britain has the largest share of the import and export trade with Valparaiso, France and the United States following in importance. Some of the public buildings are substantial, and present a handsome appearance, particularly the ranges of custom-house stores, which are very imposing and very complete. Although liberty of worship is not tolerated by law in Chile, there are two Protestant chapels and a Protestant cemetery here, which are tacitly permitted on account of the large number of Protestant foreigners settled in the town. In 1855 there entered the port 1267 vessels of 361,743 aggregate tonnage; and there cleared 1239 vessels of 347,858 tonnage. A railroad now constructing will shortly connect Valparaiso with the capital.

VAN, a town of Asiatic Turkey, capital of an eyalet on the east shore of the Lake of Van, 145 miles S. E. of Erzeroum. It is situated at the southern foot of an isolated rock on which the citadel stands, and is enclosed by a double line of walls. The principal public buildings in the town are four Armenian churches, several mosques, small but

Vanbrugh. well supplied bazaars, caravanserais, baths, and the citadel, which, if in good repair and well defended, would from its position be almost impregnable. Cotton fabrics are manufactured here, and a considerable trade is carried on in them and the produce of the surrounding country. Pop. variously estimated from 12,000 to 40,000; probably about 20,000. The Lake of Van is of a very irregular shape, about 70 miles long by 28 broad. Its elevation above the sea is 5467 feet, and its depth in some places is very great. It receives the water of numerous rivers, but has no visible outlet. The water is salt, except near the mouths of the rivers, where, though brackish, it is fit for drinking. The only fishery here is that of sardines.

VANBRUGH, Sir John, one of the most celebrated dramatic authors, as well as one of the most eminent architects, of his day. The different biographers[1] vary importantly as to the place and date of his birth, and to the origin of his family, some stating he was born at Chester, and others at London; and some attributing to him an English, and others a French or a Dutch extraction. The account, however, which he gives of his family in his petition for an exemplification of arms, and in his own pedigree attached thereto by himself, now in the Heralds' College,[2] are no doubt to be relied on, especially as in the former a careful inquiry seems to have been made by the acting authorities, who at that time appear not to have had the most friendly feeling[3] towards him. It says—

"Vanbrugh of Ghent, in Flanders, gent., fled from thence into Holland, upon accompt of the Duke of Alva's persecution, tpe Eliz., where he continued till his death.

"Giles Vanbrugh, of London, merchant, born at Ghent, in Flanders, and first came over into England about the latter end of Queen Elizabeth's reign; he died anno 1646, and was buried in the vault in St Stephen's Wallbrook (which he purchased of the parish), 21 June 1646.

"Giles Vanbrugh, of ye city of Chester, Esq., 3d son, a justice of ye peace there, was born in St Stephen's Wallbrook, and there baptized 27th April 1631; he died at Chester circa annum 1689, and was there buried."

This was the father of the subject of our biography, who is said to have carried on the business of a sugar-baker at Chester. In Tong's *Life of Matthew Henry* (1716, p. 75), he is described "as one of those worthy gentlemen that had habitations there," and who, though of the Church of England, were in the habit of hearing Mr Henry's week-day lectures. That he was a man of some note may also be gathered from the fact that he is called esquire in Blome's *Britannia*; that old Fuller dedicated a portion of his Pisgah-sight to him, prefixing his arms thereto; and that he was of sufficient standing to aspire to the hand of the youngest daughter of Sir Dudley Carleton,[4] whom he married, and who bore him eight sons (of whom John was the second) and six daughters. Various dates have been assigned to his birth as well as places. The register of his death in 1726, at the age of 60, however, fixes the former at 1666. The cities of London and of Chester dispute the latter. The Chester registers, however, have been lately searched, and the baptisms of all the rest of the family, seven of the sons and the six daughters, are therein found, but not that of John. We have also searched the register of St Stephen's Wallbrook, which breaks off at the period of the fire of London, and is blank till the rebuilding. The biographical account prefixed to the collection of his plays, published in 1759, expressly says that "he was born in the parish of St Stephen's Wallbrook, in 1666." If so, it was probably shortly before the great fire, and though born there, he may have been baptized afterwards in the nearest place where his parents found shelter from its ravages. Vanbrugh.

There is no record of his education, but the known wealth of the family, and the internal evidence of his writings, would lead us to believe that it must have been liberal, and that he must have profited largely from it. The different biographies, like most of those of the period, contain mere statements without citing authorities. We however gather from[5] them that he chose the military profession, and went into the army as an ensign at the age of nineteen;[6] we find that he obtained the rank of captain, by which he was designated by many writers till as late at least as the date of Rowe's imitation of Horace[7]. It is said that, being a very agreeable man, and having great wit, he became acquainted with many important persons, among the rest with Sir Thomas Skipwith, who happened to be in the same winter-quarters, and who, it appears, possessed a large share in the theatrical patent at Drury Lane. Finding he had a number of loose sheets of parts of plays which exhibited great talent, he urged him to complete one, and used his interest to get it put upon the stage. This play was *The Relapse*, which Cibber tells us was written in three months, and ready for performance in April, but the season being far advanced, was not acted till the succeeding winter. It, however, had such extraordinary success, that it at once placed him high in the rank of dramatic writers.

This, however, was in the year 1697, and must have occurred after some other important events of his life. Unfortunately his early biographers have been wits who recorded either with zest or envy his dramatic history, and took no pains about his professional career. It is curious that we have no account of the studies or education of three of the greatest architects Britain has produced—Wren, Vanbrugh, and William of Wykeham, although of many lesser men we have full accounts of their courses of study and their preceptors. It is, however, recorded of Vanbrugh that he went into France early in life, and that at some subsequent period he was imprisoned in the Bastille, and that in 1695, two years before the production of *The Relapse*, he was made secretary to the commissioners for completing[8] Greenwich Hospital on the nomination of the celebrated John Evelyn. On the first event all biographers are agreed; the second is certainly true, as he mentions it in

[1] The principal biographies are by Cibber (*Lives of the Poets*); a short notice prefixed to his plays in 1759; Allan Cunningham (*Lives of Painters*, &c.); Leigh Hunt (prefixed to the works of Wycherly, Congreve, Vanbrugh, and Farquhar, Ed. Moxon, London, 1840); and the English and French biographical dictionaries. These all seem to have been compiled without any reference to original documents.

[2] See also among the MSS. of Anstis, now in the British Museum. Addl. MSS. 9011, p. 346, et seq.

[3] See infra.

[4] Of Imber Court, Surrey, a very old family.

[5] Cibber, vol. iv. p. 100.

[6] Some of his biographers talk of his "heroic mania," and that he soon quitted the army; but it must be remembered that almost every young gentleman served some campaigns; in fact it was a sort of completion of a polite education in those days. There is no sort of reason to believe he quitted the army suddenly. He must have served some time to have attained the rank of captain under any circumstances.

[7] Imitation of Horace and Lydia:—

"I'm in with Captain Vanbrugh at the present,
A most sweet-natured gentleman, and pleasant;
He writes your comedies, draws schemes, and models,
And builds *dukes'* houses upon very odd hills."

This must have been subsequent to the building Blenheim in 1706.

[8] 1695, May 21. In the *Diary* of this date Evelyn records the survey of Greenwich with Sir Robert Clayton, Sir Christopher Wren, and others; on the 24th that they reported, and on the 31st "met again. Mr Vanbrugh was made secretary to the commission by my nomination of him to the Lords, which was done that day."

Vanbrugh. his letters, and as he built a house for himself at Greenwich in imitation of that style of architecture, and called it Bastille House. At what period, however, this imprisonment took place, we are not informed.

The account given by Cibber, or rather his editor's,[1] in the *Lives of the Poets*, is, that "curiosity induced him to visit France, where his taste for architecture excited him to take a survey of the fortifications in that kingdom. When he was one day surveying some fortifications with the strictest attention, he was taken notice of by an engineer, secured by authority, and then carried prisoner to the Bastille at Paris." The biographer goes on to say, that he was treated with "gentleness and humanity, and found his confinement so endurable, that he amused himself in drawing rude draughts of some comedies. This circumstance raising curiosity in Paris, several of the noblesse visited him in the Bastille, when Sir John, who spoke their language with fluency and elegance, insinuated himself into their favour by the vivacity of his wit and the peculiarity of his humour," and that by their intercession he was set at liberty.

Now a "visit" to France could not have taken place in war-time, nor can we suppose the event happened while he was on active service, as in that case he would have been shot as a spy, and not sent to the Bastille as a state prisoner. It must therefore have taken place either before the declaration of war by the allies in 1689, or after the peace of Ryswick in 1697. This was the year in which *The Relapse* first appeared, which he says in the prologue[2] "in too much haste was writ," and afterwards "'twas got, conceived, and born in six weeks' space." Our limits will not permit us to go at any great length into the inquiry: the probability however is, this captivity, which seems to have been the means of changing his fortunes, actually did take place in 1697, early in which year hostilities had ceased, although the treaty was not signed till September.

The third important circumstance to which allusion has been made, his appointment as secretary to the commissioners of Greenwich Hospital, speaks highly in his favour. It was an honourable position to be associated with such men as Tennison, Somers, and Wren, and perhaps still more so to have been introduced to them by John Evelyn. This great and good man was then in his seventy-fifth year. During his long and useful life, he had always been the patron of rising merit, and ever the opponent of the dissolute and dishonourable. Unlike many good men, however, his days had not been devoted to a cloister, but had been passed in active life. In his youth he had served as a soldier in Holland: he had travelled afterwards wherever knowledge could be gained, or taste could be refined and purified, and had frequented the court as well as the learned meetings of the Royal Society. It speaks very highly for the talent and character of the young Captain Vanbrugh that he should have been taken by the hand by such a man. If tradition be correct that he always had a turn for architectural studies, it is probable that his new position improved and confirmed him in them. But we must now pursue his history as a writer.

At the request of Halifax, he then wrote the *Provoked Wife* for the theatre in Lincoln's-Inn-Fields. This, if possible, had a greater run than the *Relapse*. The rich racy wit of the dialogue, and the originality and humour of the situations, drew forth the most clamorous applause; while, what we now all regret, the grossness of much of the language, and the immoral tendency of the plot, were in those Vanbrugh. days anything but bars to success. The stage then was in a very bad state. Not only were the plots of the dramas extremely immoral in themselves, but the dialogue was grossly indecent; so much so, that no lady could be present without a mask either to hide her blushes, or disguise the want of them. It is true that Vanbrugh was not worse than many other writers, nor in fact so bad. There are plays of Beaumont and Fletcher, of Dryden, Wycherly, D'Urfey, Behn, and a host of others, much worse than the *Provoked Wife*. But the cup was becoming full; profanity and indecency had passed for wit long enough; and people began to weary of breathing so foul an atmosphere. The first blow came from an unexpected quarter, and with unexpected force. It was given by a non-juring divine named Jeremy Collier, who had previously made himself notorious by his conduct at the execution of Parkyns and Friend,[3] for a conspiracy to murder the king. He published a little book, entitled *A short View of the Immorality and Profaneness of the Stage;* and a very curious work it is, written with great point and spirit; in fact, with more wit than many of the plays he attacked; but it is a curious image of the writer's mind. As to the first point of objection, he certainly does not say too much—in fact he could not—but his views as to profanity are very much strained and far-fetched. He cannot endure the slightest allusion to a priest, or anything approaching a religious designation. He attacks Dryden because he puts a wicked friar on the stage as a character;[4] because one of his scenes opens in a chapel; because one of his heroes, a Turk, speaks of the month Abib;[5] because an admirer of Spartan virtue[6] stigmatizes the gross superstition of the Egyptian priests and their "grass-eating god." He prefers Ben Jonson to Shakspeare in point of purity of writing, though there is ten times more indecency in *Bartholomew Fair* than in all that the latter ever wrote, nay, although he is incomparably the purest writer of the age; but then Ben Jonson had never put a clergyman on the stage, while Shakspeare had been so irreverent as to give the characters of Sir Hugh Evans and the curate in *Love's Labour Lost;* the former, by the way, a most amiable, and the latter, a most innocent character. He is furious with D'Urfey, because one of his *dramatis personæ* comes in disguised as a peasant, singing the old harvest-song—"We've cheated the parson, we'll cheat him again," and becomes almost ludicrously pathetic when he estimates how many pounds' worth of tithes will be lost to the clergy by the singing this pestiferous stanza. He censures Congreve because one of his characters named Sampson alludes to the strength of his namesake, and is reminded by another that very strength was the cause of his death. In fact, such innocent jokes as Sydney Smith fired off every day in his life would have been to Collier[7] the very depths of profanity. In spite of all this, there was too much truth in the book to be passed over; and Congreve and Vanbrugh, who had been made the objects of special attack, both published defences. That of the latter is a short and temperate reply; first of all showing that Collier had very much exaggerated all he had said; and next, that the poet must draw the world as he finds it, and means no harm in putting into the mouths of his characters such words as are used by them in every-

[1] Cibber, Lives, vol iv. p. 106. Much misunderstanding has arisen as to these Lives. The authenticity of their authorship has been questioned; but it must be remembered it is specially stated on the title-page they are "by Mr Cibber, and several other hands." And in this very biography (p. 103) the author says,—"Mr Cibber observes," and (p. 109) "Mr Cibber takes notice," &c. The truth probably is, that Cibber commenced the Lives from fragments collected by Mr Coxeter, and that the work was finished at his death by his son, assisted by some friends.

[2] The *first* prologue; a second was written after the third night.

[3] He gave them formal absolution on the scaffold, just before their execution. See Macaulay's *History*, vol. iv. p. 679.

[4] The Spanish Friar.

[5] Siege of Granada. Dryden probably remembered the Hebrew title of the month, and did not trouble himself to search for the Arabic name.

[6] Cleomenes.

[7] Collier certainly has the merit of being the first person who attempted to purify the stage; but it was a work of time, and carried out rather by public feeling than the labours of any one person.

Vanbrugh. day life. He also published the *Relapse*, with a preface, in which he says:—

"I believe with a steady faith there is not one woman of a real reputation in town, but when she has read it impartially over in her closet, will find it so innocent, she'll think it no affront to her prayer-book to lay it upon the same shelf."

It seems difficult to believe him in earnest when we read the play; but Smollett seriously claimed the same character for *Roderick Random* and *Peregrine Pickle;* and at the present day some of the French novelists, who are really worse than the old writers, do the same. We say really worse, because they do *not* delineate things as they are, as the old writers did. While this is truthfully done, whatever vice may be displayed, the ascendency of honour, virtue, and honesty, in the long-run, must also be displayed; but the modern French writers are not truthful, though they may be graphic: they varnish and draw a coloured veil over vice; and as long as they use words of scrupulous decency, care not what may be the tendency of the things they relate. As to Vanbrugh, the controversy may be best summed up in the words of his French biographer.[1] "Unfortunately the greatest license reigned on the English stage at that time, and it was unreasonable to expect a young soldier to set up for a moral teacher." He however made the attempt, and in the same year wrote *Æsop*.

This was a play, the plot of which was borrowed from the French.[2] A number of characters bearing the stamp of the different vices and follies of the day are brought before the fabulist, who converses with them, gives them good advice, and ends by relating a fable in verse, suited to the case of each. The play is full of spirit and wit, as well as instruction. The fables are really better than those of Gay, both in idea and in versification. Indeed, Pope complimented him afterwards, by telling him he had caught the true spirit of La Fontaine. But, alas! for the moralist. The town could not endure to be corrected or taught, and, after a few nights, *Æsop* was banished from the stage. An adaptation of Fletcher's *Pilgrim*, produced two years after, seems to have had a better fate.

We must now take leave of him for a short time as a wit and a poet, and follow his career as an architect, wherein, spite of his detractors, he was equally successful. The first notice we have of him in this capacity is in 1702, when he furnished the design for Castle Howard for the Earl of Carlisle. Why he should have been selected for such an important work, we cannot divine. There was no lack of architects in those days. Wren, though seventy years of age, was in his full vigour. Talman had finished Chatsworth, Thorsley, and Dyrham. Wynn was engaged on Buckingham House; and Gunnersbury, Marlborough House, Roehampton, Cliefden, were all built within a few years of this period. Be this as it may, Vanbrugh here gave the first proof of his architectural genius. In endeavouring to avoid[3] the rudeness of Gothic "magnificence," the "flutter of flying buttresses," "the uselessness of pinnacles," "the discord of oblique lines," our architects, with the exception of Wren, had fallen into a cold, tame, flat style, making square blocks of their buildings, without those decided masses which cast bold shadows and give so much breadth. They affected horizontality, and strove as much as they could to get all the various departments of the house into one solid block. Such, too, was the passion for uniformity, that all sorts of expedients were resorted to Vanbrugh. to make one half the building exactly like the other, and false windows and doors, screen-walls and parapets, and all sorts of shams, were used to "balance" the points of the design. We seem now to run into the opposite extreme, and to go out of our way to make things irregular. Windows are made of various heights, and oriels are stuck here and there without meaning or any use, except for the studied purpose of making the building irregular, or, to use a common phrase, lop-sided. Vanbrugh avoided both errors. At Castle Howard he separated the subordinate buildings, and arranged them round the principal structure in a series of regular but picturesque groups. Even the laundries and breweries were not concealed, and were surmounted by domes, which served at once for ornament and the purposes of ventilation. Instead of striving to hide his chimneys, he clusters them together, and makes them, as well as his roofs, the means of breaking and enriching the sky-line. The main building is entered by a lofty portico, from which we pass into a noble hall lighted by a cupola a hundred feet in height, and from which lengthened corridors extend, leading to numerous suites of fine apartments. Our limits will not permit a further description. Suffice it to say, that this picturesque but at the same time symmetrical building presents a frontage of 660 feet, or 130 feet more than the entire length of Westminster Abbey, and, with the exception of Blenheim, is the noblest palace in the kingdom.

The Earl of Carlisle was then the acting earl-marshal of England, during the minority of Thomas, duke of Norfolk, and as a token of his approbation of the talent of his architect, he appointed Vanbrugh to the high and lucrative situation of Clarenceux king-at-arms. As there is a rule at the college that every candidate must be a herald before he can become a king-at-arms, Vanbrugh was first created Carlisle herald,[4] a title which had been obsolete some years. His patent for this, as appears by the heralds' books, is dated 21st June 1703; that as Clarenceux, the 9th February 1725. We learn from Anstis[5] that the college petitioned against the appointment, but on what grounds does not appear. The chapter-books would probably show; but as they contain so many confidential matters relative not only to the college but to different families, they are very properly kept from the public eye. A good deal has been said as to this appointment, and Vanbrugh and his patron have both been accused of jobbing. It was no unusual thing at that time, in the college, to pass one man over the head of another, and also to elect to higher offices without passing through the lower. Camden[6] was created Richmond herald one day, and Clarenceux the next: Borrough,[7] in like manner, Mowbray herald, and then Norroy; and even St George[8] would have been created king-at-arms *per saltum*, but his friends urged him to accept the offices of Berwick pursuivant and Windsor herald some little time before he assumed the crown of Norroy. For many years there had been a struggle in the college in favour of the slow promotion of seniority as against that of talent. As long back as the time of James I., Glover[9] had written against the former course, and is said, when remonstrated with by the other party, to have answered, "that every great fat calf did not turn out a good cow." Anstis and Brook seem to insinuate Vanbrugh's ignorance of heraldry: the latter[10] hints at it; the former[11]

[1] *Biographie Universelle.*

[2] From Boursault. It was at first vigorously opposed at Paris, but ultimately was very successful there.

[3] See the reports of the commissioners in the *Parentalia*, Appendix.

[4] Anstis (see MSS. before cited) says he was created Carlisle, 25th June 1703, 2° Annæ; Clarenceux pat. dat. 29th March, 3° Annæ the warrant for creation 30th Mar. 1704; and that he was created at the Heralds' Office by the Earl of Essex, deputy to Lord Carlisle.

[5] Ibid. p. 1512. [6] Noble's *History of the College of Arms*, p. 204. [7] Id. p. 219. [8] Id. p. 237.

[9] See Anstis as above, and Noble, page 181.

[10] *De Vitis Fecialium*, MS., vol. ii. p. 141. "He seems to have had no taste for heraldic studies."

[11] Anstis (ut supra), "but whether this function hath been foreign to his genius as requiring some wisdome and understanding for the discharge of it". . . Here our author leaves off abruptly. These MSS. of Anstis are very curious, and very little known.

Vanbrugh. drops his pen in the middle of a sentence. How matters may have gone within the walls at Doctors' Commons, we cannot say. It appears, however, from their archives, he was a frequent attendant at the college, signing his name in the book like the others. A far more important circumstance is, that he was honoured by Queen Anne with the commission to convey the insignia of the order of the Garter to the King of Hanover, which he executed in 1706, three years after his first entrance into the college. It is difficult to believe that a man of such witty and pleasant spirit could be at enmity with his brethren for twenty long years, and still more so, that a young and talented man did not acquire some knowledge of the art he professed. Some say he laughed at heraldry; but this seems founded only on the fact, that in *Æsop* he is very severe on the forgers of pedigrees and genealogies. They have to this day a fine portrait of him by Richardson, which occupies the post of honour in one of the rooms of the college.

About this time he was actively engaged in his great work at Blenheim, which, in spite of all that has been said of it, is the finest palace of the style in the kingdom. It has all the excellencies of Castle Howard, with fewer exaggerations. Its site is on a rising ground in the beautiful park of Woodstock, the favourite resort of our monarchs for many ages. Before it is a magnificent lake, crossed by a triumphal bridge. The body of the house itself is about as long as the river-front of Somerset House. But the entire façade, including the chapel, orangeries, &c., is between 800 and 900 feet in extent, or about half the length of Pall Mall. The building must be seen to conceive its grandeur. The garden-fronts are all equally beautiful, but of a softer magnificence than the main elevation. Unlike many other edifices, it pleases equally from any point of view. Our space forbids a lengthened description; but we cannot omit to quote shortly the opinion of the celebrated Uvedale Price.[1]—"It appears to me that, at Blenheim, Vanbrugh conceived and executed a very bold and difficult design, that of uniting in one building the beauty and magnificence of the Grecian architecture, the picturesqueness of the Gothic, and the massive grandeur of a castle, and that, in spite of faults, he has formed, in a style truly his own, and a well combined whole, a mansion worthy of a great prince and warrior."

So much and such varied success naturally attracted envy. The rival wits, however, dreaded to meet Vanbrugh at their own proper weapons. They had seen enough to know that "he was cunning in fence." His buildings, however, offered safer game. Alas! for the architect; nothing is so easy as to throw dirt at his works. As Falstaff says, "men of all sorts take a pride to gird at him." Everyone, however ignorant of art, can liken them to something ridiculous and incongruous, and so raise an empty laugh. With the graver critics they are always "too" something; too light, too heavy, too high, too low, and very often (and this was Vanbrugh's case) both opposites at once. With the former, a house is like a dog-kennel, a pie, a coal-scuttle, a flat candlestick, a piece of floorcloth, or something equally absurd. The foremost in attack among the wits was the famous Dean Swift. Jonathan hated, or fancied he hated, Vanbrugh, first, because he was a successful humorist; and, secondly, because he was "a puppy and a whig." Vanbrugh. His attacks were in two sets of verses,[2] brilliant enough in their way, and he (knowing nothing of what he was writing about) thought himself safe by taking the "too little" line. Accordingly, the building is compared to a "goose-pie," a "snail," a "chaise," a "tilt in a boat," a "house of cards," and last, and nearly least, a "mouse-trap." The other critics took the "too large" line, "huge heaps," "cumbrous quarries." Every simile that could express ponderosity was raked up: at last came the well-known epitaph—

> "Lie heavy on him, earth, for he
> Laid many a heavy load on thee."

It seems inconceivable that two such opposite sets of opinions could at the same time be popular; but such is envy: it matters not how absurd or self-contradictory a saying may be, it will meet with admirers, if it is only acidulated sufficiently by the spirit of detraction. It appears that Vanbrugh remonstrated with Swift[3] on the subject, who made him afterwards ample amends in the preface[4] to his Miscellanies.

A more serious trouble, however, arose out of the building Blenheim than the joint attacks of all the wits. The palace had been originally voted by parliament; but with a meanness and ingratitude that is scarcely credible, they would not provide the money to pay for what they had formerly voted. Whatever faults Marlborough might have had, he had saved his country, nay, Europe, from the ambition of the French monarch, by a series of the most brilliant victories. If he had not deserved the gift, it should not have been voted; but having by a formal act decreed it should be given, it was a mean mockery to withhold the money to pay for it. The queen, however, with a generous spirit, provided the funds from her own private purse during her life. At her death, the duke, though always protesting, occasionally continued to pay the workmen, believing ultimately that he should be reimbursed by the treasury. It was before the age of "cutting" contractors, and "run-up" work. The custom then was for the architect to employ such workmen as he thought fitted for the job, to pay them himself, and to call on his employer from time to time for money as it was wanted. It may be thought the parliament had been guilty of a consummate meanness in refusing supplies to carry out its own vote; but this meanness was outdone by the duke, or rather the duchess, who ruled him and every one else with a brazen sceptre. The worthy pair actually refused to pay the workmen,[5] who, of course, were obliged to look to Vanbrugh, from whom they had received their orders. That both the duke and duchess were stained with avarice to the core, and that the latter was a fury in temper, and a savage in resentment,[6] is well known, but that they should have the gross injustice to expect their architect to pay their debts, and make them a present not only of his services, but of the house they were to live in, is absolutely inconceivable. It seems that Vanbrugh had actually advanced L.2000 (a large sum in those days, especially for an author to advance) on account of Blenheim, at the time they thought proper to quarrel with him. In

---

[1] *Essay on the Picturesque*, vol. ii. p. 211.

[2] Entitled, *Vanbrugh's House*, and the *History of Vanbrugh's House*.

[3] *Journal to Stella*, Nov. 7, 1710. "I dined to-day at Sir Richard Temple's with Congreve, Vanbrugh, Lieutenant-General Farrington, &c. Vanbrugh, I believe I told you, had a long quarrel with me about those verses on his house; but we were very civil and cold. Lady Marlborough used to tease him with them, which made him angry, though he be a good-natured fellow." We find from the *Journal* he dined with him again the next day.

[4] "In regard to two persons only, we wish our raillery though ever so tender, or resentment though ever so just, had not been indulged. We speak of Sir John Vanbrugh, who was a man of wit and honour, and of Mr Addison, whose name deserves all respect from every lover of learning."

[5] Vanbrugh says, in a letter to Tonson, "I have the misfortune of losing—for I now see little hopes of ever getting it—near L.2000 due to me for many years' service, plague, and trouble at Blenheim, which *that wicked woman* of Marlborough is so far from paying me, that the duke being sued by some of the workmen for work done there, she has tried to turn the debts due to them upon me, for which I think *she ought to be hanged*."

[6] See her character by Pope under the name of Atossa.

Vanbrugh.

the mean time the duke died, leaving the duchess not only an immense fortune, but a special sum of L.10,000 per annum to finish Blenheim.[1] This the duchess did, being wise enough carefully to follow out Vanbrugh's plans, though she not only excluded him from any direction of the works, but absolutely prohibited his being admitted to see the building, although accompanied by his fast friends the noble Howards.[2] It is very satisfactory, however, to find he at last got his money, "in spite," as he says, "of the hussy's teeth."[3]

About the time that Blenheim was begun, Vanbrugh, in connection with the celebrated Congreve, formed the project of building what Cibber calls a stately theatre in the Haymarket. The money was raised by subscriptions of L.100 each, and great expectations were formed as to its success. The first stone, in which was the quaint inscription, "Little Whig," was laid by the Countess of Sunderland, one of Marlborough's daughters, a lady, Cibber says, of extraordinary beauty, then the celebrated toast and pride of that party. The theatre was opened by an opera, which was withdrawn after the third night. This was followed by one of Vanbrugh's best comedies, the *Confederacy*. The plot was taken from the French of Dancour, but in every other respect it is perfectly original. The wit and humour that ran through the whole piece are of the very first quality, and the dialogue as brilliant as anything of that day. The play has been a favourite, and kept the stage till within a short period. Unfortunately the new house was so large, and surmounted by so vast a dome, that the actors could not make themselves properly heard. The consequence was, that everything fell flatly on the ear. Congreve, after contributing a prologue or two, backed out of the concern, leaving the whole weight on Vanbrugh. He fought against the difficulties as well as he could, and adapted three of Molière's best comedies to the English stage, but with no better success, owing to the same cause.[4] Ultimately he made an arrangement with a regular theatrical manager named Owen Swinney, and let the theatre at a maximum rent of L.700 per annum.[5]

He was now in full practice as an architect, and built Eastbury in Dorsetshire, now pulled down; King's Weston near Bristol; Easton Neston in Northamptonshire; a large house for Mr Duncombe in Yorkshire; Oulton Hall in Cheshire; Seaton Delaval in Northumberland;[6] besides a great many buildings of less importance. In 1714, he received the honour of knighthood, and, in 1716, was made surveyor of works at Greenwich Hospital, and comptroller-general of the royal works, and surveyor of the gardens and waters. About this time he married Henrietta Maria,[7] daughter of Colonel Yarborough of Haslington near York, by whom he had three children, two of whom died in infancy[8]. The other was an ensign in the guards, and died of wounds received in the battle of Fontenoy. He had strong hopes of becoming Garter king-at-arms, but finding the younger Anstis had a reversionary grant of the appointment, he resigned[9] his post of Clarenceux to Knox Ward, after having held it upwards of twenty years. He himself died of a quinsey, at his house in Whitehall, on the 26th of March 1726,[10] leaving the celebrated comedy of *The Provoked Husband* in an unfinished state. It was very cleverly completed by Cibber, who says in the preface, he has not altered one word of the portion written by Vanbrugh.

Vancouver Island.

In appearance, we are told by Noble, he was "a fine, elegant, manly person." His character may be gathered from what has been said before. Spence says of him, "Garth, Vanbrugh, and Congreve were the three most honest-hearted, real good men of the poetical members of the Kit-cat Club." Cibber says, "As he lived esteemed by all his acquaintance, so he died without leaving one enemy to reproach his memory; a felicity which few men of public employments, or possessed of so distinguished a genius, ever enjoyed."

The pen seems to linger as we get nearer the close of the short delineation of the life and character of this talented, warm-hearted, and prosperous gentleman. Enough has been said of his wit and poetic talent. His characters are strictly drawn from nature, and his language is so easy and unaffected, that the actors agreed that no author gave so little trouble to study.

Of his genius as an architect, enough also, perhaps, has been said; except we conclude with the opinion of the great Sir Joshua Reynolds:—"He had originality of invention; he understood light and shadows, and had great skill in composition;" and he adds, "this is the tribute which a painter owes to an architect who composed like a painter. (A. A.)

VANCOUVER ISLAND, a British possession, lying off the W. coast of North America, between N. lat. 48. 20. and 51., W. long. 123. and 128. 20.; separated from the mainland by Queen Charlotte Sound, the Gulf of Georgia, and Juan de Fuca Strait. It is of an irregular oblong form, stretching from N.W. to S.E. Its length from Cape Scott to Point Gonzales is 270 miles; its greatest breadth 70 miles; its mean breadth from 40 to 50; and its area estimated at 16,000 square miles. The general appearance of the island is by no means attractive. The coasts consist for the most part of steep cliffs, against which the sea dashes impetuously, and breaks itself into foam and spray at their feet. Almost immediately behind rise a uniform series of rounded hills, densely covered with pine forests; while the back-ground of the scene is filled up with a serrated ridge of bare mountains, which run like a backbone through the middle of the island from end to end. The interior, so far as it has been explored, consists of a mass of rocks and mountains; and of the level ground, which lies for the most part along the coasts, by far the greater part is covered with wood, although the portions that are clear have generally a very fertile soil. There are many small bays, harbours, and inlets along the coasts; and in the interior are some small rivers and lakes, but none of any

[1] In another letter to Tonson, Vanbrugh says that the duke's property "exceeded the most extravagant guess. A round million has been moving about in loans on the land-tax, &c., exclusive of his land, his L.5000 a year upon the post-office, mortgages, South Sea stock, annuities—many in foreign banks—and yet," says Vanbrugh, "this man could neither pay his workmen their bills nor his architect his salary."

[2] He says the duchess got information that Lady Vanbrugh was to be of the party, and "sent an express the night before we came there, with orders that if *she* came with the Castle Howard ladies, the servants should not suffer her to see either house or garden, or even enter the park; so she was forced to sit all day long, and keep me company at the inn." It seems difficult to comprehend such petty spite.

[3] This, he says, was through the assistance of Sir Robert Walpole.

[4] Cibber says, "However well executed these pieces were, yet they came to the ear in the same undistinguished utterance by which almost all plays had equally suffered; for, as few could plainly hear, it was not likely a great many would applaud."

[5] It is not improbable, however, that the concern may have suffered from a want of business knowledge, which is only found in professed managers. It is very rare indeed that either actors or authors have been successful in such speculations.

[6] The greater part of them are published in the well-known *Vitruvius Britannicus*.

[7] Some say she was twenty years younger than himself; but Lady Mary Wortley Montague, in one of her lively letters, writes, "You know Van.'s taste was always odd; his inclination *to ruins* has given him a fancy for Mrs (Miss) Yarborough." He must have been about five and forty at the time.

[8] Noble says he had a daughter who married Sir Wm. Baker.

[9] The surrender is recited to be on the 9th February $172\frac{4}{5}$ in the patent passed to Knox Ward, 28th June 1725. See Anstis.

[10] The register book of St Stephen's Wallbrook runs thus:—"1726, March 31, was buried Sr John Vanborough in ye North Isle."

Vandervelde.

considerable size. The prevailing geological formations are gneiss and mica schist; but towards the S.E. extremity strata of limestone and sandstone occur; and among the mountains of the interior there are many blocks of granite and dikes of trap. In the central part of the island the hills are steep, rugged, and in many cases bare; the valleys narrow and shallow; and the soil such as to be of very little use. The scenery is wild without being romantic, and has neither beauty nor sublimity to attract the traveller; but some of the fertile spots along the coast are of a very different and superior character. The climate is in general agreeable and healthy. There are two seasons, a dry and a rainy. The former lasts from April to September, during which time the heat is excessive, and no rain falls. In the rainy season, from October to March, there is generally a great deal of snow and rain, but the seasons are not very certain. The *flora* of the island is very poor, and includes no plants that are not to be found elsewhere. The principal plant is the *camass*, which has an esculent root like an onion, and is a favourite article of food with the natives. Besides this, they live principally on dried salmon and potatoes, the latter of which are probably not indigenous, but have been introduced by some of the early traders. Of wild beasts, bears, wolves, panthers, and deer, are the principal; and of birds, there are several species of grouse, woodpeckers, and a great variety of water-fowl. The most important mineral in Vancouver Island is coal, of which there are extensive and valuable seams at many places. These have already been worked to some extent. The extent of land in the island that has been appropriated was, in 1853, 19,807 acres; of which 10,172 were claimed by the Hudson Bay Company; 2374 by the Puget Sound Company; and the rest by private individuals; but of this land there are not more than 400 acres actually under culture. In these, excellent crops of wheat, barley, oats, pease, beans, turnip, and potatoes, have been raised; and the land is especially favourable to the growth of green crops. The most of the arable land lies in the neighbourhood of Victoria, at the S.E. extremity of the island, and there the majority of the settlers live, the rest being at Fort Rupert and Nanaimo, on the N.E. coast, where the principal coal mines are. All along the ocean-coast of the island the fisheries are very valuable; salmon and herrings abound to an extent almost unknown elsewhere, and mackerel and cod are also found. The produce of these fisheries, along with the coal and timber, form the principal resources of the island, as it is not at all adapted for pastoral, and only partially for agricultural purposes. The exports in 1853 included 1492 tons of coal, 16,500 cubic feet of squared timber, 150,800 feet of piles and spars, 10,000 square feet of lumber, 1000 bushels of oysters, 3540 barrels of salmon, and 200 barrels of oil; and amounted in value to about L.14,350; the value of the imports for the same year, consisting chiefly of specie, provisions, and various merchandise, being estimated at L.12,920. The aboriginal inhabitants, who belong to several different tribes, are in a very savage condition. Their total numbers are estimated at 17,000; while that of the settlers in 1853 amounted to about 450; but it is probable that, since the discovery of gold on the adjacent mainland of British Columbia, a great many more settlers have been attracted to Vancouver Island. Until 1789 this island was believed to form part of the mainland, but then an American captain sailed round it; and in 1792 Captain Vancouver visited it, and gave it the name of Quadra and Vancouver Island, the former of which titles, given in honour of the Spanish commandant of Nootka Sound, is now generally dropped. Vancouver Island was granted in 1848 to the Hudson Bay Company, on condition of their colonizing it.

VANDERVELDE or VANDEVELDE, WILLIAM, usually called the Younger, to distinguish him from his father whose name he bore, and whose profession he followed, but who achieved a much greater fame as a marine-painter, was born at Amsterdam in 1633. He was originally taught by the elder Vandervelde; but, on their both removing to England, he was placed under a ship-painter named Vlieger. He succeeded his father as painter of sea-fights to Charles II. Of the older masters, Vandervelde the Younger is regarded by connoisseurs as the foremost of all marine-painters. Walpole says of him, that he "was the greatest man that has appeared in this branch of painting; the palm is not less disputed by Raffaelle for history than with Vandervelde for sea-pieces." But he is far inferior to Turner in representing the grandeur of a storm, and in colour and in transparency he cannot vie with Stanfield. The National Gallery contains a few Vandervelde, but the finest collection of his works is in Bridgewater House, the property of the Earl of Ellesmere. He lived with his father at Greenwich, where he died in 1707.

Van Diemen's Land. || Van Dyck.

VAN DIEMEN'S LAND. See TASMANIA.

VAN DYCK, SIR ANTHONY, one of the greatest portrait painters that have ever lived, was the son of Francis Van Dyck, and of his first wife, Cornelia Kerbsoom (or according to the testimony of connections of his second wife, now resident in Antwerp, Maria Kupers or Kuperis), and was born on the 22d of March 1599. Some of his biographers make his father a glass-painter, others a worsted manufacturer; but, be he what he might, he was well to do in the world, and could gratify the early longings of his son in numerous important respects. The lad's mother is reported to have been skilled in embroidery, and to have worked landscapes and figures with her needle with much taste and skill. Thus, he had his eye early familiarized with exquisite gradations of form, and with all the refinements of colour which the thread manufacturer could invent. Having displayed at an early age a decided talent for drawing, his parents encouraged him in the art, and were no long time in discovering what a treasure had been committed to their charge in young Anthony Van Dyck. Henry Van Balen, the painter, who had been a valued pupil of Rubens, and who had improved himself by a sojourn in Italy, was induced to take the youth under his charge and teach him his art. This occurred in 1610, when Van Dyck was just in his eleventh year; young enough, certainly, even to satisfy the manufacturer of the proverb of "learn young, learn fair." How "fair," he did learn, we shall see. Mastering the preliminary difficulties of his art with surprising facility, Van Dyck, with much of that youthful ambition peculiar to genius, and with a good deal, perhaps, too, of his own constitutional vanity, expressed a wish, in 1615, to enter the school of Rubens. The paintings of this great master had already attained so wide a celebrity, that it is not strange to find an ambitious young artist anxious to connect himself with so distinguished a school. The parents of Van Dyck were both able and willing to help him forward, and he accordingly transferred his easel to the studio of Rubens. The youth set to work with a zeal that astonished even his master, and in a short while he was ahead of all his compeers. Rubens, to mark his esteem for the vigour and care of his execution, employed him to make drawings of his master's works for the engravers who were busy with prints from those designs. There is a pleasing anecdote ordinarily told in illustration of Van Dyck's superiority; but unfortunately it is better suited to gratify the feelings than to please the intelligence, when one looks closely at it. Here is the story. Rubens, having left his studio once, on his favourite evening ride, the too curious youths who assisted him, anxious to obtain a glimpse of what their master was engaged on, stole into his room, and after inspecting a piece, which was yet shining from the final touches of his brush, gave way to some of that boisterous levity peculiar to their years, and jostled

Van Dyck. Diepenbeck against the wet painting. Filled with the greatest consternation, they unanimously implored Van Dyck to try and restore it. Van Dyck did his best, but the quick eye of Rubens found him out; and his ready generosity forgave the offence, as he relished hugely the attempt to conceal it. It is a pity this pretty story hangs so badly together, for both Descamps and Mensaert, in their several works, say the accident occurred to *two* several pictures, to which on other grounds it is obvious it could not have occurred. For, according to the former author, it was the "Descent from the Cross" that met with the blemish, a picture that was completed in 1612, three years before Van Dyck entered his studio; and, according to the latter, it was the "St Sebastian in the Church of the Augustines," a picture which was not finished till 1628, when Van Dyck had returned from Italy. Yet the occurrence *may* have taken place nevertheless.

Certain biographers, of the meaner sort, let it be hoped, have industriously circulated a report of the jealousy of Rubens of Van Dyck's abilities, and have sought to lay at the door of the great Fleming Van Dyck's subsequent pursuit of portraiture. Rubens certainly advised his pupil to abide by portraits, and neither time nor Van Dyck has yet convicted this judgment of dulness, whatever may be thought of its sincerity. Rubens, we suspect, was altogether above such mean jealousies; and this story must, we fear, trace its origin to some envious person, who disliked the master, or who regarded the scholar with over-enthusiasm.

In 1620, Van Dyck visited England, but not meeting with the encouragement he expected, he, on the advice of Rubens, set out for Italy. Before doing so, Van Dyck left with his master three exquisite memorials of his pencil, in a portrait of Rubens' first wife, "Isabella Brandt" (not of his *second* wife, as some assert), an "Ecce Homo," and "the Seizure of our Saviour in the Garden of the Mount of Olives;" and Van Dyck received in return one of the finest horses in his master's stud. A love-affair detained Vandyck in the village of Savelthem longer than his friends could have wished. A master of words would have sung the praises of his mistress; this master of forms resolved to paint his one. He introduced his enchantress and her parents as the members of a "Holy Family," and in genuine cavalier style represented himself on horseback as "St Martin dividing his cloak with a beggar." "Happily," as some would say, he took leave of this pretty girl, and pushed on for Venice. The florid colouring of Rubens, Van Dyck had learned to trace to the influence of the Venetian school; and he resolved, now that he was in the city, to sit at the feet of Titian and the other great colourists of that school while his money lasted. Leaving Venice, he proceeded to Genoa, where the nobles and wealthy merchants of the city were only too glad to have themselves perpetually imprisoned on canvass by the hand of such an artist. After a time, he went to Rome, whither the glorious productions of Michael Angelo and of Raphael attracted him. He was a guest in the palace of Cardinal Bentivoglio during his stay, whose portrait displays in an eminent degree the great advancement made by Van Dyck during his study in Venice. Many palaces in Rome can boast to the present day of having more than one picture by this great Flemish portrait-painter. Disgusted, it is said, with the intemperance and other kindred vices of the Flemish artists in Rome, after a stay of two years, he accompanied the Chevalier Nani into Sicily. It is not unlikely that there was some truth also in the report that *Il pittore cavaliere*sco found himself too important a personage to waste his precious hours in Roman bagnios and beer-houses. In Palermo, he painted the viceroy, and Soffonisba Angosciola, the celebrated paintress, then in her 91st year and quite blind. After paying a hasty visit to Florence, he returned to Antwerp in the end of the year 1626.

Of course, an artist with such brilliant antecedents would Van Dyck. not remain long idle. He was urgently solicited by guilds and corporations, by private individuals and by public bodies, to lend his pencil in aid of some great undertaking of personal or public vanity, of social or ecclesiastical adornment. The first work of importance painted by Vandyck, after his return from Italy, was an altar-piece for the church of the Augustins. Reynolds says of this picture, in 1809, "it in some measure disappointed my expectations." Being commissioned by some ignorant canons of the church of Courtray to paint a grand altar-piece for their order, the stupid churchmen eyed the performance with much apparent curiosity, and finally came to the sage conclusion, that the artist was a mere "dauber." The same brotherhood afterwards repented of this rash judgment when they heard of the great fame of the painting, and tried to induce Vandyck again to embark in the service of the church. But the painter replied, there were daubers enow in Courtray without calling any from Antwerp. The great painting of "Christ crucified between the two Thieves," in the church of the Recollets, in Mechlin, is by Van Dyck, and is pronounced by Reynolds "one of the first pictures in the world." It is full of that "soft precision of the clear Vandyck" of which the poet sung in after-years.

During the five years which this artist stayed in Flanders, after his return from Italy, he was very laboriously employed, and painted many of the principal commanders who afterwards figured in the thirty years' war. In 1632, Van Dyck came to England, invited thither probably by the king. He was lodged, on his arrrival in London, with Edward Norgate, a protégé of the Earl of Arundel, until apartments were provided for him in the Blackfriars. The arrival of Van Dyck was the signal for Daniel Mytens and Cornelius Jansen to quit the court of England. To an address eminently courtly and refined, Van Dyck added great attractions of person and attire, which so won the heart of Charles, that he made him a knight in three months from his arrival, and bestowed upon him the royal portrait set in brilliants and attached to a gold chain. Add to this, that, on the 17th of October 1633, he received from the crown the gift of a yearly pension of L.200, besides the necessary patronage by the nobility; and we may form some estimate of the style of dress and the grandeur of equipage which this princely genius now indulged in, seeing that fortune showered down her gifts so lavishly upon him. Poor Van Dyck was now the rage, and if the king moored the royal barge almost daily in the neighbourhood of Blackfriars, the fashionables thought a lounge in his studio was indispensable to their daily existence. He had too great a relish for "gallantry," as it was politely phrased in those days, and one of his mistresses, Margaret Lemon by name, was almost as notorious as the Nell Gwynn of his royal master. The simple maiden of Savelthem was altogether forgotten now. Hard work and gallantry soon exhausted Van Dyck's strength, which was never very robust. The short, finely rounded, graceful figure, could not stand this pleasure-seeking long. He is described by John Lievens, not long after Sir Anthony came to England, as "emaciated and feeble," foolishly sitting over his crucible in search of the philosopher's stone! The king and his friends saw with some concern the wreck that this great artist was fast becoming. The sorrow, perhaps, was not of the most extreme kind, resembling, as it did, much more closely the grief of the eastern dervish over his moribund hen with the golden eggs, than that intelligent pity which men have a right to expect from their kind. Yet it was real so far as it went. Those grand personages accordingly found him a wife in the person of Maria Ruthven, granddaughter of the first Earl of Gowrie, who, it was hoped, would in time lead him into more quiet and temperate habits. If the matrimonial state tended to sober Van Dyck, it rendered him very un-

Vane || Vanloo.

happy by affording him leisure for reflection. He had done nothing yet worthy of his own ambition in England, and so indifferent was his health that he could not promise himself a long life. He had wasted, it was clear, the last few years, and he was perpetually racked by the exquisite torture of which a highly strung nature is alone capable. While in this state of mind, he suddenly conceived the idea of decorating the walls of the banqueting-room at Whitehall, of which his old master, Rubens, had formerly ornamented the ceiling. The design was a grand one, and the price to be paid for the execution of it must correspond. L.75,000 is said to have been the sum which Van Dyck asked for the performance of this great task. His friend, Sir Kenelm Digby, represented the matter to the king, but as the royal coffers were none of the fullest, Charles declined pledging himself for so large a sum. Add to all this, that, from the partial and niggardly parsimony of the treasury, many pictures which Van Dyck had already painted for a stipulated sum, were very greatly reduced at the time of payment. The disappointed artist went to Paris in the hope of obtaining the painting of the Louvre; but Nicolas Poussin, an inferior artist to Van Dyck, was there before him; and, with frustrated hopes and increasing ill health, Van Dyck returned to England to die. His end occurred at his own residence at Blackfriars, on the 9th of December 1641, in the forty-second year of his age. He was buried on the 11th of the same month in St Paul's Cathedral, near to the tomb of John of Gaunt, where his ashes still repose.

Van Dyck, curious to say, after all his lavish expenditure, died comparatively wealthy. His wife and daughter were tolerably provided for, and he left an illegitimate daughter L.4000. The last of the English descendants of Van Dyck died in 1825. (For critical notices of the works of Van Dyck, see the articles ARTS, *Fine*, and PAINTING.) (J. D—S.)

VANE, SIR HENRY, an English statesman of the time of the Commonwealth, was the son of Sir Henry Vane, secretary of state under Charles I. He was born in 1612, at his father's seat of Hadlow in Kent, and educated at Westminster school and Oxford, after leaving which he spent some time in France and Geneva, strengthening the aversion he had early imbibed to the doctrines and government of the English Church. These opinions led him, on his return to England, to emigrate to Massachussetts, of which colony he was afterwards appointed governor, but becoming involved in religious dissensions there, he returned home after an absence of two years. Having been elected a member of the Long Parliament in 1640, Vane gave zealous and energetic support to the popular party, and became a leader of the Independents. He was the chief mover of the Solemn League and Covenant, and of the Self-Denying Ordinance; but he opposed the execution of the king and the usurpation of Cromwell, by whom he was imprisoned for some time in Carisbrook Castle. From this time he took no part in public affairs, except for a short period after the death of Cromwell; and after the Restoration he was arraigned for high treason, and beheaded on Tower Hill, 14th June 1662. Vane was the author of several political and religious works, and was highly esteemed by the poet Milton, who addressed one of his sonnets to him. See BRITAIN.

VANLOO, JOHN BAPTIST, a distinguished painter, of a Flemish family. He was born in 1684 at Aix in Provence, where his father Louis, also a painter, had settled the year before; and from an early age was taught painting by his father. He soon gained a reputation for portraits and historical paintings, and was taken into the service of the Prince of Carignano. After studying under Benedetto Luti at Rome, he settled in 1719 at Paris, where he amassed a large fortune, but lost much of it in the Mississippi scheme. In 1738, he came to London, where success continued to attend him; but, after a residence of four years there, the state of his health compelled him to seek a more genial climate, and he retired to his native town, where he died in 1746, leaving about 90,000 francs to his children. His brother, CHARLES ANDREW, was also a distinguished painter. Born 1705; died 1765.

Vanmander || Var.

VANMANDER, CHARLES, a painter, poet, and biographer, born in 1548, at the the village of Meulebeke, near Courtray, in West Flanders. At an early age he gave indications of a genius both for poetry and painting; and as he spent his life in the cultivation of these arts, it was marked with no important events or striking incidents. After spending some years at Rome in the study of art, he returned to his native country in 1577; but in the civil war then raging in the Netherlands, he narrowly escaped from the Spanish soldiery, and was obliged to take refuge in flight. In 1683 he found an asylum at Haarlem, where he resided twenty years, and he died at Amsterdam in 1606. His chief literary work is *The Lives of the Painters*, but he also translated the *Iliad*, the *Eclogues*, and *Georgics of Virgil*, and the *Metamorphoses of Ovid*, and wrote many dramatic pieces.

VANNES, a town of France, capital of the department of Morbihan, at the mouth of the River Vannes, in the Bay of Morbihan, 68 miles N.W. of Nantes, and 285 W. by S. of Paris. It stands on the summit and slope of a hill, and was formerly fortified and entered by six gates, four of which and a great part of the ramparts still remain. The streets are dark, narrow, and irregular; and the houses antique, and not very well built. The cathedral is a massive and heavy building, with a lofty inelegant spire; but it contains some good monuments and pictures. Of the ancient castle, a single large tower is all that remains. Besides these, Vannes contains several churches, an episcopal palace, college, various schools, hospitals, a theatre, public library, and courts of law. The manufactures consist of coarse woollen cloth, linen, cotton, lace, and leather. The harbour is small, and admits only vessels of small burthen; but it is lined with good quays, and has ship-building yards near it. A considerable trade is carried on in corn, hemp, butter, wax, cider, brandy, wine, and manufactured goods. Vannes is by some considered to occupy the site of *Dariorigum*, the capital of the ancient *Veneti*, though others believe the latter to have been at *Locmariaker*, about 5 miles N. by W. of Vannes, where remains of a circus and Roman road are still extant. Pop. (1856) 12,466.

VANVITELLI, LOUIS, one of the greatest modern architects, was born at Naples in 1700. He was of Flemish origin, his father being a native of Utrecht, who settled as a painter at Naples. He displayed precocious talents for painting, but at the age of twenty forsook that pursuit for architecture, which he then began to study, and in which he made astonishingly rapid progress. At the age of twenty-six he was appointed architect of St Peter's, and completed some of the decorations of that church; and from that time his reputation became such, that he had a share in almost all the great architectural works of the day. Vanvitelli's masterpiece is the palace of the King of Naples at Caserta, founded in 1752. It is an enormous building, and one of the finest of the kind in Europe. He also erected the pentagonal lazaretto at Ancona, and improved the harbour and defences of that town. He died at Caserta, March 1, 1773.

VAR, a department of France, bounded on the N. by that of Basses Alpes, W. by that of Bouches-du-Rhone, S. by the Mediterranean, and E. by Nice. Its length from N.E. to S.W. is 83 miles; its greatest breadth 49; and its area 2825 square miles. The coast is bold and rocky, indented by many arms of the sea, and lined with a number of islands. The principal inlets, beginning from the E., are the bays of Juan and Napoule, opposite to which lie the

Var. Lerino islands, the gulfs of Fréjus and Grimand, and the harbours of Hyères and Toulon. Off Hyères are the islands of the same name, comprehending Porquerolles, Portcros, and Levant, with others of smaller size. The interior of the department is mountainous, being traversed from east to west by a branch of the Alps, which separates the valley of the Durance, an affluent of the Rhone, on the north, from the country watered by the Argens and other rivers that fall into the Mediterranean on the south; while another chain of hills, connected with the former towards the west, runs along the coast to the south of the Argens. The latter ridge is called Les Monts des Maures. Some of the hills in these ranges attain a height of more than 3000 feet above the sea. Numerous rivers water the department, but most of them are small, and none of them navigable. The Var, from which it takes its name, rises in the department of Basses Alps, and flows south-east into the Mediterranean, forming the boundary between Nice and Var. Its whole length is 70 miles, and its chief affluent is the Esteron from the right. The largest river wholly within the limits of the department is the Argens, which rises on the mountains towards the west, flows in an irregular course eastwards, and falls into the sea near Frejus, after a course of 60 miles. It receives from the hills on either side numerous tributaries, among which are the Caulon, Calami, Bresque, Braque, Artuby, Endre, and Aille. The other streams that flow into the Mediterranean are the Loup and Siagne in the east, and the Gapou in the west of the department. The Verdon, an affluent of the Durance, forms for some distance its northern boundary; and the Durance itself at one point touches the limits of the department. Along the coast there are three small lagoons called Pesquier, Napoule, and Villepoy. The climate of the country is mild, except when the *mistral*, a keen wind from the north-east, blows. In summer the heat is great, and the south-east wind has an enervating effect. The geological structure of the country consists partly of primary and partly of limestone and other secondary rocks; and the most important minerals that are found here are coal, marble, porphyry, granite, and gypsum. Lead and iron were at one time worked, but these operations not proving profitable, were given up. The soil is on the whole by no means good, although in some particular places it is of great fertility; and the hilly nature of the country is not favourable to agriculture, so that the arable land in the department is not more than one-sixth of the whole area; and the corn produced only supplies about a half of the consumption. There are extensive forests, and a large proportion of the ground is quite waste. Vines and olives are cultivated to a great extent, and yield good crops, the wines of the department being much esteemed. Oranges, pomegranates, citrons, figs, peaches, and other fruits, are raised here in great abundance, and of excellent quality. The principal trees in the forests are firs, oaks, and cork-trees. Tobacco is grown in considerable quantities. There is a good deal of pasture-land, but in summer the grass is so parched up that most of the flocks are driven to the mountain-pastures in the department of Basses Alpes. Sheep, goats, mules, asses, and pigs are the principal kinds of live stock; horses and cattle being few in number. Bees are kept in large numbers, and there are extensive plantations of mulberries, on which silkworms are reared. Game is abundant, and the fisheries in the rivers and in the sea are profitable; the former for sturgeon, trout, tench, carp, &c.; and the latter for sardines, tunny, and anchovies. The principal manufactures carried on are those of coarse woollen cloth, paper, leather, soap, oils, perfumery, earthenware, and marble goods. The trade is not very extensive, and the chief articles are wine, oil, fruit, timber, and fish. The department has for its capital Draguignan; and is divided into four arondissements, as follows:—

Arrondissements.	Cantons.	Communes.	Pop. (1856.)
Draguignan	11	60	86,919
Brignoles	8	54	67,432
Grasse	8	60	66,422
Toulon	8	28	151,047
Total	35	202	371,820

Varenius ‖ Varna.

VARENIUS, or VAREN, BERNHARD, the author of the earliest work on physical geography, was born at Ulzen near Lüneburg. Nothing is known of his history, except what can be gleaned from the prefaces and dedications of his works, and of the date of his birth and his parentage we are alike ignorant; unless he may have been related to Henricus Varenius, who died pastor of the church at Ulzen in 1636, or to Augustus Varenius, a Lutheran theologian, who was born there in 1620. We learn that Bernhard attended the gymnasium at Hamburg, and published there, in 1642, a treatise on the Aristotelian definition of motion. He then studied medicine at Leyden, where he took refuge from the war raging in Germany; but, after finishing his course, having no prospect of obtaining a practice, he devoted himself to the mathematical and physical sciences, of which he was exceedingly fond. He wrote a work on Conic Sections, but was unable to find a publisher for such an abstruse production; and having come into contact with a number of Dutch navigators, he turned his attention to that science in which his genius and labours formed an important epoch. In 1649 he took his medical degree at Leyden, and settled as a practitioner in Amsterdam, where he published, about the same time, his first geographical work—a description of Japan—in Latin. This was followed in the succeeding year by a much more important and valuable treatise, the *Geographia Generalis*, which was the first attempt ever made at a system of physical geography. It consists of three parts, designated respectively—Absolute, Relative, and Comparative Geography; the first comprising a description of the form, dimensions, and character of the earth, considered in itself; the second, of its relation to the other heavenly bodies, and their influence on climate, seasons, length of days, &c.; and the third, of the relative position of places, latitude, longitude, the construction of maps, the theory and the practice of navigation. The whole, although not exempt from grave errors, is characterized by lucid and orderly arrangement, extensive mathematical acquirements, and much knowledge of natural history; and was thought worthy of being reprinted by Newton, with notes and illustrations, for the use of his students. In the preface the author intimates his intention of following this work by one on the food, drink, and medicines in use among different nations, but this design was never executed; and if, as is commonly stated, Varenius' death occurred in 1660, when he must have been comparatively young, it was probably this that prevented the prosecution of his studies. Besides the two editions of Newton (1672 and 1681), the *Geographia Generalis* was edited with further additions by Jurin in 1712, translated into English by Dugdale, and from that into French by Depuisieux.

VARIATIONS, CALCULUS OF. See CALCULUS.

VARIATION *of the Compass*. See MAGNETISM.

VARIATION, in *Music*, means either the change induced upon a melody by embellishments given by the vocal or instrumental performer, or the new forms and more studied ornaments given by a composer to a theme of his own or to some popular air. Among instrumental variations, some of the most beautiful are to be found in Haydn's andante movements, and in Mozart and Beethoven's variations to their own andantes, or to popular themes on which they have displayed their skill and genius.

VARNA, a sea-port and fortified town of European Tur-

Varnhagen. key, Bulgaria, at the head of a bay of the Black Sea, 47 miles E. of Schumla. It stands on a low ridge of sand-hills stretching along the side of the bay, and it is enclosed by high and strong walls and by a deep moat. There are several well constructed batteries, but they are all commanded either from the sea or from the surrounding heights. The town consists of an irregular assemblage of red-tiled wooden houses, very ill built, and has a general appearance of decay about it, the only public buildings being a few mosques. There is good anchorage in the bay, which is sheltered to the N. and N.E., but exposed in other directions; and there are three small wooden piers near the principal gate. To the west of the town is a lake about 12 miles long by 2 broad, which, if connected by a canal with the bay, as has been recently proposed, would form an excellent harbour, and enable Varna to rival Odessa as a place of trade. Even as it is, the commerce of the town is considerable; the exports of corn, tallow, eggs, and other rural produce, amounting in value to about L.600,000. At Varna the Hungarians were defeated by the Turks in 1444, and in 1828 the town was taken by the Russians after a siege of three months. In the summer of 1854, the British and French troops were encamped at Varna previous to the invasion of the Crimea, for which they set sail September 7, 1854. Pop. 16,000.

VARNHAGEN VON ENSE (KARL AUGUST LUDWIG PHILIPP), was born at Dusseldorf, 21st February, 1785. To his own countrymen, a writer of great mark, and a publicist of tried and varied service, he is chiefly notable abroad for his close connection throughout a long life with men of European fame; for the contributions he has made towards the just appreciation of some of those men; and for the many remarkable incidents of a career that, in an unusual degree, mirrors the age in which it has been run. To Englishmen, what Varnhagen saw and has described is, perhaps, more considerable than what he thought or did.

Student life at Berlin. In 1803, while attending the medical college at Berlin, he formed the acquaintance uf Chamisso (the author of *Peter Schlemihl*), and with him made his first literary venture in the *Musen Almanach* of 1804. There, too, he obtained an introduction to Fichte, "to whom," he says, "I listened as to a divine man," and there he met, for the first time, Rahel Levin. In 1806 he went to the University of Halle, but soon returned to Berlin, for the purpose, as he thought, of merely spending his vacation there.

He found the Prussian capital the scene of a proud excitement. Troops were marching out in quick succession, to check, as it was hoped, the progress of Napoleon. But a very brief interval brought the news of Auerstadt and Jena. Not a Prussian soldier was to be seen or heard of. It seemed to Varnhagen, he tells us, as if the earth had opened and swallowed them up. In October he witnessed the entry of the French. Halle University was now closed, and many both of the professors and the students flocked to Berlin. Varnhagen attended the lectures of Fichte and of Schleiermacher, and eagerly improved his acquaintance with Rahel, who had long occupied a conspicuous place in the best society of the town. Without possessing either rank, or wealth, or beauty, or, indeed (as Carlyle puts it), any artificial nimbus whatsoever, this lady was the queen of a distinguished circle, in which the youth, just entering on life, enjoyed the fellowship of Friedrich von Gentz, of Tieck, of Prince Lewis Ferdinand of Prussia, of Friedrich Schlegel, and of the two Humboldts. But Rahel herself was ever the central object, and friendship ripened into love.

Rahel Varnhagen von Ense. This eminent woman exercised her singular influence over all who were privileged to approach her, partly by the force and freshness of an intellect which gushed forth in conversation all the more vigorously for its freedom from the tasks of authorship, and partly from the habit of speaking her thoughts with little regard to the conventionalisms of the fashionable world. One who knew her well has said of her, "She had the head of a sage and the heart of an apostle, and yet she was as much a child and a woman as anyone can be."[1] In these days, it is only by such mere reports—unsatisfactory as they are—that she can be estimated. Her correspondence, indeed, is abundant, but it does not reflect her mind. Only in speaking face to face with those to whom she addressed herself does she seem to have had the command of her own powers. When the intercourse between Varnhagen and Rahel first became intimate, he was but twenty-four years of age; she was thirty-six. Seven years more of adventure and of struggle lay before him, ere he could join his lot with hers. Yet, when twenty-four years had passed, we find him writing:—"Rahel is still to me the freshest and brightest feature in my life (*das neueste und frischeste meines ganzen Lebens.*" These words were written just before her loss (1833). Shortly after it, he added, "In her, nature and intellect were ever in free reciprocity; great in innocence as well as in wisdom, her utterances, both of mind and heart, were original and vivid; her words and deeds were quick, appropriate, decisive. To force of character she added womanly gentleness and grace." Such a woman may well have done her life-task, and have done it faithfully and fully, without writing any books.

Varnhagen. In 1809, Varnhagen entered the Austrian army as an ensign in the Count von Bentheim's regiment, and was severely wounded at Wagram. Count von Bentheim was one of several Austrian officers who, on the conclusion of the short-lived peace, accompanied Prince Charles von Schwartzenberg on an embassy to Paris, and shared in the festivities which attended the marriage of Napoleon with Maria Louisa. Varnhagen went with his commander. Beneath the smiling surface he found mutual distrust and hostility. Frenchmen were dwelling with more pleasure on their past victories than on their new alliance. Germans were already rejoicing in the hope of another appeal to the arbitrement of the sword. For a moment, however, both gaieties and heartburnings were stilled, under the impressions of grief and terror caused by the calamity at the ambassador's house on the night of the 1st July 1810. Varnhagen saw the splendid beginnings of the festival; noticed the significant smile with which Napoleon looked at a certain German transparency announcing the return of the golden age; witnessed the bursting forth of the flames, the strange alarm created by a cry that there was a conspiracy to kill the emperor, and the terrible rush which followed the emperor's quiet departure. He saw Napoleon's unexpected return, to direct in person the extinction of the fire, and stood beside the spot on which were discovered the blackened remains of the poor princess who, a few hours before, radiant with beauty and hospitality, had opened the ball. Such a shock must needs have thrown gloom over all the pomps of Paris, and may have deepened the prepossessions which already made it hard for Varnhagen to give an impartial picture of the court and of the man on whose words and deeds all Europe was then intent. His chapter, *Am Hofe Napoleons* is the least satisfactory one in the *Denkwürdigheiten*. He represents Napoleon's speeches as "those of a schoolboy; insignificant in substance and in expression; without spirit, wit, or force (*gering so wohl dem Inhalt als dem Wortausdrucke nach; ohne Geist, ohne Witz, ohne Kraft*), and speaks of "his ridiculous attempts to shine." We possess too many of Napoleon's utterances—from Paris streets in 1793; from the rock of St Helena in 1816–21; and from almost every intermediate stage of the marvellous

Residence at Paris in 1810.

Varnhagen's account of Napoleon.

[1] De Custine, in the *Revue de Paris* of November 1837.

Varnhagen.

itinerary comprised within those bounds; to be misled on a fact to which the witnesses are legion, and substantially of one accord. Rarely has a writer of great ability and of unimpeachable honesty fallen into a stranger mistake than has Varnhagen when he goes on to assert that "even the French themselves" perceived in Napoleon only ordinary faculties and common gifts, in an uncommon measure. Such a statement affords a gauge of the credulity even of able observers, when they are seeking what they wish to find. The just moral estimate of such a man is not advanced a tittle by unjust attempts to dwarf his intellectual stature.

During the remainder of the enforced submission of Austria to Napoleonic policy, Varnhagen lived in retirement; sometimes in Bohemia, where he formed a friendship with the Prussian minister Von Stein, and sometimes in Saxony. Just before the news came of the burning of Moscow, he entered the Russian army under Tettenborn, who was so soon to become one of the most conspicuous leaders in the War of Liberation. His first service lay in

The war of liberation.

the expedition for the seizure and defence of Hamburgh. When that city again fell to the French, he followed Tettenborn in his campaigns in Mecklenburg, Hanover, and Holstein; and, finally, in the advance on Paris. These campaigns form the subject of two of his works,—(1.) *Geschichte der hamburger Ereignisse*, 1813; (2.) *Geschichte der Kriegszüge Tettenborns*, 1814. In Paris he made the acquaintance of Madame de Staël, and at her house listened to a remarkable conversation on Negro slavery and Russian serfdom, in which the Emperor Alexander took a leading part, and in the course of which he promised (in 1814) that serfdom should be abolished; thus affording another illustration of the fitness of his famous self-definition. Madame de Staël's social position naturally excited in Varnhagen's mind some mental comparisons, which did not turn altogether to her advantage. He praises her talents, but finds her wanting in simplicity. "She was," he says, "both a princess and a 'bourgeoise' and it became a matter of grave doubt with me which of these characters was assumed. Perhaps both were."

Diplomacy.

It is characteristic of those times of upheaving, that as it was at Berlin he had entered the Russian army, so now, being at Paris, he entered the diplomatic service of Prussia. His chief duty in prospect was to aid the chancellor Von Hardenberg at the Congress of Vienna. But he had first to discharge a political mission at Hamburg, and then to secure the long-promised felicity of his life by his marriage with Rahel at Berlin. Together they proceeded to Vienna. His account of the congress, or rather of its outward life, is graphic, and is charmingly written; but it neither makes, nor pretends to make, any essential contribution to political history. Always fortunate in the opportunities of observing famous men at critical times, he saw the last flashes of that relic of a bygone age, the old Prince de Ligne, and he was present at the expiatory service which Talleyrand had to celebrate for the execution of Louis XVI. His career in diplomacy was for a while prolonged by a mission of three years at the court of Baden, where he was much too honest and too liberal to satisfy the court of Prussia. It was then interrupted for nearly ten years. In 1829 he went on a mission to Hesse-Cassel, to endeavour to heal the dissensions in the electoral family, a service in which he acquitted himself with great ability, although with small success. At a later period, he declined an offer of the embassy to Washington, as he also declined other offers of official employment and honour. That his experience of diplomatic life never weakened his lofty ideas of public duty and responsibility, we have the best evidence. There lies, too, ancillary testimony, instructive in itself, to the same effect, in the words of withering scorn with which, in his *Diary*,[1] he has branded Lord Normanby's *Year of Revolution*, and the pitiful intrigues therein recorded.

Varnhagen.

From 1819 onwards, Varnhagen's main work in the world was literary. But with him literature was ever the handmaid to life. The reader of his books need not be a German to trace in them the good results of the discipline of 1813, and of the gloomy antecedent years, as well as the fruits of original faculty and of a wide and patient culture. Their literary merit is great, but they have merits more important. Varnhagen can depict with force and beauty men and epochs that are past, but he so depicts them as to show that in his eyes the chief value of the dead heroes and the dead ages consists in their capacity of exciting the living to wise, earnest, and fruitful action, instead of lulling them in a fool's paradise. He, for one, will not be content with that division of power which assigns to the Germans the empire of the air. He felt, in all its bitterness, the contrast between the intellectual greatness and the political degradation of Germany, and he laboured to make German books the seedplot of German independence and self-truthfulness. Neither in literature nor in public life was he the dupe of such fine-spun schemes as those by which Frederick William IV., and his knot of pseudo-pietists, sought to build up a system of policy which should be half modern and half mediæval; which should mask the principles of a feudal tyranny in the garb of a delusive constitutionalism. Few surviving men had seen more of the horrors of war; still fewer could appreciate more lovingly the domestic blessings which take wings at the first approach of that calamity; but he knew that there are calamities less tolerable than those even of civil war. Perhaps in the whole extent of his writings (of the most important of which we give a list below),[2] nothing more significant is

---

[1] *Briefe Alex. von Humboldts an Varnhagen*, 391, 392.

[2] Varnhagen's principal works, in addition to those of which the titles have been sufficiently given in the text, are as follows:—I. *Vermischte Gedichte*, Frankfurt-am-Main, 1816. 2. *Goethe in den Zeugnissen der Mitlebenden*, Zum 28th Aug. 1823, Berlin, 1823. This is a series of appreciations and eulogies of the great poet, printed to commemorate his birthday. 3. *Biographische Denkmale*, 5 Thle. Berlin, 1824–30. This admirable work includes lives of adventurers, soldiers, poets, and mystics. The contents of the several volumes are as follows,—vol. i. Count Wilhelm zur Lippe; Count Matthias von der Schulenburg; Theodore, king of Corsica. ii. Baron Georg von Derfflinger; Prince Leopold von Anhalt-Dessau; iii. Blücher; iv. Paul Flemming; Friedrich von Canitz; Johann von Besser; v. Zinzendorf. Alex. von Humboldt has characterized these and the biographies which followed as "a series of life-pictures unequalled in German literature." 4. *Angelus Silesius und Saint Martin, Auszüge*, als Handschrift [*i. e.* privately printed], Berlin, 1833. This curious little work contains selections from the *Cherubinischer Wandersmann* of Johann Scheffler (who wrote in the seventeenth century under the pseudonym of Angelus Silesius), and from St Martin's *Portrait historique et philosophique*; with remarks on both by Rahel. 5. *Zur Geschichtschreibung und Literatur, Berichte und Beurtheilungen*; aus den Jahrbüchern für Kritik und andern Zeitschriften gesammelt, Hamburg, 1833. 6. *Rahel: ein Buch des Andenkens für ihre Freunde*, 3 Bde, Berlin, 1834. 7. *Galerie von Bildnissen aus Rahels Umgang und Briefwechsel*, 2 Bde, Berlin, 1837. The first of these Rahel books contains a copious selection of her correspondence; the second consists of a series of delineations of the chief members of her circle. 8. *Denkwürdigkeiten und Vermischte Schriften*, 4 Bde, Mannheim, 1837; to which was added a "Second Series," 3 Bde, Leipzig, 1840–46. The interest and value of this book are lessened by a very incoherent sequence, which, it is to be hoped, the future publishers will amend. 9. *Voltaire in Frankfurt-am-Main*, 1753. In this remarkable essay, Varnhagen endeavours to show, that, outrageous as was Voltaire's treatment, he was himself chiefly blamable for it. The copy before us has neither date nor place of printing. 10. *Hans von Held: ein Karakterbild*, Leipzig, 1845. 11. *Schlichter Vortrag an die Deutschen über die Aufgabe des Tages*, Berlin, 1848. 12–17. Lives of Generals von Seydlitz, von Winterfeldt, von Schwerin, Jakob Keith, and Bülow von Dennewitz; and of Sophia Charlotte, queen of Prussia. These biographies were published between the years 1836 and 1853.

Varnish. to be found than those few sentences of his *Diary*[1] which indicate the conclusions and the omens that, ten years ago, came upon his mind as to the future of Prussia, from all he had seen and heard during the years 1840 to 1849. If a happier issue may now be hoped for, than at that time he could foresee, his own writings and influence—and those of men likeminded—have had no inconsiderable share in bringing about the improved prospect which, as we trust, is opening before his country. (E. E.)

VARNISH. A solution of a resin, or of a gum-resin, in a liquid, which being applied to the surfaces of different objects, the liquid evaporates and leaves the solid in a brilliant transparent film. The solids used for making varnishes consist of amber, animé, arcanson, benzoin, colophony, copal, damar, elemi, lac, mastic, sandarach, and common resin. The solvents are, alcohol, ether, woodnaptha or pyroligneous ether, the oils of turpentine, rosemary, nuts, and linseed. Varnishes, or rather *lacquers*, are sometimes coloured by one of the following substances: aloes, annotto, cochineal, dragon's blood, gamboge, indigo, red saunders, saffron, and turmeric. The varnish-maker calls his resins *gums*, and he uses them and the solvents either singly—that is, one gum and one solvent—or a mixture of gums and a mixture of solvents. A good varnish should be durable, both as respects hardness and colour; and in this respect amber is remarkable; but amber-varnish is expensive, and is a long time in drying. Animé should be pale and of large size, and be prepared by scraping, to get rid of its rust-like colour, although it is sometimes prepared by pickling in a strong alkali, accompanied by friction with a broom. The large transparent pieces are sold as *body-gum*, and the worst quality is used for gold-size and japan black. Animé-varnish is not so tough as amber, and although it dries quickly, it is liable to crack, and to deepen in colour by exposure. Animé is much used in oil-varnishes, and also in copal-varnishes, on account of its drying quickly. Copal, according to Lindley, is produced by *Hymenia verrucosa* of the East Indies; but the resin known in India as *copal*, and in England as *gum-animi*, is the produce of *Vateria indica*, and in its recent and fluid state forms the *Piny varnish* of India. It is tenacious and solid, but melts at about 97° Fahr. Copal is imported in lumps of a slightly yellow tint; the finest and palest forming *body-gum*; the second quality *carriage-gum*; and the third, or worst quality, when picked, is used for gold-size or japan-black. Copal ranks next to amber in durability, and the varnish becomes lighter by exposure; it is not easy to form it into spirit-varnishes, on account of its little solubility in alcohol. It dissolves in ether, but this is too volatile for practical purposes. The oils of rosemary, spruce, and lavender, are sometimes used as its solvents. Amber, animé, and copal, separately or mixed, may be formed into varnish by softening, by means of heat and stirring in hot linseed oil over the fire. Oil of turpentine is used to impart the necessary fluidity. Such are the oil-varnishes used for the best work, which has to bear exposure to the weather or much friction, such as the panels of coaches, japan work, and house-decoration. The usual basis of spirit-varnishes are lac and sandarach. They are used for cabinet and painted indoor-work. Lac is the basis of most lacquers, and also of French polish. It is harder than sandarach, but the latter is hardened by a proportion of shell-lac or mastic, if required to be kept pale, and of Venice turpentine when it has to be polished. Mastic is a favourite spirit-varnish from its working very easily, and, as it can be removed by friction, it is used as a picture-varnish, and for delicate works of a pale colour. Damar, with turpentine, is nearly colourless, and, mixed with mastic, tolerably hard and flexible, so that it is fitted for maps and similar work. Common resin improves the brilliancy of other varnishes, but makes them brittle. The resin dissolved in turpentine or linseed oil forms a varnish which is used for common purposes. Varnish.

The preparation of varnishes requires considerable care, or an unpleasant colour may be produced. The linseed oil used for the harder resins should be of a pale colour, properly clarified, and united with the resin at a low temperature. About a quarter of an ounce of magnesia per gallon is used in clarifying, with the assistance of heat, and then some months of repose. If a drying oil be required, sulphate of zinc or acetate of lead is used. A cheap varnish is formed by heating linseed oil gradually to the boiling point, skimming, and slowly sprinkling in about three ounces each of dry litharge and red lead per gallon of oil, boiling for three hours, or until scum and smoke cease to be formed. A rough test, as to whether the boiling has been sufficient, is to dip the end of the feather into the oil, when, if it be burnt off or curl up briskly, the boiling is deemed sufficient. The oil is left to cool very gradually, during which the greater portion of the driers subside. The oil should be kept in close leaden cisterns. If the oil is required to be pale, the driers are white lead, sugar of lead, or sulphate of zinc.

Turpentine is much used, either for dissolving the resins or for thinning oil-varnishes. The turpentine should be clean and limpid, qualities in which it improves by keeping. Turpentine-varnishes dry quicker than oil-varnishes; they are of a lighter colour, but not so durable. Mastic, damar, and common resin, are commonly used in such varnishes. Spirit-varnishes, such as those known as *white* and *brown hard*, consist of sandarac and shell-lac dissolved in spirits of wine. Such varnishes are harder and more brilliant than the turpentine, and dry more quickly. The spirit must not contain much water, or it will not dissolve the resins; and, in applying the varnish, the air must be tolerably dry, or the varnished surface will appear cloudy or milky—*chilled*, as it is called—arising from a partial precipitation of the resins. The varnish-maker judges of the strength of the spirit by setting fire to a piece of paper dipped into it; if the paper be consumed, the spirit is judged to be strong enough; if not, it contains too much water.

Naptha, or pyroligneous ether, is used for cheap varnishes, but the effect is not so brilliant as when the resins are dissolved in spirit of wine.

Turpentine and spirit varnishes are formed either cold or with the assistance of a gentle heat. A high temperature is required in preparing oil-varnishes, and as the materials used are very inflammable, the factory should be removed from other buildings. A large copper is used for boiling the oil, gold-size, japan, and Brunswick black, &c.; it is called a *set-pot*, and is set in a furnace with a flue winding round it. The resins are fused in a *gum-pot*, or copper, 2 feet 9 inches high and 9 inches in diameter, let into the opening of a small furnace, and furnished with a long iron handle. There is also a copper boiling-pot, the bottom of which let into a hole in the iron plate of the furnace, is 7 inches high and 20 inches in diameter, with a cylinder or body rising from it 2 feet 10 inches high. This pot has a strong handle on each side. There are also a number of ladles, stirrers, funnels, oil-jacks, brass or copper sieves, and other articles required by the varnish-maker.

In using the gum-pot the fire should not be allowed to rise higher outside the pot than the depth of melted resin within, or it is liable to catch fire. The resin must be constantly stirred and divided with the copper-stirrer during the fusing, and should it swell up, the pot must be removed from the fire for a short time; but when at length the resin has become as fluid as oil, the clarified oil is poured in very

[1] *Briefe Alex. von Humboldts an Varnhagen*, 241.

Varnish. slowly with continual stirring. A clear varnish should be formed in eight or ten minutes, as will be seen by dropping a little of it on a piece of glass. The boiling must be continued until a drop of the varnish, placed between the finger and thumb, can be drawn out into fine threads on separating them. This *string-test*, as it is called, is to be tried every minute or oftener, and when the boiling is complete, all greasiness in the varnish will have been destroyed. The varnish is then removed from the fire, and when cold enough for mixing, oil of turpentine is poured in with continual stirring, care being taken not to allow the turpentine to form into vapour, or the varnish will overflow. The varnish is lastly strained, care being taken not to disturb the *bottoms*.

When varnishes are made on a large scale, the boiling-pot and the gum-pot may be in use at the same time. About 8 gallons of oil are gradually heated in the boiling-pot, and 8 lb. of gum in the gum-pot. When the latter, by diligent stirring, has fused into a clear liquid, and the oil is approaching the boiling-point, the maker and his assistant lift the boiling-pot out upon an ash-bed, formed by sifting dry ashes at the side of the furnace; the maker then returns to the gum-pot, and an assistant ladles a quantity of oil into a pouring-jack, which he puts on the iron plate at the back of the gum-pot to keep it hot. When the gum is nearly fused, the maker calls out, "Ready, oil," and the assistant lifts up the jack to the edge of the pot; and when the maker calls out "Oil," he pours it in, and the boiling is continued until the mixture is clear. The gum-pot is then removed to a stand, and the assistant puts three more ladlefuls into the pouring-jack, and three more into a spare tin. The contents of the gum-pot are then poured into the boiling-pot, which still contains about 3½ gallons of oil. In this operation the boiling-pot sometimes catches fire; but the assistant is ready with a thick piece of wet carpet to throw over the blazing pot, so as to smother the flame. If the gum-pot take fire, it is kept inverted, when the flame will go out of itself. The gum-pot is washed out with half a gallon of turpentine, and a broom called a *swish*. It is emptied into a tin jack, wiped dry, and another 8 lb. of gum put into it and fused. This and another run are treated like the first, when the boiling-pot has a charge of 8 gallons of oil and 24 lb. of gum. It is heated until a froth or scum covers the surface, when the pot is lifted out upon the ash-bed, and the froth stirred down. In this way the boiling may be continued three or four hours, but the time varies with the state of the weather, the quality of the oil, of the gum, the driers, and the state of the fire. When it is decided by the string-test that the boiling is satisfactory, the pot is removed to the ash-bed, and the varnish stirred down until cold enough for the mixing. From 12 to 15 gallons of turpentine are gradually poured in, after which the varnish is strained and stored away. The boiling-pot, ladles, stirrers, &c., are well cleaned with the turpentine used in washing the gum-pot.

In preparing some of the finer varnishes, such as artists' *virgin copal*, the powdered resin is mixed with powdered glass, 3 lb. of copal to 2 of glass; the glass, by separating the particles, allows the copal to be fused at a more moderate heat. To this quantity 3 quarts of very hot clarified oil are poured in and boiled until it strings freely between the fingers; it is to be thinned with 5 quarts of old turpentine, strained, and kept in an open jar, exposed to air and light, until of sufficient age for use.

The best copal varnishes are slow in drying, as they are made without driers, which injure their brilliancy, colour, and durability. A quicker-drying varnish is formed with animé instead of copal, or it may be mixed with copal.

Spirit and turpentine varnishes are made by mixing the dry picked resins and the solvent with repeated agitation, by means of a stick, furnished with pegs at its lower end, or the ingredients may be put into a kind of churn, mounted so as to revolve upon bearings at the ends. Coarsely pounded glass may be added to prevent the resin from agglutinating. When the solution is complete, it is strained through muslin or lawn. When heat is employed for spirit varnishes, it should be by means of a water-bath or a sand-bath, and a still and worm may be used to prevent loss by evaporation. In such case the resins and solvent in the still are kept in motion by a stirrer passing through a stuffing-box in the head. If a pale lac-varnish be required, *white* or *bleached lac* may be used, for which purpose the solution of shell-lac in spirit may be heated with recently prepared animal charcoal, strained through silk, and filtered through blotting paper. Chloride of lime may also be used for bleaching lac varnish. Black varnish may be made by mixing fine lamp-black with brown hard varnish or lacquer. A black varnish for metal may be made by fusing asphaltum and shell-lac, and adding turpentine. The recipes for making varnishes are innumerable. We do not give them in this place, because they are much better and more safely prepared by the varnish-maker than by the amateur. In applying varnishes, soft clean brushes are used; and for spirit-varnishes, camel hair pencils and brushes. The varnish should be applied in thin coats, and time be allowed for drying between the application of every two coats. The time allowed will depend on the state of the atmosphere; but in general from two to three hours will be required between every two coats for spirit-varnishes, six or eight hours for turpentine, and twenty-four hours for oil-varnishes. Cold draughts and moist air must be avoided, especially during spirit-varnishing, or the surface may become chilled, as already noticed. Previous to varnishing, the surface must be smoothed with fine glass-paper, and minute holes stopped with gum or wax. The first coat of varnish is usually more or less absorbed by wood and porous surfaces, and a second or a third coat may be required to fill up the pores uniformly. The work is next smoothed with fine glass-paper, and two or three coats of varnish are applied. Where the surface is very absorbent, size is sometimes put on instead of varnish. Coloured works receive their coat of colour before being varnished. The splendid lustre given to the finest kinds of varnish-works is produced by a large number of layers of varnish, and repeated rubbings with fine glass-paper between every two or three coats, then with fine pumicestone powder and water on woollen rags: it is next polished with yellow tripoli and water; and lastly with tallow rubbed all over with the ends of the fingers, the tallow being gradually got rid of by dusting the surface with clean wheat flour, and the surface completed by slightly rubbing with a clean old silk handkerchief.

A great deal might be written on japanning, French polishing, lacquering, &c., but enough has probably been stated to give the general reader an idea of the subject of varnishes. See JAPANNING, LACKER, &c. (C. T.)

Varro. VARRO, MARCUS TERENTIUS, a very learned and very miscellaneous writer, was born at Rome about the year 116 before the Christian era. He received what was then considered as the best education that could be obtained. Having studied at Rome under Stilo, he proceeded to Athens, and became the disciple of Antiochus, an Academic philosopher. Returning to his native city, he began to take some share in the business of the forum, but he does not appear to have acquired much reputation as an orator. He successively filled the office of triumvir, and tribune of the people. When he was about forty-nine years of age, Pompey intrusted him with the command of a Greek fleet, employed in the war against the pirates. In a naval engagement which took place near the coast of Cilicia, he acquitted himself with so much courage, that he was the first that boarded one of the enemy's ships; and in honour

Varro. of this exploit Pompey presented him with a rostral crown. For some time he acted as governor of Cilicia, apparently by virtue of an extraordinary appointment.

During the civil war which ensued, Varro adhered to Pompey, and was employed as his lieutenant in Farther Spain. He was, however, advanced in years, and, according to Cæsar's account, was disposed to follow the turns of fortune. The affairs of his own party having assumed a more promising aspect, he pursued measures of greater decision; and having embodied two legions, with thirty irregular cohorts, he made vigorous preparations for defending the province; but the speedy approach of Cæsar rendered all his plans abortive. One of his legions revolted, and the inhabitants evinced no disposition to make the quarrel their own. Varro now adopted the resolution of marching towards Italy; but finding that this attempt was impracticable, he offered to deliver the remaining legion to any one whom the victorious general should nominate. Having accordingly delivered it to Sextus Cæsar, he presented himself to Julius Cæsar at Corduba, and made a surrender of all his treasure, ships, and stores. After this unfortunate termination of his military services, he appears to have devoted himself with great ardour and perseverance to the pursuits of literature; and, as his life was extended beyond the usual term, he produced a great number of works, and on a great variety of subjects. He cultivated a particular intimacy with Cicero, who inscribed to him his *Academica*, as he inscribed to Cicero a portion of his treatise *De Lingua Latina*.

When Cæsar returned to Rome after having subdued all his enemies, Varro entertained some apprehension for his personal safety, and thought it prudent to withdraw from the city; but his fears were soon removed, and their hostility was at length converted into friendship. Cæsar committed to him the charge of forming and superintending a public library,—a charge for which he was eminently qualified by his very extensive and varied learning. After the death of this ruler of the world, he was again exposed to danger: he was included in the same proscription which proved fatal to his friend Cicero; but, even on this occasion, his good fortune did not desert him. His wealth, as well as his political connections, must have contributed to mark him for destruction. He was sheltered and concealed by Calenus, and his name was erased from the list of the proscribed. He was the possessor of several villas; and in the meantime one of these had been seized and plundered by Antony. The loss of his valuable library, including some of his own writings, was one of the contingencies to which he was exposed at this unhappy crisis. He, however, survived for many years, and continued his studies with unabated ardour. At the age of seventy-eight, as we learn fron Aulus Gellius, he had composed 490 books. According to Pliny, he still continued to write at the age of eighty-eight. His death is referred to the year 27 B.C.; and according to the computation from this date and the supposed date of his birth, he must have attained the age of eighty-nine. It is, not, however, improbable that he may have exceeded this age by a few years.

Varro has very frequently been described as the most learned of the Romans; and it has already been stated that he wrote on an immense variety of subjects. His works were partly in prose, and partly in verse. One of them, a Menippean satire, consisted of an intermixture of verse with prose, of Greek with Latin. Some of them related to grammar and rhetoric; others to history and philosophy; others, again, to politics and theology. He seems indeed to have embraced almost every topic of human speculation. But of all these treasures of ancient learning, it is deeply to be regretted that only a very inconsiderable remnant has escaped the ravages of time. Of his twenty-four books *De Lingua Latina*, the first three have all perished except a few inconsiderable fragments. The fourth, fifth, and sixth, relating to the origin of Latin words, and inscribed to Cicero, and the seventh, eighth, and ninth, relating to the analogy of the language, are, however, preserved, though not without some mutilations. Of the other books, scarcely a vestige remains. Even in this mutilated state, the work is both curious and valuable. His editor Scaliger has, however, shown that his etymologies are not unfrequently erroneous; and another very learned critic, Salmasius, has remarked that his reluctance to admit Greek derivations often leads him very far astray. Varro.

His three books, *De Re Rustica*, have reached us in a better condition. It appears from the exordium, that he undertook the composition of this work at the age of eighty; and that his wife Fundania, to whom it is addressed, had purchased a demesne which she wished him to manage in the most advantageous manner. Some inconsiderable fragments of his other works, in prose and verse, have been preserved, and have been collected with due care.

Of the work *De Lingua Latina*, an edition, considered as the first, is in quarto, without either place or date, but supposed to have been printed at Rome by G. Lauer, about the year 1471. The editor was Pomponius Lætus. There are other three very early editions, likewise without dates, but conjectured to have been printed, the first at Venice, about 1472, the second in the same city in 1474, and the third at Rome about the same time. The first two are in quarto, the third is in folio. After this period, the work was inserted in various collections of the Latin grammarians. Several editions of it bear the name of Michael Bentinus. One of them is that of Paris, 1530, 8vo. This edition likewise contains the spurious *Origines* ascribed to Cato. An edition was published by Antonius Augustinus, afterwards archbishop of Tarragona, Romae, 1554, 8vo. The same edition, which contains marginal emendations, but no commentary, is generally to be found with the date of 1557, and it then includes several editions; at the beginning of the volume, "Dubia et Varia," "Doctorum Virorum Nomina qui hujus libri emendationi operam dederunt," and more than two pages of *Emendata*; and at the end, seventy-two unnumbered leaves, occupied with various indices. This edition of Varro was reprinted among the works of the editor, Augustini Opera, tom. vii. p. 425-524. The next edition was that of Vertranius Maurus, Lugd. 1563, 8vo. It was followed by the very elaborate and valuable edition of Joseph Scaliger, Paris, 1565, 8vo; and soon afterwards appeared *Adriani Turnebi Commentarii et Emendationes in libros Varronis de Lingua Latina*, Paris, 1566, 8vo. This was a posthumous work, and therefore laboured under the usual disadvantages of such publications. Here we must not overlook another learned labour, *Ad M. Ter. Varronis Assertiones Analogiæ Sermonis Latini, Appendix Henrici Stephani*. Exc. H. Stephanus, 1591, 8vo. An edition of Varro's work was published by Scioppus, Ingoldstadii, 1605, 8vo. Another separate edition appeared after a very long interval, Biponti, 1788, 2 tom. 8vo. This very useful edition, which also includes the fragments of Varro's works, is illustrated with the notes of Augustinus, Turnebus, Scaliger, and Popma. It was followed by the critical edition of L. Spengel, Berolini, 1826, 8vo. And last of all appeared *M. Terentii Varronis de Lingua Latina librorum quæ supersunt, emendata et annotata a Carolo Odofredo Muellero*, Lipsiae, 1833, 8vo. This is an edition of no small value; and we add, with much regret, that the editor has been prematurely arrested in the midst of a very distinguished career. He died at Athens on the 1st of August 1840.

Varro's treatise *De Re Rustica* has been printed in the numerous editions of the *Scriptores Rei Rusticae*. The earliest edition of this collection is supposed to be that printed by Jenson, Venet. 1472, fol. Two editions issued from the Aldine press in 1514 and 1533. A critical edition was published by Victorius, Lugd. 1541-2. It consists of four parts; of which the first three contain the text of the different writers, and the fourth, dated in 1542, bears the title of *Petri Victorii Explicationes suarum in Catonem, Varronem, Columellam Castigationum*. This part, consisting of 144 pages, is sometimes to be found as a separate publication. And here we must likewise notice a learned work of Fulvius Ursinus, *Notæ ad M. Catonem, M. Varronem, L. Columellam de Re Rustica*, Romae, 1587, 8vo. For a very elaborate and learned edition of the *Scriptores Rei Rusticæ*, we are indebted to Gesner, Lipsiae, 1735, 2 tom. 4to, Lips. 1773-4, 2 tom. 4to. And another edition, described as the best, was more recently published by Schneider, Lips, 1794-7, 4 tom. 8vo. Of Varro's Treatise on Agriculture, an English translation was published by the Rev. T. Owen, Lond. 1800, 8vo.

Of both works of Varro there are several editions, and the earliest is that of Scaliger. Exc. H. Stephanus, 1569, 8vo. It was reprinted at Paris in 1573, 1581, and 1585. A collective edition of these two works, and the fragments of his other works, was published by Ausonius Popma, Lugd. Bat. 1601, 8vo. The same editor had previously made a collection of the Fragments, Franequerae, 1589, 8vo. Another edition of all his works was published not long afterwards, Durdrechti, 1619, 8vo. Some copies of the same edition exhibit the imprint of Amsterdam, 1623. (D. I.)

Varro || Vasto.

VARRO ATACINUS, *Publius Terentius*, a Latin poet, was born in the province of Narbonne in the year 82 before the Christian era. According to Jerome, he derived his *cognomen* from a village named Atace; but as we discover no other trace of such a village, the account of Porphyrion, that he derived it from the river Atace, appears more probable. His name indicates a Roman origin. Jerome likewise informs us that, at the age of thirty-five, he applied himself with great ardour to the study of Greek literature. Horace, Sat. i. 10, 46, alludes to him as an unsuccessful writer of satires:

> Hoc erat, experto frustra Varrone Atacino
> Atque quibusdam aliis, melius quod scribere possem,
> Inventore minor.

Wüllner concludes, that of a living poet Horace would not have spoken in such terms. Adopting Bentley's chronology, according to which the satire that contains this passage was written in the year 37 B.C., he infers that Varro did not exceed the age of forty-five. The conjecture is not devoid of plausibility, but cannot be admitted as certain.

Varro Atacinus is extolled by several of the ancient writers. Velleius Paterculus classes him with Lucretius and Catullus. Quintilian mentions him as a poet who had acquired a name. He is likewise mentioned by Ovid, Propertius, and Statius. Virgil adopted several of his verses with little or no alteration. It is, however, to be regretted that, with the exception of a few fragments, all his works have perished. These fragments are to be found in various collections, and, among the rest, in Wernsdorf's *Poetae Latini Minores*, Altenburghi, 1788–99, 6 tom. 8vo. They are incorporated in Wüllner's learned dissertation on the life and writings of the author. One of his works was a version of the *Argonautica of Apollonius Rhodius*; but from the fragments which remain, it does not appear to have been a close version. Another of his works, *Bellum Sequanicum*, was an epic or historical poem in celebration of Cæsar's recent victories. A third was a metrical *Chorographia*, of which Ruhnkenius supposes his *Europa*, quoted by Festus, to have formed a part. The rest of his works, so far as they are enumerated, consisted of elegies, satires, and epigrams. (D. I.)

VASARI, GIORGIO, a painter and biographer, was born at Arezzo in 1512. His father Antonio gave him the first instructions in drawing; but at the age of twelve he was taken by Cardinal Passerini to Florence, where his education in art was further carried on by Michael Angelo and others. After his father's death in 1528, he worked for a time as a goldsmith in order to assist his family; but the necessity for this having been removed by the kindness of an uncle, he resumed the work of an artist. Cardinal Ippolito de Medici took him into his service, and enabled him to complete his studies at Rome under the best masters, and afterwards introduced him to Pope Clement VII. Finally Vasari settled at Florence, where he enjoyed the favour and patronage of the powerful Medici family, and attained a high reputation as a painter and architect. He painted a very large number of works, but few of them are of first-rate merit; and he is now better known as the author of the *Lives of the most eminent Painters, Sculptors, and Architects*, than as an artist. This great work is undoubtedly one of the best of its kind, although it is not free from inaccuracies and partial judgments. It has been frequently reprinted; and an English translation by Mrs J. Foster has been published in 5 volumes by Bohn, London, 1852. Vasari has added to the work a sketch of his own life up to his 55th year. He died at Florence in 1574, and was buried at Arezzo.

VASSAL, a tenant, feudatory, or person who vowed fidelity and homage to a lord, on account of some land, &c., held of him in fee. It was likewise applied to a slave or servant, and especially to a domestic of a prince. See FEUDAL SYSTEM.

VASTO, IL, or VASTO D'AMMONE, a town of Naples, in the province of Abruzzo Citra, on the Adriatic, 31 miles S.E. of Chieti. It is walled and pretty well built, having regular streets, and a large square with a fine fountain. There are here two churches, numerous convents, hospitals, alms-houses, and manufactories of silk, woollen cloth, and earthenware. Many of the inhabitants are employed in fishing. Pop. 9000.

Vater || Vattel.

VATER, JOHANN SEVERIN, an eminent linguist and theologian, born at Altenburg in 1771. He was educated at first at the gymnasium of Altenburg, and at the age of nineteen was sent to the University of Jena, and pursued there and at Halle, to which he went in 1794, the study of philosophy and theology. At the latter university, after completing his academical course, and graduating in 1796, he became a private tutor; and in 1798 he was appointed extraordinary professor of theology at Jena. His studies were especially directed to the Hebrew language, the grammatical knowledge of which he materially improved; but he also extended his researches to a number of other languages, with a view of ascertaining the great principles common to all. In 1800, Vater removed to Halle as professor of theology and oriental literature, to which position he returned, after having been from 1809 till 1820 at Königsberg as librarian and theological professor. His greatest linguistic labour was the completion of the Mithridates of Adelung, which had been left unfinished by the death of that scholar. Besides this, he wrote grammars of the German, Polish, Russian, Hebrew, and other languages, several works on universal grammar, and an index of grammars and lexicons of all languages. After his final settlement at Halle, without giving up his linguistic studies, Vater laboured more in biblical exegesis and church history, and published a commentary on the Pentateuch, a critical edition of the New Testament, and several works of church history. His last publications were *The Preacher's Journal, Church History Archives*, and *Annual of Family Devotion*, which he set on foot in 1819, and conducted with the aid of Bretschneider and others till his death in 1826. In his own department the learning of Vater was unequalled by any of his contemporaries; and his works contain an immense store of materials for the study of comparative grammar and philology.

VATTEL, EMMERICH DE, an eminent jurist, was the son of a Protestant minister, and was born at Couret, in the principality of Neuchâtel, in the month of April 1714. His academical studies he prosecuted at Basle and Geneva. During his early years his favourite pursuit was philosophy; and having carefully examined the works of Leibnitz and Wolf, he exhibited a specimen of his talents for metaphysical investigation by publishing a defence of Leibnitz's system against Crousaz. It was printed in 1741, and in the course of the same year he repaired to Berlin in the hope of obtaining some public employment from the king; but this hope was so long deferred, that in 1743 he proceeded to Dresden with similar views, and experienced a very favourable reception from Count Bruhl. Some private affairs required his presence in his native country; but he returned to the court of Saxony in 1746, and obtained from the elector, Augustus the Third, the title of counsellor of embassy, accompanied with a pension. He was sent to Berne in the capacity of the elector's minister to that republic; and as his diplomatic functions did not require constant residence, he passed some portion of his time with his own family. Much of his leisure was devoted to literature and jurisprudence. Among other works he published *Mélanges de Littérature, de Morale, et de Politique*, and *Loisirs Philosophiques*. But his best efforts were directed to a more elaborate work, on which his reputation is chiefly founded. It appeared under the title of *Droit des Gens; ou, Principes de la Loi Naturelle appliqués à la Conduite et aux Affaires des Nations et des Souverains*, Neuchâtel, 1758, 2 tom. 4to. During the same year,

Vauban || Vaucluse.

having been recalled from Switzerland, he was employed in the cabinet of Dresden, and was soon afterwards honoured with the title of privy-counsellor. Although his constitution had originally been robust, his labours now became so intense as to exhaust his strength. Having tried the effects of relaxation and of his native air, he thought himself sufficiently recovered to resume his place in the cabinet. He accordingly returned to Dresden in 1766; but his renewed exertions soon produced a relapse, and he made another excursion to Neuchâtel, where he died on the 20th of December 1767, in the fifty-fourth year of his age. He left a son, who was recently a member of the council of that principality. The last of his literary labours was a work entitled *Questions de Droit Naturel; ou, Observations sur le Traité du Droit de la Nature, par Wolf.* Vattel's *Droit des Gens* continues to be studied and quoted as a book of authority. It has passed through many editions, and has been translated into various languages. An English translation was published in the year 1760.

VAUBAN, SEBASTIEN LE PRESTRE DE, marshal of France, and the greatest engineer that country ever produced, was born in 1633. He displayed his knowledge of fortification in the course of many sieges, and his services were rewarded with the first military honours. He was made governor of Lisle in 1668, commissary-general of the fortifications of France in 1678, governor of the maritime parts of Flanders in 1689, and a marshal of France in 1703. He died in 1707, after having brought the arts of attacking and defending fortified places to a degree of perfection unknown before. His writings on these subjects are in great esteem. See FORTIFICATION.

VAUCANSON, JACQUES DE, an ingenious mechanician, was born of a noble family at Grenoble, in Dauphiné, 24th February 1709. While yet a boy, he exhibited a taste and a talent for mechanics, and succeeded in the construction of a wooden clock which marked the time with accuracy. Afterwards, for the purpose of studying mechanics more fully, he went to Paris, where he made an automaton that played on the flute. This curious and ingenious machine, having attracted much attention and admiration, he produced others even more wonderful, among which was a duck that swam, quacked, flapped its wings, and even swallowed and digested its food, like a living animal. But besides these ingenious toys, Vaucanson also invented some really useful contrivances. Having been appointed in 1741 inspector of silk factories, he introduced many improvements, and invented machines for weaving and dressing silk. He wrote in the journals of the Academy of Sciences several admirable descriptions of the machines he had invented, and had a very valuable collection of these and other objects connected with art and manufactures, which was unfortunately dispersed after his death in 1782.

VAUCI USE, a department of France, bounded on the N. by that of Drôme; E. by that of Basses Alpes; S. by that of Bouches-du-Rhone; and W. by that of Gard. Length, from N.W. to S.E., 60 miles; greatest breadth, 38; area, 1373 square miles. The Rhone forms its boundary on the W., and its tributary, the Durance, on the S. The country, thus enclosed between the two rivers, is partly level and partly mountainous, the eastern portion being occupied by various branches of the Alps, and the western forming part of the valley of the Rhone. The mountains of Lure, which separate the departments of Drôme and Hautes Alpes, enter Vaucluse in the N.E., and reach the height of 5500 feet above the sea. Connected with this chain is Mount Ventona, the highest summit in the department, about 6500 feet in height; but the general elevation of the mountains is not more than from 2400 to 3000 feet. The mountainous part of the department is chiefly occupied by calcareous, and partly also by other secondary strata, while the less elevated regions consist of tertiary formations. The only navigable river belonging to the department is the Rhone, which receives here the Lez, Aigne, Ouveze, Nesyne, and Durance, all having a general direction from N.E. to S.W. The last of these, which is the second river in importance, itself receives the Jabron and the Cabavon within the department. The fountain of Vaucluse, celebrated in the poems and letters of Petrarch, who frequently resided here, forms the source of the small river Sorgues. It rises in a cavern between Apt and Avignon, and derives its name from the secluded valley in which it is situated (*Vallis Clausa*). The poet lived in the small village near it, and sometimes in the old castle of the bishops of Cavaillon, which still goes by his name. The climate of Vaucluse is mild and healthy, but subject to sudden and violent changes, and terrible storms are not unfrequent. The soil is on the whole poor, although some parts are of considerable fertility. Husbandry is in a backward state, and only about half of the land is arable. Rye, barley, wheat, buck-wheat, and maize, are the principal crops raised; and the produce of these is not sufficient to supply the domestic consumption. About one-twelfth of the area is occupied by vineyards, which yield about 9,000,000 gallons of highly esteemed red wines. There is here abundance of various fruits, including almonds, figs, pears, peaches, plums, apricots, and melons; and there are extensive plantations of olives and mulberry trees, on the latter of which great numbers of silkworms are reared. Saffron, madder, aromatic and medicinal plants, are largely cultivated. There is a considerable extent of meadow-land, and of heaths and open pastures, and on these large flocks of sheep are fed. The other domestic animals are not numerous. There are no minerals in the country of any importance. The chief manufactures are those of silk at Avignon and Orange, of woollen cloth, perfumery, confectionery, glass ware, and printing types. These goods, along with wine, brandy, madder, saffron, wax, honey, and wool, form the principal articles of export from the department. Vaucluse is traversed by numerous roads, and by the railway from Lyons to Marseilles. It forms the diocese of Avignon, which is the capital. The department is divided into four arrondissements as follows:—

Arrondissement.	Cantons.	Communes.	Pop. (1856.)
Avignon	5	20	81,037
Carpentras	5	31	56,672
Apt	5	50	56,025
Orange	7	48	75,260
Total	22	149	268,994

Vaud.

VAUD, (Ger. *Waadt,*) a canton of Switzerland, bounded on the N. by the canton and lake of Neuchatel; E. and S.E. by the cantons of Fribourg, Bern, and Valais; S. by the lake and canton of Geneva; and W. by France. Its length from N. to S. is 29 miles, its greatest breadth 23, and its area 1180 square miles. It occupies the country lying between the range of the Jura and that of the Alps; the former mountains extending from N.E. to S.W. along the boundary between this canton and France, while the latter, stretching westwards between Bern and Valais, terminate about the S.E. extremity of the canton. These two ranges are connected by the Jorat, a chain of hills extending E. and W., and forming the watershed between the affluents of the lake of Neuchatel and the Aar on the N., and those of the lake of Geneva and the Rhone on the S. From this central chain, the country slopes on either side towards the lake of Geneva on the S., and to that of Neuchatel on the N. The loftiest mountains in the canton are in the Alps, the Diablerets, 11,120 feet high; and

Vaud.

in the Jura, La Dols, and Mont Suchet, the former 5775, and the latter 4900 feet. The entire surface is undulating, as the canton is traversed by numerous valleys, and indeed derives its name from the old word *vaula* which was applied to them. The country between the range of the Jorat and the lake of Geneva is one of the finest regions of central Europe. It presents to the view fertile plains, picturesque valleys, green pastures, and terraced hills covered with vineyards; and it is watered by a number of streams for the most part of small size. The rivers to the north of the Jorat ridge are of larger size, and of these the principal are the Orbe, flowing into the lake of Neuchatel, and the Broye into that of Morat. Besides the lakes of Neuchatel and Geneva, which belong only partly to the canton, there are several of smaller size entirely included within its limits, the most important being that of Jorea in the Jura mountains, traversed by the river Orbe. The climate of the country varies considerably in different parts, but is on the whole mild and healthy, especially about the upper end of the lake of Geneva. The only mineral worked to any extent is iron; though coal, marble, and sulphur are also obtained. At Bex, in the east of the canton, is one of the few salt springs in Switzerland. The soil is not very favourable for agriculture, being in the more elevated tracts poor and thin, and on the lower ground heavy and difficult to work. Still farming is the principal occupation of the people; although the amount of corn produced is hardly equal to the consumption; the vines being the most profitable production of the country. Hemp and flax are also grown to a considerable extent. There are extensive orchards, yielding fruit of various kinds, and a large part of the canton is covered with wood, in which pine, elm, ash, alder, and various kinds of nut-trees are the prevailing growth. In the Alps and Jura there are extensive mountain-pastures, on which horses, cattle, sheep, goats, and pigs are reared in large numbers and of good quality. Indeed, next to the growth of vines, the rearing of live stock is the most important branch of rural industry. In 1854, the canton contained about 172,000 acres of arable land, 311,000 of pasture, 148,900 of forests, and 14,400 of vineyards; and in the same year, the number of horses was 17,522, of horned cattle 72,650, of sheep 41,493, of goats 17,455, and of pigs 29,728. Few manufactures are carried on, except those of leather, yarn, and coarse pottery for domestic use. The commerce consists chiefly of the transport of French goods to the interior of Switzerland and Germany; and the export of wine, cheese, and cattle. A railway from Geneva to Bern, with branches to Verdun and Bex, traverses the canton, and many steamers ply regularly on the lake of Geneva. The great majority of the inhabitants are of French origin; and among the upper classes that language is spoken, though the common people generally use a Romance dialect. The established religion, and that of the majority of the people, is the Protestant, and the canton is divided into 149 parishes. There are nearly 7000 Roman Catholics, a number of Protestant dissenters, chiefly Pietists, and a few Jews. Education is well provided for, as the canton contains an academy at Lausanne, with theological, legal, medical, and philosophical faculties; a normal seminary; a number of classical and industrial schools; and upwards of 700 elementary schools. The constitution of Vaud is more aristocratic than that of most of the Swiss cantons, but it has so large an intermixture of the democratic element, that it is difficult to say which is most prevalent. The legislature consists of a council of 184 elected for five years, and meeting annually at Lausanne, the capital. Its members must possess a certain pecuniary qualification, and are only partly chosen by popular election. The executive consists of a council of nine elected by the legislature. Vaud is represented by two members in the council of states, and by ten in the national council of Switzerland. Its contingent to the army of the confederacy is 2964 men. Pop. (1850) 199,575; of which 192,225 were Protestants, and 6962 Roman Catholics.

Vaudois ‖ Vega Carpio.

VAUDOIS. See VALDENSES.

VAULT, in *Architecture*, an arched roof, so contrived that the stones which form it sustain each other. Vaults are on man occasions to be preferred to soffits or flat ceilings, as they give a greater height and elevation, and are besides more firm and durable.

VEDAS (from the Sanscrit root *vid*, to know), the name given to the four principal sacred books of the Hindoos, believed to have been revealed by Brahma, and to be the fountain of all knowledge, human and divine. The *Rigveda* consists of prayers and hymns to various deities; the *Yajurveda*, of directions about sacrifices and other rites; the *Samaveda*, of various lyrical pieces; and the *Atharvaveda*, chiefly of incantations against enemies. All these are believed to have emanated from Brahma at the creation, but they remained for a long time scattered in confusion until, about 5000 years ago, a number of vyasas or compilers arranged them in their present form. Each *Veda* contains, besides the ancient fragments called *Sambuta*, a more developed and dogmatic portion called *Brahmana;* and besides all these, there are the *Upavedas*, *Vedangas*, and *Upangas*, which form a sort of expository literature, and are sometimes reckoned a fifth *Veda*. For an account of the general character and doctrines of the *Vedas*, see BRAHMINS and HINDUSTAN.

VEGA CARPIO, LOPE FELIX DE, a celebrated Spanish dramatist, was born at Madrid on the 25th November 1562. He was, according to his friend and biographer Montalvan, a poet from his cradle; and beginning to make verses before he had learned to write, he used to bribe his elder schoolfellows with part of his breakfast to commit to paper the lines which he had composed. Having lost his father while he was still a child, his love of adventure led him to leave his home and wander with another lad to various parts of Spain, till, having spent their money, they were found at Segovia and sent home again to Madrid. Soon after this adventure, the young poet was taken under the protection of Geronimo Manrique, bishop of Avila, and began to distinguish himself by his dramatic compositions, which were received with great applause by the public, though their author had not yet completed his education; for, after this period, he entered the university of Alcala, where he devoted himself for four years to the study of philosophy. He was then engaged as secretary to the duke of Alva, and wrote his *Arcadia* at the request of that patron, who is frequently mentioned in his occasional poems. He quitted that employment on his marriage with Isabel de Urbino, a lady of rank, beauty, and virtue. His domestic happiness was soon interrupted by a painful incident. Having written some lively verses in ridicule of a person who had taken some injurious freedom with his character, he received a challenge in consequence of his wit; and happening, in the duel which ensued, to give his adversary a dangerous wound, he was obliged to flee from his family, and shelter himself in Valencia. There he resided for a considerable time; but at length found it safe to return to Madrid. His wife died the year of his return. His affliction at this event led him to embark on board the Armada, which was then preparing for the invasion of England. His brother, who served in that fleet as a lieutenant, was shot in an engagement with some Dutch vessels; and his virtues were celebrated by the afflicted poet, whose heart was peculiarly alive to every generous affection. After the ill success of the Armada, Lope de Vega returned to Madrid, and became secretary to the Marquis of Malpica, to whom he has addressed a grateful sonnet. From the service of this patron he passed into the household of the

Vegetius Renatus.

count of Lemos, whom he celebrates as an inimitable poet. He was once more induced to quit his attendance on the great, for the more inviting comforts of a married life. His second choice was Juana de Guardio, to whom he was married in 1590. By this lady he had two children, a son who died in his infancy, and a daughter named Feliciana, who survived her father. The death of his little boy is said to have hastened that of his wife, whom he had the misfortune to lose in about seven years after his marriage. Having now experienced the precariousness of all human enjoyments, he devoted himself to a religious life, still continuing to produce an astonishing variety of poetical compositions. He undertook the very unpoetical employment of secretary to the Inquisition, and shortly afterwards entered into holy orders. In 1609 he became a kind of honorary member of the brotherhood of St Francis. His talents procured him many unsolicited honours. Pope Urban VIII. sent him the cross of Malta, with a diploma of Doctor in Divinity, and appointed him to a place of profit in the Apostolic Chamber. He had dedicated his *Corona Tragica* (a long poem on the fate of Mary Queen of Scots) to that learned pontiff. In his seventy-third year he felt the approaches of death, and prepared himself for it with the utmost composure and devotion. His last hours were attended by many of his intimate friends, and particularly his patron the duke of Sessa, whom he had made his executor; leaving him the care of his daughter Feliciana, and of his various manuscripts. Having given his dying benediction to his daughter, and received the last consolations of his religion, he expired on the 26th August 1635. The number of his works is immense, but there is no complete and uniform edition. Fr. Cerda y Rico superintended a *Collecion de las Obras sueltas, assi en prossa como en verso.* Madrid, 1776–9, 21 tom. 4to. This collection does not include his comedies, which would occupy a much larger number of volumes. See Lord Holland's *Lives of Lope Felix de Vega Carpio and Guillen de Castro*, London, 1817, 2 vols. 8vo. This *Life of Lope de Vega* was separately published in the year 1806; and see particularly Ticknor's *History of Spanish Literature*, 3 vols. London, 1846.

VEGETIUS RENATUS, Flavius, a Latin writer, flourished towards the close of the fourth century. His treatise, *Epitome Institutorem Rei Militaris*, he inscribed to the Emperor Valentinian the Second, who was assassinated in the year 393. He appears to have been a man of rank. Raphael Volaterranus styles him "Comes Constantinopolitanus," and some manuscripts of his own work describe him in a similar manner. In the older editions, his treatise is divided into four books; but Scriverius, on the authority of certain manuscripts, divided it into five. The authors whom Vegetius professes to follow are Cato, Celsus, Frontinus, and Paternus, together with Augustus, Trajan, and Hadrian, in their constitutions or legal enactments. He has thus collected a valuable mass of materials; but Lipsius has remarked that he confounds the customs and practices of his own with those of former ages.

An edition of his work, supposed to be the first, appeared in folio, without place or date, but, according to conjecture, was probably printed at Utrecht about the year 1473. There is another undated edition in quarto, and a third in folio. After various intermediate editions appeared that of F. Modius, Colon. 1580, 8vo. It was followed by two editions, containing the elaborate commentary of Stewechius, Antverp, 1585, 4to, Lugd. Bat. 1592, 8vo. His commentary, together with that of Modius, is to be found in the edition of Scriverius, Lugd. Bat. 1607, 4to. These three, like most of the editions, include Frontinus and other ancient writers on military affairs. The text of these authors, with the notes of Scriverius, was reprinted in 12mo, at the same place, in 1633 and 1644. An edition of Vegetius, containing select notes of Stewechius and Scriverius, with those of the editor, and a French translation, was published by N. Schwebelius, Norimbergæ, 1767, 4to. Another, containing the annotations of various critics, appeared long afterwards, Argent. 1806, 8vo. The work has been translated into several modern languages. There is an early English version by John Sadler, Lond. 1572, 4to; and a more recent translation was published by Lieut. John Clarke, Lond. 1767, 8vo.

Vegetius Renatus ‖ Veii.

VEGETIUS RENATUS, *Publius*, is sometimes confounded with the writer noticed in the preceding article. He is the author of a work on the veterinary art.

Artis Veterinariæ, sive Mulo-medicinæ, libri iv., Basil. 1528, 4to. This is the *editio princeps*; and it was followed by the edition of Sambucus, Basil. 1574, 4to. Vegetius was inserted by Gesner among the *Scriptores Rei Rusticæ Veteres Latini*, Lipsiæ, 1735, 2 tom. 4to. There is a separate edition, of which the title bears, Curante Jo. Matthia Gesnero, Manhemii, 1781, 8vo. But it merely contains a reprint of Gesner's text without his annotations. Of this work an English version was published "by the author of the translation of Columella," Lond. 1748, 8vo.

VEGLIA, an island in the Adriatic, belonging to the Austrian empire, and the crown land of Illyria, separated from the mainland by the channel of Morlacca, and from the island of Cherso on the S.W. by that of Plaunich. It is about 24 miles in length, and half as much in breadth. The coast is bold; the surface rugged and mountainous; and the soil, except in the north and east, pretty fertile, producing wine, timber, and various fruits. Marble is the most important mineral in the island. Along the coast a productive fishery is carried on. There is a small town called Veglia, with a harbour and fort, on the south-west side. Pop. of the island 15,000.

VEHMIC or Fehmic Courts, were secret tribunals established in Germany in the middle ages, terrible from the secrecy with which they carried on their proceedings, as well as from their organization and the extent of their authority. The members, who are said to have at one time amounted to not less than 100,000, were bound by a terrible oath to secrecy, and to obey and carry out the laws of the order. These tribunals are said to have originated with Charlemagne, but it was not till the thirteenth century that they reached their greatest prominence. The lawlessness and anarchy which prevailed at that time gave them work to do, and they gathered strength in the performance of it. They were professedly established to support virtue and peace and honour; but there is no doubt they were often perverted to the gratification of private malice and tyranny. Westphalia was the great centre of their jurisdiction, and was hence termed the *Red Land.* See *Wigands Fehmgerichte Westphalens*, 1827.

VEII, an ancient city of Etruria, celebrated in the early history of Rome, from which it was distant about 12 miles to the north. It was more ancient than Rome; and in the early days of that city possessed an extensive territory on the right bank of the Tiber, extending from Mount Soracte to the sea. According to the Roman historians, the Veientines were very frequently at war with Rome, and with uniform ill success, having been defeated in successive wars by Romulus, Tullus Hostilius, Ancus Martius, and Tarquinius Priscus. Another war occurred after the expulsion of the kings; in which, to check the continual inroads of the Veientines, the family of the Fabii, 306 in number, offered themselves to act as a guard against the enemy, and took up a strong position on the Cremera. This they held for some time, until, being drawn into an ambuscade, they were slain to a man. This war ended soon after by a truce; but in 407 the final contest between the states began. The Romans laid siege to the city; but it was not till they had spent ten years before its walls that they succeeded, under Camillus, by means of a mine, in capturing it. As Veii was no less a city than Rome itself at that time, a question was raised as to the propriety of making it a sort of second capital; but, through the influence of Camillus, this idea was abandoned. Again, after the destruction of Rome by the Gauls, a large party proposed to remove the seat of empire entirely to Veii; but

Velasquez. again Camillus opposed and defeated this project. The city was in consequence deserted, and rapidly fell into decay.

VELASQUEZ, DIEGO RODRIGUEZ DE SILVA Y, the greatest painter of Spain, both in variety and in power, was the son of a lawyer, and was born of good family at the town of Seville in 1599, the same year in which Van Dyck saw the light. The lad received the best scholastic education that Seville could afford, and gave early evidence of a decided taste for drawing, which determined his parents to place him with the painter Herrera the Elder, a harsh, violent, passionate man; but a bold, dashing, spirited artist. Velasquez, being of a quiet and gentle temper, grew weary of the rough usage of this master, and sought the instructions of Francisco Pacheco, a timid, cold, classical painter, in every respect the very opposite of Herrera. And yet Velasquez remained with him five years; but at the end of this period he married Juana, Pacheco's daughter, who most likely exercised a much stronger fascination over him than that which her father's brush could exert. Besides, he had early made up his mind that nature is the artist's best teacher, and industry his surest guide to perfection. He accordingly kept a peasant lad as an apprentice, whom he sketched in every conceivable attitude, and thus laid the foundation of that wonderful excellence to which he afterwards attained in the art of delineating male heads. His detractors used to say that he could paint a head and nothing else; but a moment's reflection would have taught them that the Spanish Van Dyck, when he chose to descend to the *Feria*, could rival his townsman Murillo; and no Teniers or Hogarth could surpass his drunken wassailers. His dogs equal those of Snyders; his horses those of Rubens; and his landscapes exceed those of all Spanish artists. To those who suggested Raffaelle to him as a model, he used to reply, that "he would rather be the first of vulgar than the second of refined painters." This was his artistic creed throughout his whole life. "Tell me not," he seemed to say to all critics, "what is spiritual, ideal, poetical; but tell me what is real, earthly, human, and I shall paint that." The ideal he left to those who had a relish for it; he was content simply to delineate truthfully what lay near him. Hence Velasquez's works are quite unique. His mind passed into his subjects; and he painted men as if they would walk out of the frames.

Furnished with various introductions from his father-in-law, Velasquez set out, in the month of April 1622, to visit the capital of Spain. After some months' study at the Pardo and the Escorial, he returned again to Seville, only to leave it on a second and more successful visit to Madrid. Attended by his slave, Juan Pareja, who afterwards rose to eminence as a painter, Velasquez set out for the capital. They lodged at the house of Fonseca, a patron of art, and a warm friend of Velasquez, whose portrait brought the young Sevillian into such notice that he received an order from the king to remain in his service henceforward. Velasquez was now on the high road to fortune, and, if his star should prevent not, likewise to fame. He painted the king, mounted on a fine Andalusian charger, "the best horseman in all Spain;" and his devoted subjects had an opportunity of bespattering the royal subject and the artist alike with praise, on the exhibition of the painting in front of the church of San Felipe el Real, in the High Street of Madrid. His majesty had never been painted before. So spake the prime-minister. So thought the king; and he resolved that henceforward Velasquez should have the monopoly of his royal countenance,—a vow which he characteristically broke in favour of Rubens and Crayer. Both sonnets and ducats poured in upon the young painter, and, what he probably valued more, he was chosen painter in ordinary to the king on the 31st October 1623. His salary was doubled, his family was ordered to Madrid, and he was provided with Velasquez. apartments in the treasury worth 200 ducats a year. To portray the royal family was henceforward his chief duty. The celebrated equestrian portrait of King Philip IV., now in the Royal Gallery of Madrid, is supposed to be one of the finest pictures in the world. The same year his pencil was busy on a picture of low life, which for force of character and strength of colouring has never been excelled. This is the famous painting of "The Topers" (*Los Borrachos*). Velasquez next gained a victory in a pictorial competition proposed by the king, of "Philip III. expelling the Moriscos." Philip advanced Velasquez to the post of usher, and bestowed upon his father three legal appointments in the government offices at Seville.

In 1628, Velasquez had the pleasure of making the friendship of Rubens, and of showing him over the Escorial. Next year he set out on a tour to Italy. He visited Venice, Ferrara, and Rome. Pope Urban VIII. assigned him apartments in the Vatican, while he diligently copied the works of M. Angelo and Raffaelle. As spring advanced he sought the airy heights of Villa-Medici, from which he was soon compelled to remove by the malaria with which the place was infected. He spent nearly the whole of the next year in Rome. The paintings of "Velasquez" himself, of the "Forge of Vulcan," and of "Joseph's Coat," all intensely Spanish, in spite of the grandeur of Italian art, complete his original works during his residence at Rome. He returned to Madrid in the spring of 1631, where he was kindly received by Olivarez, as well as by the king, who was that subtle minister's tool. Portraiture was the main work of Velasquez for some years. He painted excellent pictures of Philip III. and Queen Margaret, of the Count-Duke of Olivarez, and of the Duke of Modena. He produced, in 1639, one of his noblest paintings, "The Crucifixion," executed for the nunnery of San Placido. During the same year he was busy with a painting of Admiral Pulido Pareja, which is said to have been so true to nature, that the king mistook it for the original. Next year he visited, with his royal master, the Tempe of Spain, and painted numerous pieces from the silvan shades and exquisite garden-walks of fair Aranjuez. Besides portraits of Queen Isabella of Spain, of the king, of Don Balthazar Carlos, and of Quevedo the poet, we have nothing more from his hand for some time, save the noble picture, "The Surrender of Breda," commonly known as *Las Lanzas*.

Velasquez visited Italy a second time on a royal mission to collect works of art. After spending about a year altogether in Italy, during which time he painted the portrait of Pope Innocent X., now the gem of the Doria collection, he hastened back to Madrid in 1651. On his return the king made him Aposentador-mayor of the royal household. This lucrative and honourable post had formerly been held by the architects Herrera and Mora. The duties of this office were various; but the burden of the post consisted in securing a lodging for the king's person during his numerous migrations. Henceforward Velasquez had little time for painting. Except the exquisite picture known as the "Maids of Honour" (*Las Meniñas*), which artists have usually considered his masterpiece, little else of any note intervenes worthy of record. In 1656 he was made a Knight of Santiago, the king drawing with his own hand the much coveted red cross on the portrait of the artist introduced into the "Maids of Honour." His visit as Aposentador to the Bidassoa, to erect a royal pavilion on the Pheasants' Isle, for the reception of royalty on the occasion of the celebration of the nuptials of Louis XIV. of France and the Infanta Maria Theresa, cost Velasquez his life. After a lingering illness, he died on the 6th of April 1660, in the sixty-first year of his age. See *Velazquez and his Works*, by William Stirling, 1855. (For a critical estimate of Velasquez as a painter, see ARTS, *Fine*, and PAINTING).

Velez Blanco || Vendée.

VELEZ BLANCO, a town of Spain, Andalusia, in the province and 60 miles N.N.E of Almeria. It is an old and ruinous place, standing on a hill, and defended by a small castle. There are here a church, town-hall, prison, schools, manufactures of woollen and linen cloth, hats, soap, and tiles; and an active trade in wool. Pop. 7546.

VELEZ *Malaga*, a town of Spain, Andalusia, in the province and 14 miles E.N.E. of Malaga, at the mouth of the small river Velez in the Mediterranean. Its situation is very fine, in a fertile valley at the foot of steep mountains, and it was formerly a place of much commercial importance, but has of late greatly declined in prosperity. It is on the whole well built, and has a Moorish castle, elegant town-hall, several churches, convents, and schools, a custom-house, prison, and various hospitals. The manufactories include numerous oil-mills, sugar-houses, soap-works, distilleries, and tanneries. The neighbourhood of Velez Malaga yields abundance of fruits, which are exported; while coal, timber, rice, and dried fish are imported. The harbour is not very good. Pop. 13,713.

VELEZ *Rubio*, a town of Spain, Andalusia, in the province and 54 miles N.N.E. of Almeria. It is walled, and contains a handsome church, a large court-house, with a prison attached to it, several schools, and an extensive foundling hospital. Woollen and linen cloth, flour, and oil are made here; and some trade is carried on in these articles, and in the produce of the surrounding country. In the vicinity there are mineral springs. Pop. 12,342.

VELLETRI (anc. *Velitræ*), a town of the Papal States, in the Comarca, and 21 miles S.E. of Rome. It stands on the lower slopes of Monte Artemisis, which overhangs the Pontine marshes; and it is enclosed with ruinous walls, and irregularly and meanly built. It has a large square, containing a statue of Pope Urban VII., and a fine church with a lofty tower. There is also here a cathedral, a handsome town-hall, and two private palaces, one of which formerly contained the Borgian museum, now at Naples. The neighbourhood of Velletri is celebrated for its wine, and the beauty of the women of the town has been noted by many travellers. The ancient Velitræ was an important Volscian city destroyed by the Romans, but afterwards rebuilt. In 1734, Carlo Borbone, king of Naples, gained, near Velletri, a decisive victory over the Austrians, which secured the kingdom of the two Sicilies to the Spanish Bourbons. Pop. 10,000.

VELLORE, a town and fortress of British India, presidency of Madras district, and 16 miles W. of Arcot. The fort is extensive and strong, the walls being built of very large stones, with bastions and round towers at short distances. These are connected together by a covered way, which, with its embattled wall, and small projecting square towers, produces a very fine effect. The whole fort is surrounded by a deep and wide ditch, cut chiefly out of the solid rock; but, though strong in itself, it is commanded by the surrounding hills. The town is clean and airy, and has a large bazaar and a splendid pagoda. The heat is very great, but yet the station is considered one of the healthiest in the Carnatic. After the capture of Seringapatam in 1799, Vellore was selected as the residence of Tippoo's family; but on the occurrence, in 1806, of a serious mutiny among the troops, in which they were suspected to be implicated, they were removed to Bengal. The population of Vellore is given at 51,500.

VELLUM. See PARCHMENT.

VELVET, a rich kind of silk-stuff, covered on the outside with a close, short, fine, soft shag, the other side being a very strong close tissue. Cotton stuffs manufactured in the same way are commonly called *velveteens*.

VENDÉE, a department of France, bounded on the N. by those of Loire Inferieure and Maine et Loire; E. by that of Deux Sèvres; S. by that of Charente Inferieure; and W. by the ocean. Length, from N.W. to S.E., 82 miles; greatest breadth, 56; area, 2616 square miles. The surface is in general low and flat, uninterrupted by any hills, except in the N.E., where the department is crossed by the series of heights extending from the central mountains of France to the mouth of the Loire. They cover a considerable breadth of country, but nowhere rise more than 500 feet above the sea. This hilly part of the department is distinguished by the name of the *Bocage*, on account of the copses and thickets with which it is covered; and it was the chief theatre of the long and bloody war waged here at the time of the first revolution. South of the *Bocage* lies a region called the *Plaine*, covering about 120 square miles of the best land in Vendée, and sloping gradually towards the S.W. The remainder and by far the larger part of the department forms the *Marais*, which stretches along the whole coast, and is chiefly occupied with extensive marshes. The coast is low, and indented with no large inlets, except that of Aiquillon in the S.W. Off it lie several islands, the largest of which are those of Noirmoutier and d'Yeu. The rivers are of no great size or importance. That from which the department takes its name is a small stream, rising in Deux Sèvres, and flowing S.W. through the *Plaine* into the Sèvre-Niortaise, which forms the southern boundary of the department. It is navigable for small barges as far as Fontenay. Further N. is the Lay, which rises by two branches in the hills of the *Bocage*, flows irregularly S.W., and falls into the Atlantic. It has been made navigable for 20 miles. Another river falling into the sea is the Vic, navigable for 6 miles. The Sèvre Nantaise traverses the N.E. corner of the department, and it, as well as the Boulogne, which rises here, flows northwards to join the Loire. The geological structure of the country is various in different parts. In the hilly region granite and other primitive rocks prevail; while the rest of the department has a thick clayey soil, supported in the portion called the *Plaine* by extensive strata of limestone. Coal and iron are worked to some extent, and large quantities of salt are obtained from the marshes along the coast. The soil is fertile, especially in the *Plaine*, and much of the marshy land, when drained and protected by embankments, affords excellent pasturage. The climate in the *Bocage* is colder but more healthy than in the rest of the country, as the marshy land along the coast gives rise to noxious exhalations, and is liable to sudden and violent changes of weather. Agriculture is in a very low state, although the produce of corn is more than sufficient for the home consumption. Besides wheat, barley, oats, rye, millet, buckwheat, hemp, and flax are raised; and a large extent of ground is occupied by vineyards, though the wine produced is of very inferior quality. On the pastures, horses of small size but good breed are reared; but the cattle and sheep are little esteemed. Game abounds in the woods and heaths, and fish in the rivers. The manufactures are few. The most considerable is that of linen; but coarse woollen cloth and earthenware are also made. The principal articles of trade are corn, wine, timber, charcoal, and horses. There is one navigable canal, from Luçon to the bay of Aiguillon, and numerous roads traverse the department. The inhabitants, especially those of the Bocage, are described as hospitable, good-tempered, honest, simple and antique in their manners, averse to any innovations, and attached, almost to superstition, to the doctrines and observances of the Roman Catholic Church. The nobles and the common people were equally resolute in their opposition to the changes effected by the Revolution of 1789, and all were alike distinguished for their bravery, their perseverance, and their endurance of the hardships and disasters which came upon them. The department has for its capital Napoléon-Vendée, and is divided into three arrondissements as follows:—

Vendée.

Vendôme || Venezuela.

Arrondissement.	Cantons.	Communes.	Pop. (1856.)
Napoléon-Vendée.....	10	104	144,391
Fontenay-le-Comté	9	111	134,567
Les Sables-d'Olonne.....	11	79	110,725
Total	30	294	389,683

VENDOME, a town of France, capital of an arrondissement in the department of Loir-et-Cher, on the slope of a vine-covered hill near the Loir, 20 miles N.N.W. of Blois. It is well built, and has on the heights above the picturesque ruins of an ancient castle, and in the town itself an old church, another now used as a corn market, a monastery now a barracks, a college, and a theatre. Woollen and linen cloth, gloves, leather, and paper are manufactured here. Vendôme was formerly the capital of a county, afterwards raised to a duchy of the same name; and the dukes resided in the castle here. Pop. (1856) 7930.

VENEERING, VANEERING, or *Fineering*, is the art of laying thin leaves or slices of a superior kind of wood upon an inferior, so as to give the whole the appearance of the more valuable kind. A more complicated kind of veneering or inlaid work, in which pieces of various kinds of wood, and sometimes of horn, ivory, and metal, are arranged so as to produce an ornamental effect, is commonly called Marquetry.

The wood intended for veneering is first sawn out into slices or leaves, about a line thick. In order to saw them, the block or planks are placed upright in a kind of vice or sawing-press. See SAW and SAW-MILL. These slices are afterwards cut into slips, and fashioned divers ways, according to the design proposed; then the joints being carefully adjusted, and the pieces brought down to their proper thickness, with several planes for the purpose, they are glued down on a ground or block of dry wood, with good strong glue. The pieces being thus joined and glued, the work, if small, is put in a press; if large, it is laid on the bench, covered with a board, and pressed down with poles, or pieces of wood, one end of which reaches to the ceiling of the room, and the other bears on the boards. When the glue is quite dry, they take it out of the press and finish it; first with little planes, then with divers scrapers, some of which resemble rasps, which take off dents left by the planes. When sufficiently scraped, the work is polished with the skin of a sea-dog, wax, and a brush and polisher of shave-grass.

VENEZUELA, a republic of South America, lying between N. Lat. 1. 12. and 12. 16.; W. Long. 59. 42. and 73. 17.; bounded on the N. by the Caribbean Sea; E. by the Atlantic and British Guiana; S. by Brazil; and W. by New Granada. Length from E. to W. 860 miles; breadth from 400 to 640; area 426,712 square miles. The name Venezuela, or Little Venice, is due to Vespucci and Ojeda, the discoverers of the lake of Maracaibo, who found the native villages there built like Venice on piles in the midst of the water.

The coasts of the country are much varied both in their outline and in their character. From the Boca de Navios, the most southerly and principal mouth of the Orinoco, which makes the boundary of British Guiana to the Gulf of Paria, the coast is occupied by the delta of the Orinoco, a low and alluvial region, intersected by the numerous branches of the river, and covered in some parts with gigantic forests. Off this part of the coast lies the British island of Trinidad, forming the east side of the Gulf of Paria. The north side of the gulf is formed by the peninsula of Paria, terminating towards the east in the promontory of the same name. From this headland westward to the Punta d'Araya extends a series of bare rocks, at some places coming close down to the sea, and at others leaving a narrow sterile plain along the shore. Opposite this part of the coast is the island of Margarita, forming a province of the republic. See MARGARITA. South of the Punta d'Araya is the opening of the gulf of Ariaco, which runs eastward into the land, and is separated from the sea by the narrow tongue of land terminating in the Punta d'Araya. Further west, the coast, which takes a gentle curve towards the south, becomes low and sandy, and is lined with many lagoons and salt marshes. At Cape Codera, about 200 miles west of the Gulf of Cariaco, its character entirely changes; and as far as Puerto Cabello, about 155 miles, a chain of lofty mountains rises steeply from the very edge of the water. This is in fact the termination of one branch of the Andes. At Puerto Cabello, a low and sandy tract of coast succeeds; and here it takes a curve towards the north, continuing to have this character as far as the mouth of the Lake of Maracaibo. About the middle of this tract lies the peninsula of Paraguara, joined to the mainland by a long narrow isthmus. The frontier of New Granada reaches the sea a short distance to the west of the Lake of Maracaibo. The whole length of the coast is 1584 miles, of which about 300 are washed by the Atlantic and Gulf of Paria, the rest by the Caribbean Sea.

Venezuela.

The interior of the country is no less diversified in its character than the coast. About a fourth of the whole area is occupied by mountains, and these belong to two different chains, the Andes and their branches, which occupy the north-west; and the mountains of Parima in the south and south-east of the state. Of the former range, it is only the eastern Cordillera that enters Venezuela. That ridge traverses New Granada, and near Pamplona in that country divides into two branches. The most westerly of these extends northwards along the frontier of New Granada, and terminates near the Lake of Maracaibo. It has few summits more than 4000 feet high, and is for the most part covered with dense forests. The other branch of the Cordillera enters Venezuela, and stretches about 300 miles in a north-east direction, covering a tract of country about 30 miles broad. It consists of an enormous mass of rocks, having in general narrow plateaux called *paramos* at the summit. These *paramos* are from 10,000 to 12,000 feet above the sea; but many of the summits rise higher: the Sierra Nevada de Merida, the only one above the snow-line, being 15,342 feet, and the Pichado de Mucuchies, 14,168 feet high. The sides of the mountains have generally steep declivities, but in some places they descend by terraces which are occupied by small plains. At the point where this range terminates, the coast-range, Sierra Costanera, which may be considered as a sort of branch or continuation of it, begins. This range, which consists of several ridges nearly parallel, reaches the sea near Puerto Cabello; and there one branch extends to the north-west; while another stretches along the coast terminating at Cape Codera; and still a third extends parallel to this, but further inland. The first of these branches is nowhere higher than 4200 feet; the second contains the summits called Silla de Caracas, 8808 feet, and Picache de Naiguata, 9480 feet above the sea; and the loftiest points in the third are the Cerro de Platilla, 6217 feet, and the Cerro Azul, 5816 feet in height. A small portion of the N.E of the country is occupied by a range called the Bergantin mountains. In the southern part of Venezuela, on the borders of Brazil, and nearly half way between the Orinoco and the Amazon, a range of mountains called Sierra Parima stretches from west to east, diverging from the western extremity of the Pacaraima range. This region, however, still remains unexplored; it is covered with vast and dense forests; but would probably be capable of cultivation, as the mountains do not rise above 12,000 feet from the sea.

From these mountains to the coast-range, and from the delta of the Orinoco to the foot of the Andes, the whole of Venezuela is occupied by an immense plain. The por-

Venezuela. tion of this region lying north of the Orinoco and its affluent the Meta, forms what are called the *llanos* or levels of Venezuela. These plains are estimated to cover an area of 116,592 square miles, and vary considerably in their elevation; some parts being very little raised above the level of the sea, while others, near the foot of the mountains, have a height of nearly 1300 feet. The whole are characterized by the absence of forests; the trees that do grow being found either singly or in small groups. South of the Meta lies a region of a very different character; for here the country is entirely covered with dense forests, which extend as far as the boundary of Brazil, and indeed even beyond the equator. But in this region the frontiers of Venezuela are uncertain; for, while it claims all the country to the east of 69 degrees of W. Longitude, New Granada extends its boundaries as far east as the Orinoco.

Venezuela is on the whole well watered. The principal river is the Orinoco, which is the third in size of all the South American rivers. It and its principal tributaries are described in a separate article. (See ORINOCO.) Of rivers not belonging to its basin, there are few of any size or importance. The Cuguni rises in the east of the country, flows eastward into British Guiana, and joins the Essequibo. Further west, the Guiania, or Rio Negro, an affluent of the Amazon, crosses the south-west corner of the state. The rivers that fall immediately into the Caribbean Sea are for the most part of small size; but some of them are navigable. These are the Tocuyo, rising in the coast-range, and falling into the sea near the town of Tocuyo, 300 miles long, and navigable for 150; the Tui, 190 miles long, and navigable for about 80; the Unare, 170 miles long, and navigable for 90; and the Guarapiche, 180 miles long, and navigable for more than 70. The Lake of Maracaibo also receives the Catatumbo, 200 miles long, and navigable for 135; the Zulia, 230 miles long, and navigable for 160; the Exalante, 140 miles long, and navigable for 80; and the Motatan, 180 miles long, and navigable for about 90. The lakes and lagoons of Venezuela are numerous but small; that of Maracaibo, the only one of large size, is more properly a gulf than a lake, as it communicates by a narrow channel with the sea. It is described under the article MARACAIBO.

The climate of the country is various in different parts, owing to their different elevation. The whole of the state is divided by the natives into three regions or zones—the hot, temperate, and cold countries. The first of these comprises all the land less than 2000 feet above the sea-level; the second all lying between 2000 and 7000 feet high; and the third all above 7000 feet. The first of these divisions is by far the most extensive, including all the *llanos* and wooded plains in the country. Here the climate is quite of a tropical character. The distinction of seasons is into wet and dry; the former corresponding to the winter, and the latter to the summer of temperate countries. Immediately after the autumnal equinox the rains begin, and continue in great abundance and with few intermissions during the whole winter; while hardly any rain falls in the summer. This alternation of season produces a vast difference in the appearance of the *llanos;* for they are transformed in the winter from vast pastures into an immense sheet of water. Along the coast the seasons are subject to various modifications; and in some places there are two wet and two dry seasons annually. About the delta of the Orinoco the climate is very unhealthy, owing to noxious exhalations; and elephantiasis and *goître* are prevalent diseases. Nearly the whole of the country, especially the regions about the coast, is liable to violent earthquakes, which have frequently proved very destructive.

The vegetable productions of Venezuela are most abundant and varied. In the whole of the temperate zone palms of various kinds abound; among which is the cocoa-palm, yielding large quantities of oil for exportation. Along with these flourish many other native plants, such as pine-apples, tamarinds, mimosas, cactuses, and the cow-tree, which yields a fluid resembling milk. Among the larger indigenous trees are the *bauhinia* of colossal size, the bombax, or silk cotton-tree, yielding a cottony matter, and the mahogany tree; while among plants that yield valuable drugs are the sarsaparilla and dragon's-blood plants. In the more elevated and temperate regions, cinchonas, which are valuable as febrifuges, abound; and in many places form by themselves immense forests. There, too, most of the grains of temperate countries grow well. The cold regions of Venezuela are distinguished by an alpine vegetation, gradually diminishing in amount towards the snow-line. Many European fruits have been introduced into the warm regions, especially vines, figs, pomegranates, oranges, limes, and lemons, which succeed well. Tobacco of excellent quality is grown in the Bergantin mountains, and in the valley of Barinas in the north-east of the country; and throughout the whole of the state maize is cultivated. Rice is only grown in a few places; wheat only at a considerable elevation; and barley only on the slopes of the Andes. Almost all kinds of pulse are raised, as well as potatoes and other edible roots. Venezuela.

Domestic animals form, to a large extent, the riches of Venezuela. The *llanos* afford abundant pasture for cattle, horses, mules, and asses; and great numbers of these animals are reared on them. Sheep and goats are not kept in large numbers, except in a few places. The chief of the wild animals are the jaguar or American tiger, hunted for its valuable skin, and the puma or lion; but both these animals are becoming rare in the country. The tiger-cat, the ounce, the tapir, varieties of the deer, and the wild hog, and many different kinds of monkeys, also abound in the forests. The birds of the country are numerous, including various species of falcons, hawks, parrots, pelicans, wild-geese, &c. Two kinds of whales are frequently seen off the coast of the Caribbean Sea, and all the rivers, lakes, and seas abound in fish of various kinds. The chief fishery is between the island of Margarita and the mainland; where large numbers of a fish called *liza* are caught, salted, and exported to the West Indies and neighbouring ports. In this strait, also, a profitable pearl-fishery was carried on for some time subsequently to the discovery of America, but the supply has long been exhausted.

The mineral resources of the country are not very great. Gold has been worked at some places in the Andes, but never with much success. Silver, tin, and copper, also exist, but only the last has been profitably worked. Coal occurs in the coast-range; petroleum and a kind of natron are obtained in various places; and large quantities of salt are produced in the salt-works along the Lake of Maracaibo, and on the peninsulas of Paraguana and Araya.

Manufactures are in this country still in their infancy, being carried on to a very small extent, as the industry of the people is chiefly directed to agricultural and pastoral pursuits. Tocuyo, Barguisemeto, Trujillo, and Merida, are the principal manufacturing towns; and the articles made there are chiefly those required for domestic use; such as coarse cotton cloth, hammocks, straw hats, and pottery. There are also a large number of tanneries in the country, as most of the leather used is of home manufacture. The commerce of Venezuela, which declined very much during the civil war that raged in the country, has since somewhat improved. The following table exhibits the total value of the export and import trade of Venezuela with the principal countries with which it carries on commerce, for the years ending June 30, 1854 and 1856 respectively:—

Countries.	Imports.		Exports.	
	1854.	1856.	1854.	1856.
	L.	L.	L.	L.
Great Britain...	254,817	309,902	42,032	38,095
United States...	166,222	241,802	372,651	541,053
Hanse Towns...	120,462	200,794	184,159	318,627
France	95,801	125,573	165,780	109,366
Spain	39,026	46,131	150,503	188,511
Other countries	234,454	196,224	227,245	131,568
Total	910,782	1,120,426	1,142,370	1,327,220

The principal seaport in the country is La Guaira, on the Caribbean Sea, near Caracas, the capital. The value of the exports from that port alone, consisting chiefly of cocoa, coffee, cotton, hides, indigo, and tobacco, amounted in 1857 to L.595,960; while the value of the imports in the same year was L.671,253. At Puerto Cabello the value of the exports was L.578,533; and that of the imports L.246,737; and at Bolivar and the other ports on the Orinoco, the exports were valued at L.116,847; and the imports at L.126,231. The following table shows the navigation at these ports in 1857.

Ports.	Entered.		Cleared.	
	Vessels.	Tons.	Vessels.	Tons.
La Guaira.....	230	37,913	230	37,535
Puerto Cabello.....	135	29,969	151	34,485
Ports on the Orinoco...	179	17,694	183	19,766

The population of Venezuela, like that of the whole of what was formerly Spanish America, is of a very mixed character. There are the aboriginal inhabitants, the descendants of the Spaniards and Africans; and the various races that have been produced by the intermixture of these. The pure natives are copper-coloured, some of them very dark, and others almost as fair as Europeans. They are little, and not very strong, but have large heads and limbs. Many of them are altogether independent, divided into about 100 tribes, speaking different dialects, and occupying the unexplored forests of the interior. Others are in subjection to the government of the country; but live separately, preserving their own manners and customs; while some have been entirely mixed with the more civilized races. The negroes were formerly kept in slavery, but since the prohibition of the slave-trade in 1830, the slaves had been very much reduced in number; and by a decree passed in 1854, they were emancipated. The Creoles, or people of European descent, form only about a fourth-part of the entire population; but the mixed races, Mestizos, Mulattoes, Zambos, &c., are much more numerous.

The government of Venezuela is republican, being framed on the model of that of the United States of North America. The political franchise is vested in all the people who possess a certain property qualification and are able to read and write. They choose electors, 1 for every 4000, for two years; and these again appoint the president, vice-president, and members of the legislative body. This last consists of a senate, in which each province is represented by 2 members; and a house of representatives, consisting of 1 member for every 25,000 inhabitants. The president and vice-president, who exercise the executive power, are elected for four years; and half of the legislative body retire biennially. Besides the central government, each province has a legislature of its own, chosen in the same way, whose acts are subject to the approval or disapproval of the central legislature. The religion of the country is the Roman Catholic; the other sects, though tolerated, are not allowed the public exercise of their religion. Education is provided for by law, but has as yet made very little progress in the country. The principal event in the history of Venezuela is the war of independence against the Spaniards, an account of which is given in the article BOLIVAR. In 1821, after securing its independence, Venezuela was united with New Granada and Ecuador to form the republic of Colombia; but this only lasted till 1830, when the three states again became independent. Since gaining its independence, the country has been in a very disturbed state, and its finances have fallen into total ruin, the expenditure for 1852–53 being three times as much as the revenue, and a large debt having been contracted. The following table shows the area, population, and chief towns of the several provinces:—

Provinces.	Square Miles.	Pop. (1854.)	Capitals.
Apure.....	21,134	24,618	Achaguas.
Barinas.....	23,808	128,532	Barinas.
Barcelona	13,774	64,372	Barcelona.
Barquisimeto.....	17,305	126,392	Barquisimeto.
Carabobo, Cogedes..	8,080	102,116	Valencia, San Carlos.
Caracas, Araqua	33,819	298,913	Caracas, Aragua.
Coro.....	11,197	48,127	Coro.
Cumana.....	17,409	66,526	Cumana.
Guiana.....	226,563	63,738	Bolivar.
Maracaibo.....	33,082	59,311	Maracaibo.
Margarita.....	441	23,967	Asuncion.
Merida.....	10,793	76,816	Merida.
Trujillo	9,307	55,378	Trujillo.
Total.....	426,712	1,138,806	

In 1858, the total population was estimated to have increased to 1,564,000.

VENICE, a celebrated city of Northern Italy, capital of the Austrian crown-land of the same name, is situated in N. Lat. 45. 25., and E. Long. 12. 20., in the midst of a lagune or shallow lake, which extends about 20 miles in length from north to south, and about 6 in breadth, divided from the sea by the two islands or sand-banks of Malamocco and Palestrina, each about 9 miles long, but only half a mile in breadth. The city occupies a tract of dry ground about 7 miles in circumference, but divided into a great number of islands by canals, the principal of which, the Canale Grande, extends in a great curve through the heart of the town, with a width of 200 feet, and is crossed near its middle by the Rialto bridge, a magnificent structure of marble, consisting of a single arch overtopped by two ranges of shops, which form three roadways. The principal part of the city is, moreover, divided by a still wider canal, that of Giudeca (which varies in width from about 1200 feet to 2160), from a long and narrow series of islands, the most easterly of which contains the fine church of San Giorgio Maggiore, built by Palladio. Venice is considered to be one of the finest cities of Europe, though its streets are very narrow and winding, and most of them only calculated for foot passengers, the great thoroughfares being the canals. But in the midst of its labyrinth of canals and streets there are several large piazzas, or open areas, almost every one of which is adorned with a fine church or palace. The principal of these areas is the Piazza di San Marco, a large oblong measuring 562 feet by 232, surrounded with elegant buildings on a regular plan, and terminated at its eastern extremity by the metropolitan church of St Mark, a singular but splendid combination of the gothic and the oriental styles of architecture. In front of it stand the three flagstaffs that once bore the banners of Cyprus, Candia, and Morea; and over the principal portal are the celebrated bronze horses, which, after adorning the triumphs

Venice. of Nero and Trajan at Rome, were conveyed by Constantine to Constantinople, by the Doge Davidolo to Venice, by Napoleon to Paris, and finally restored by Francis II. of Austria to their present position. The Piazza likewise contains the campanile or belfry of St Mark's, a lofty square tower, 316 feet high and 42 on each side, terminated by a pyramidal top, to which the ascent is formed by an easy inclined plane instead of a stair. Adjoining the church is the doge's palace, a marble edifice in the Saracenic style. This magnificent building was first founded in 800, and afterwards five times destroyed; but it rose each time with increasing splendour from its ruins, till in 1354 the Doge Marino Faliero erected the present building. Its form is an irregular square, and the grandeur of its proportions and unity of its design give it a most imposing appearance. From a large quadrangle in the interior, the Giant's Staircase, so called from Sansoveno's colossal statues of Mars and Neptune, leads to an open arcade, where stood the celebrated lions' mouths for the receipt of secret information. Many of the halls of the palace are very fine, and their walls and ceilings are profusely covered with paintings by Titian, Tintoretto, Paul Veronese, and other masters. Behind the palace the celebrated Bridge of Sighs gives access over a canal to the horrible dungeons of the old republic, now no longer used. In front of the palace is the Piazzetta, which forms the communication between the great piazza and the lagune, and is as it were the state entrance to Venice. On the quay of the Piazzetta are placed two magnificent monolithic granite columns, one crowned with the winged lion of St Mark, and the other with the statue of St Theodore, the first patron of the republic. Between these columns was formerly the place for public execution.

Venice contains in all 103 churches and chapels, mostly Roman Catholic, and 7 synagogues. It is divided into 6 quarters, which are subdivided into parishes; and each of the smaller islands in the lagune has also its church, generally that of a convent. Next to St Mark's, the most interesting churches are that of Santa Maria Gloriosa, containing Titian's and Canova's graves; and that of S. Giovanni 'l Paolo, containing those of many of the doges. There are three theatres, and as many opera-houses. The principal scientific and literary institutions are, the lyceum, which possesses a rich physical cabinet and a botanical garden; the three gymnasiums; the patriarchal seminary; the college of the Salesiane for young ladies; the college for marine cadets; the principal normal school; the athenæum of sciences and literature; the academy or school of the fine arts, whose rooms may be ranked among the finest in Europe, containing a choice collection of casts, a superb picture-gallery adorned with the works of the greatest masters of the Venetian school, and a considerable library formed of the most important works relative to the fine arts. Although entirely reorganised in 1807, this academy may be regarded as the oldest establishment of the kind, for the statutes of the fraternity of artists which it represents are of a date anterior to the year 1345. Lastly, we may notice the library of St Mark, one of the richest in Italy, with a fine cabinet of antiquities and medals, now placed in the great council-hall of the ducal palace. There is, besides, the Cornarian museum, an immense collection of pictures, medals, books, and curiosities of every kind, bequeathed to the city by a noble Venetian of the Cornaro family. The principal public walks of Venice are the Piazza of San Marco, the Piazzetta, and the Riva degli Schiavoni, a long quay leading to the public gardens, which are finely situate at the south-eastern extremity of the city. The great number of bridges, which all have steps, and the narrowness of the streets, render the use of wheeled carriages impossible; but in their stead there are a great number of boats named gondolas, which form one of the principal characteristics of this singular city. Venice.

The most important public institution now at Venice is the arsenal, which is very spacious, being about three miles in circuit, and containing workshops of all kinds, large stores of every article requisite for the outfit of ships of war, and a series of halls in which immense quantities of arms and munitions of war are grouped in a tasteful manner. The hall of models contains a large collection of models of all sorts of ships; and in an adjoining chamber there are busts by Canovo of Emo, a naval hero celebrated in Venetian history, and of General Galtamelta, a commander of high repute. The arsenal contains 32 covered slips for ships of the line, 54 slips for smaller vessels, 4 large basins, 5 cannon-foundries, a ropewalk 910 feet long, extensive workshops for carpenters, ship-builders, &c. The number of people employed, which in the time of the republic was 16,000, is now only from 1000 to 1200. The harbour, though very large, is inaccessible to line-of-battle ships, or even frigates with their guns on board; as even the deepest entrance has only 16 feet water. Venice is the headquarters of the Austrian imperial navy.

For a number of years after the downfall of the republic, Venice exhibited such symptoms of rapid decay, that many were induced to prognosticate that erelong it would be abandoned, and its foundations again buried in the waters. In 1815, many Venetians entertained a natural and laudable wish for the regeneration of their country; but the force of circumstances prevailed, and Venice continued to be an appendage of the Austrian empire. By commerce Venice had become great; and by new commercial regulations, the people believed that she could again be raised to prosperity. The wish for the establishment of a free port was expressed so generally and so loudly, that the government at length consented, and in 1830 the wished-for object was attained. This privilege was withdrawn in consequence of the share taken by Venice in the revolution of 1848–9, but restored in 1851. But though there has been a decided increase in the maritime traffic, yet the magnificent expectations of the citizens have not been realized. Although about 6000 vessels annually enter and leave the harbour, yet it is far surpassed by the neighbouring port of Trieste. Neither have manufactures on an extended scale been yet introduced, though the abundance of low-rented houses and cheap labour seems to offer many advantages. Mirrors, straw-hats, wax candles, catgut, which are the staple productions of Venice, and the like, are articles of trifling importance compared with objects of universal consumption. It is however already a great point gained, that a stop has been put to the diminution of trade and population, which were rapidly melting away. The progress of decay has been arrested, and things are again improving, though but slowly. The Venetians are recovering their ancient habits of prudence and activity; but much yet remains to be done before they can be relieved of the general reproach of indolence. Scarcely any kind of labour in Venice is performed by natives; and many strangers find employment as water-carriers, servants, &c.

All Italy is distinguished for the number of its charitable institutions, and in this respect Venice holds a prominent place. Indeed, a large number of such establishments was rendered necessary by the decayed condition of the city, as at the time when the French evacuated it not less than half the population were dependent on charity. There are at present 23 hospitals of various kinds, besides 40 religious fraternities, many of which are devoted to charitable purposes.

A railroad has been recently constructed connecting Venice with Milan, passing through Padua, Vicenza, Verona, and Brescia, a distance of 166 miles, nearly upon

Venlo || Ventilation.

one level. The greatest work on this line is a magnificent viaduct of more than 200 arches, carrying the road across the lagune, exceeding 2 miles of mud and water. The population of Venice, which was once as much as 200,000, but had sunk in 1800 to 90,000, was in 1851 (exclusive of the garrison and visitors), 123,290; in 1852, 110,429; and in 1857, 118,120.

To the north of the city is the small town of *Murano*, whose glassworks were in great repute for several centuries, though their productions are now inferior to those of France, England, and Bohemia; and to the eastward is *San Lazzaro degli Armeni*, an island with a convent inhabited by Armenian monks, who devote themselves to the education of their countrymen, and the cultivation of their national literature. They have a printing-press, from which have issued several useful works in their national language. For an account of the Venetian territory, see LOMBARDY.

VENLO, or VENLOV, a fortified town of Holland, in the province of Limburg, on the right bank of the Meuse, 43 miles N.E. of Maestricht. It stands in a marshy region, and is entered by four gates. The houses are much crowded together. The town contains three market-places, a town-hall, several churches, hospitals, and schools, arsenals, breweries, tanneries, and manufactories of tiles, pipes, tobacco, and vinegar. An active trade is carried on. Pop. 7179.

VENOSA (anc. *Venusia*), a town of Naples, in the province of Basilicata, in a small plain, 23 miles N.N.E. of Potenza. It has a ruined castle of the fifteenth century, a splendid cathedral, several parish churches, five convents, an hospital, almshouses, an exchange, and a fine Norman abbey, with a church containing many interesting monuments. The ancient Venusia was a flourishing Roman colony; but it is chiefly remarkable as the birthplace of Horace, B.C. 63. Pop. 6000.

VENTILATION is the art of providing any confined area or apartment with an adequate supply of air in a condition suitable to the purposes for which it may be required. The air is usually introduced in a stream which maintains a freshness and purity of atmosphere in the place that is ventilated, any contaminated air being removed as the fresh air enters.

The progress of science has shown that no more prolific cause of disease and death exists among men than a vitiated and ill-regulated atmosphere in their habitations, whether it operate slowly and insidiously, producing scrofula, consumption, fevers, and other complaints; or, with sudden and extreme fatality, as in the Black Hole of Calcutta, in mines and wells loaded with carbonic acid, or in ships where the hatches have been battened down during storms. In a case that occurred a few years ago in the Irish Channel, every one below, about seventy altogether, was suffocated. Such examples, and the ever-active power of air during life, have at last established the conviction that much more attention ought to be given to this question than has usually been accorded to it, and that ventilation ought to be a primary instead of a secondary object in all architectural structures. It can never be so satisfactorily adjusted when it is merely introduced into buildings erected previously without any adequate provision for it. In numerous operations of nature and art, and more especially during combustion, respiration, and the decay that attends the putrefaction of animal and vegetable matter, unwholesome products are evolved; and so deleterious are these to animal life, that death is the necessary consequence when they accumulate in a concentrated form around the person. In a smaller proportion, they produce an endless variety of discomfort and disease, from a slight sense of languor or debility to the most violent apoplectic headache, suppressing for a time all attempts at exertion either of mind or body; while, on other occasions, they gradually undermine the constitution, and induce a permanent loss of health. In extreme cases death is induced, more or less rapidly, according as the oxygen of the atmosphere is withdrawn, or an impregnation of poisonous gases communicated to it.

The air of respiration is the material agent that sustains and harmonizes all the physical changes in the human frame, supplying the important element that oxidizes the blood, consumes much waste animal matter, and contributes essentially to that organic chemistry by which heat and electricity, as well as all special products, are developed in the living system. In the external atmosphere, air is constantly supplied to the bodies of animals, flowing to them on every side, and displacing the vitiated air which they produce. All habitations and other structures, or enclosed spaces for the use of man and other animals, must be provided with apertures for the ingress and egress of air, and additional means, when necessary, to secure the required supply. Without this they are deprived of the natural ventilation that is essential to life, and for which no other substitute can be given. We draw upon the atmosphere no less than 1200 times an hour, on an average, for nourishment and support, during the whole period of our existence; we consume oxygen and replace it by carbonic acid; and were air withdrawn from us, or changed much in its qualities, death would inevitably ensue. The air acts incessantly, not only on the blood as it passes through the lungs, but also on the surface of the body; and disease and death may arise from an unwholesome atmosphere in contact with the skin, even when the lungs are supplied with pure air. Well attested cases are recorded where severe oppression has attended the action of an amount of impurity so small as from $\frac{1}{11000}$th to $\frac{1}{1000}$th part of sulphureted hydrogen gas, while the absolute amount of impurity in air tainted by miasma is so excessively small, that its precise nature, as well as the minuteness of its weight in the most pestilential atmospheres, is unknown.

Ventilation.

The supply of a fresh and wholesome atmosphere may accordingly be ranked among the first and most essential necessaries of life. In the atmospheric ocean which rests on the surface of the terraqueous globe, a perpetual movement, or *natural ventilation*, is maintained on a great scale by numerous causes, more especially, however, by the unequal action of the rays of the sun on the equator and at the poles; the colder air moves along the surface from the poles to the equator, while the warmer air from the equator ascends and proceeds in a contrary direction towards the poles. These great and primary currents are modified in endless variety by the attraction of the sun and moon, the rotation of the earth, the relative effect of land and water, the ever-varying influence of local temperatures, volcanic action, meteorological phenomena, particularly the evaporation and deposition of moisture, the electrical condition of the air and of the surface of the earth, and the innumerable changes that attend chemical action in the mineral kingdom, as well as in those that occur in the organic world. The animal and vegetable kingdoms not only contribute to the movement of the air, but are the great causes of the most important changes induced in it, and the means of preserving the unity of its composition. The animal kingdom consumes its oxygen and produces carbonic acid, while, in the vegetable kingdom, the great tendency is to absorb carbonic acid and replace oxygen. But wherever these great movements are interrupted by local causes, or an undue accumulation of vegetable and animal debris takes place, there the right balance is not sustained; pestilential effluvia contaminate the air; and were it not for the wind, the rain, and the impetuous storms which, from time to time, visit such localities, and the operation of a peculiar diffusive power, in consequence of which no gas can accumulate permanently to the exclusion of other gases on the surface of the earth, whatever may be its specific gravity, they would at last become as fatal as the valley of death in Java, or the carbonic acid springs in Bavaria, in the grotto Del Lano in Italy, and other places notorious for their destructive atmospheres.

In selecting a site for a city, a house, or any establishment where numbers are crowded together, too much attention cannot be paid to its natural ventilation. An aspect towards the south, a dry gravelly soil, a moderate elevation securing efficient drainage and freedom of access to the air, with protections from offensive currents, and an immunity from local impurities, are great desiderata.

In the open air the temperature is generally under that of the body; and the air expired from the lungs, and also that in contact with the surface of the body, being expanded by the heat which it receives, escapes from its levity, and a fresh stream is immediately supplied; but when the body is confined within a limited space, special arrangements must be made to admit of a constant renewal of fresh air.

This ventilation must be modified and adapted to the circumstances of each individual case, and the state of the external air. It is a subject, therefore, of great extent, and as various in its details as the climate in which we live, the habitations in which we dwell, the occupations in which we are engaged, the food on which we live, the means of protection against heat and cold, and the peculiarity of constitutions which each may have. We shall therefore content ourselves in the space allotted to this article, by pointing out the leading facts connected with the more prominent objects which it includes in reference to the frame of man. It must not, however, be forgotten that this branch of science is as yet so imperfectly attended to, that it is impossible to turn to any city

Ventilation.

without seeing much discomfort, disease, and even death, induced from time to time by ignorance of the laws of ventilation; and, in assemblies of every variety, the whole audience is not only too frequently subjected to extreme uneasiness, but the tone of the mental faculties, and the capacity for exertion and attention, are also affected by the state of the atmosphere.

I. Source of Air.—This cannot be too particularly examined. Many buildings are supplied with air from a low level, where the ground is too frequently left in a neglected condition, and exposed continuously to different sources of impurity. At night, in clear weather especially, when the cold produced by radiation from the earth is great, and more or less at all times, cold air is too often supplied from the surface of a street loaded with the offensive emanations which they evolve, and these become still more disagreeable when subjected to the action of heat in a warming apparatus. By taking air from the highest attainable point, avoiding the immediate vicinity of chimneys, a much better atmosphere is secured, and it may be conducted downwards to any required depth by a flue. In extensive public buildings, situated in localities noted for the impurity of their atmosphere, the erection of air-towers to draw down a comparatively wholesome atmosphere is an object of great importance. An elevation of five, ten, or twenty feet often gives a much better atmosphere. In all lofty buildings, fresh air may be supplied, when requisite, from above; and where local circumstances render it desirable, air is sometimes advantageously introduced by turrets from an altitude of one, two, or three hundred feet. When air is pure, and dry cool vaults are available, they are invaluable in cooling it during hot weather. In large towns, such as London and Manchester, where local impurities abound, and particularly when fog and frost are observed at the same time, special means may be adopted for removing those that are most offensive. Filters have been constructed for air on the same principle as for water. Few of the more simple arrangements of this kind, that have been sustained for any length of time, have been found more serviceable than filtration through any porous texture to exclude suspended blacks (soot). Washing the air also has, in some cases, been tried, by moistening the filter with a stream of water. Lime-water is preferred where sulphurous acid, carbonic acid, hydrochloric, or hydrosulphuric acid are present from manufacturing operations in any notable proportions. Perforated zinc, or porous gauze, steeped previously in a solution of hydrochlorate of zinc, have been used largely for the filtration of air.

II. Ingress and Egress of Air.—Though windows, especially when made to open above, afford a very convenient means for the ingress and egress of air, they should not be the sole resources for ventilation in any apartment in new buildings, especially where gas-lights, or any other powerful and brilliant lamps are used, or where they are likely to be crowded with visitors. An aperture in the ceiling of every apartment, constantly drawing off vitiated air, is the great desideratum. It should communicate with a flue discharging into the external air, and be protected there from local currents, or down-draughts, arising from the action of the wind. Valves should regulate with precision the amount of discharge, and arrest it entirely when they are closed. An aperture near the ceiling in an ordinary chimney is sometimes sufficient, but it cannot always be trusted. An independent discharge is better.

The ingress of air should be equally under control, and supply air where it can enter gently, and diffuse itself most widely, without local draughts, through the apartment to be ventilated.

A very important arrangement has been introduced in numerous buildings, which consists in providing a large aperture above all internal doors leading to individual rooms, while valves regulate the amount of clear opening permitted. The staircase and passages being constantly supplied with a mild atmosphere, such rooms can always be ventilated from this source, the aperture admitting fresh air and discharging vitiated air by the general discharge from the upper part of the staircase. There, too, the principal ingress, as well as the channel for the escape of vitiated air, is constructed so that the cold air, as it enters, receives indirectly some warmth from the vitiated air. In large assemblies, and where apartments are crowded, it is desirable to maintain a more perfect separation between the fresh and the vitiated air, so as to facilitate the ingress of the former, and the escape of the latter.

Where a more complete system of ventilation is desired, nothing conduces more to secure this object in individual habitations than the construction of a special flue for the discharge of vitiated air. A connection can be established at any time between it and individual rooms, closets, or cellars, and all vitiated air expelled with a velocity proportional to the amount of fuel consumed in this flue.

Thus, then, in the habitations of the people, the independent warming and ventilation of each individual room is the first object, whatever system of heating be employed. The warming of the whole house, to a certain extent at least, through the hall, passage, or staircase, is another desideratum. The special action of a ventilating flue, available at all times and seasons on one or more rooms, is a luxury that has hitherto been only rarely introduced in private dwellings.

Ventilation.

III. Equalization.—Air entering by doors, windows, or other apertures, and rushing in a well defined but partial stream, so as to produce local currents, may be exceedingly offensive, while, if divided into innumerable smaller streams, by causing it to pass through a porous texture having the most extensive possible surface, it may proceed so gently as not to be perceived. Air ought always to be admitted in this manner, *or at such a distance from those upon whom it is to act, that its impulse may be greatly moderated before it reaches them.* Wherever a proper supply of air is admitted, this equalization is essential, more particularly in crowded apartments; and the greater the degree to which it is carried, the more perfect and agreeable is the result. Nothing is more common than to see apartments ventilated effectually, so far as may be necessary for the removal of foul air, but with a movement that induces a most offensive series of chilling draughts, if means be not taken to warm the supply of air given, and for introducing an effective equalization. In rooms for invalids, this subject becomes of great consequence, especially in diseases of the chest. To a great number of constitutions, unequal currents are as dangerous and offensive as an oppressive atmosphere.

IV. Amount of Air necessary for Ventilation.—Few subjects present a greater diversity in practice than the amount of air given for ventilation. From 2 to 4 cubic feet per minute for each person have usually been considered a large supply, but this is far beyond the amount commonly allowed. A very slight examination, however, will show that even this amount is often too small. If the process of respiration be accurately examined, it will be observed that a cubic foot of air, or more, is involved or mixed, and contaminated with the air discharged from the lungs, at each expiration, independently of that affected by the skin. Such a supply, therefore, is at least desirable, were the air always at a mild and genial temperature. According to Dr D. B. Reid's experiments, where the effects of variable quantities of air were tried upon numbers included in an experimental apartment, not less than 10 cubic feet of air per minute should always be allowed when it is warm; and to sustain the atmosphere in all its freshness and purity, even a much larger quantity is at times desirable. At the late houses of parliament, from 36,000 to 50,000 cubic feet per minute have occasionally been given in sultry weather in the House of Commons alone, or about 60 feet per minute to each individual in a crowded house. This question of the amount of air necessary for ventilation, taking the deterioration produced by the human frame alone into account, is often complicated and influenced by a vast variety of circumstances, of which the following are the most important. In the preceding and following remarks, a temperature of 65 degrees may be considered as the average most generally desired when there is a steady but uniform and gentle movement in the air. It is not so much the amount of supply with which life can be sustained that is the question, as that which it may be desirable to afford so as to maintain the system in a state of vigour and comfort, even when the air is much warmer.

1. *The Purity of the Air supplied.*—In general, the less pure the air the greater the amount necessary for ventilation, especially if it be loaded with moisture, and charged with offensive exhalations from the lungs and skin. But rare cases occur, when an atmosphere is so largely charged with external poisonous effluvia, that it becomes an object to use as little as possible to avoid this source of contamination. In one instance, cases of fever are reported to have occurred at a particular period in every room that was largely supplied with air, while, in other rooms in the same building, with a much less supply of air, no disease was noticed.

2. *The Temperature of the Air.*—This is the most important circumstance affecting the supply necessary for ventilation. When the air is very cold, and the moisture of the breath is condensed in hoar-frost as fast as it escapes from the lungs, a proportion of air extremely small compared with the usual allowance desirable will be sufficient for ventilation. Air, under ordinary circumstances, is below the temperature of the body; it therefore acts as a cooling power. But the higher its temperature, and the more nearly it approaches that of the body, the larger is the quantity required to produce an equivalent cooling power. Further, in warm weather, the air is charged with more moisture than in the cold season, while the body is at the same time more exhalant of moisture. These and other circumstances tend to render the supply of air desirable in warm weather far greater than the mere arithmetical increase in the temperature would, at first sight, appear to demand. But here we must advert to the popular error that the temperature, as indicated by the thermometer, is a proper guide to the quality of air in respect to the warmth that may be most agreeable. The temperature, as a moment's reflection will show, is a very imperfect guide, unless the velocity of movement and chemical qualities of

Ventilation.

the air, especially in reference to moisture, be also taken into consideration. A small quantity of air, stagnant, and at 32° Fahr., does not cool the body more than a larger supply at 40°, 50°, 60°, 70°, 80°, or 90°, and, indeed, at any temperature below that of the living system, if brought to act upon it in sufficient proportion. A large quantity of air not so cold may be made to produce the same amount of cooling effect as a less amount of colder air.

3. *Moisture in the Air.*—Air in winter usually requires the addition of moisture when warmed and introduced into any apartment, as at this period it has deposited a large proportion of the moisture associated with it in summer. When the air is warmed by the approach of summer, it gains moisture from the surface of the earth or of the ocean, and thus acquires more of the pleasing and agreeable qualities which a summer atmosphere presents; but if warmed and introduced into any apartment without the previous addition of moisture, then, having had its power of action upon moisture increased, without receiving a corresponding supply, it absorbs moisture with extreme rapidity from the surface of the body and of the lungs. By taking away an undue proportion, it produces a harsh and disagreeable impression. The injection of steam into the air, or the evaporation of water from shallow pans placed over the heating apparatus, removes the defect.

Moisture is frequently communicated to the air with the view of cooling it by the reduction of temperature attending evaporation.

In some climates, again, a redundancy of moisture forms one of the greatest sources of oppression, and is regarded as one of the most powerful causes in developing the activity of miasma.

The influence of different degrees of moisture in the air is as various in different constitutions as that of different temperatures. Again, some individuals exhale moisture almost solely by the lungs, while in others the skin is equally active. According to the relative condition of the living system, the air, in reference to moisture, may either exhale or absorb moisture from it. A large quantity of air charged with much moisture, but not saturated, may produce as much evaporation from the body as a less quantity of air containing little moisture in solution.

4. *Idiosyncrasy and Habit.*—A very wide range of experiments has shown that the constitutional peculiarities of different individuals vary as much in respect to the amount of air desired, and the temperature at which it is preferred, as in respect to food or drink. In the British Houses of Parliament, no temperature below 52° or above 76° has been demanded for a series of years. It is often very difficult to determine, however, how much is due to absolute peculiarities of constitution, and what is dependent on the circumstances of the moment, more especially the state of occupation or excitement, the time that has elapsed since any refreshment may have been taken, and the nature and quality of the repast, the clothing in use, the previous exposure, the temperature, moisture, and other circumstances affecting the quality of the air. The brilliancy of the illumination also affects the supply of air required by some constitutions. The force of habit is nowhere exemplified in a more marked manner than in the amount of contamination which different individuals can bear. Some miners pass habitually much of their time in air in which a candle does not burn, though a lamp may be maintained in combustion in the same atmosphere. In public buildings, the great object is to sustain a uniform standard of ventilation suitable to the great majority of the audience, and to reject the complaints of individuals with extreme constitutions in regulating this standard. It is not unreasonable, however, to provide a judge who is confined for a long period to a particular place in a court of law, and others in parallel positions, with more power in varying the atmosphere in their vicinity than is given in any other part of the court.

V. Nature of Heating Power.—This is necessarily as various as the climate, the fuel available, the building to be heated, and the precise effect desired. Few circumstances require more care in connection with ventilation. The open fire, so much prized from its lively and cheerful appearance, exerts also an agreeable effect upon the animal system by the light radiated along with the heat, and the movement of air which it sustains as it ventilates the apartment in which it is placed; but in point of economy of fuel, or facility of regulation, so as to maintain an equal temperature in large apartments, it is, perhaps, the least desirable of all kinds of heating apparatus. The great beauty, therefore, which its appearance presents, the absolute purity of the heat which it conveys by radiation, and the extreme facility of access which it affords, so important for many different purposes, ought to be contrasted with the attendance which it requires, the dust and ashes which it leaves, and the tendency, when neglected, to produce back-smoke, if the action of the flue be not maintained with proper force. In connection with ventilation, the following points require special attention in the construction of the common fireplace. 1. It should be provided with an independent supply of air entering in its immediate vicinity, to be employed when heat is required in any apartment without changing much air there, as in warming the apartment before it is occupied, or moderating offensive currents near the fireplace. 2. An open fireplace, unless the air enter at or near the ceiling, often produces little or no ventilation above the level of the chimneypiece, and even then it does not afford the best and purest atmosphere. 3. The air above may be comparatively stagnant, and offensive in the extreme from lights and the products of respiration, while a fresh current moves along the floor to the fireplace alone, if no separate discharge be provided above. 4. The introduction of a valve to regulate or diminish the excessive draught of some chimney-flues often adds more to the comfort of the rooms on which they act than any other measure. Sometimes a reduction in the escape at the top, even to a quarter of the aperture previously given, is found to be a great improvement both in point of comfort and in the economy of fuel.

Ventilation.

Of other arrangements for heating, the mild hot-water apparatus, where the water is always under the boiling temperature, affords a very perfect and equal diffusion of heat, when properly arranged, —a point of great importance in producing equality of ventilation. Stoves presenting an extensive surface at a moderate temperature, varying from 100° to 200° degrees, as the Russian, Prussian, and Swedish porcelain stoves, or Dr Arnott's iron stove, come next in order. Those varieties should be preferred which are provided with chimneys, both for the ingress and egress of air, that have no direct communication with the apartment in which they are placed; otherwise, when worked most economically, they are all liable to evolve carbonic acid occasionally, if they are not adjusted by persons who thoroughly understand their action. Stoves and other apparatus, where the iron is heated to a high temperature, may be in many cases more economical than the preceding varieties; but from the manner in which they affect the air, they are not so conducive to health, and greatly interfere with regularity of ventilation, the very hot air from them ascending rapidly to the ceiling, while a cold atmosphere, almost unaltered, is often left below. The stoves and heaters usually employed for conveying warm air to the principal apartments and passages of houses in very cold countries, generally heat it too much, and are provided with channels that are too small, while they are deficient in arrangements for returning air from the passages and individual apartments, when there is little or no vitiation of the air supplied.

There are three different kinds of steam-apparatus.—1. Mr Gould's low-temperature steam-apparatus (a recent patent). A variable proportion of steam is admitted into thin but broad iron cases, part of the air only being expelled, according to the temperature required. A somewhat similar effect may be secured by surrounding steam-pipes at 212°, with discs or leaves of zinc or other metals.

2. The ordinary steam-apparatus, in which steam is used at the temperature of 212°.

3. Perkins's high-pressure steam-apparatus, in which a more elevated temperature is maintained, according to the pressure on the water producing it.

With such a variety of resources, great facilities are afforded in regulating the ventilation of public buildings. The more certainly the floor is warmed, the milder the source of heat; the more universal the diffusion of the entering air, the more certain the continuous escape of vitiated air; and the means of altering a valve to adapt the amount of air to the numbers present, the more satisfactory will the ventilation be.

In buildings for public assemblies, subject to great and sudden fluctuations of attendance, hot and cold air-chambers are provided, from which any supply of warm or cold air may be obtained. A mixing-chamber for mingling the various proportions that may be supplied is a great additional convenience.

VI. Source of Movement.—An alteration of specific gravity in the air, dependent on an alteration of temperature produced by expired air, and the general warmth of the body, is the great, the more natural, and the most economical source of movement, under all ordinary circumstances. When the openings for ingress and egress are well arranged, any ventilated apartment may be compared to a piece of apparatus in which the current of air, entering rapidly by a narrow channel, expands with the greatest possible diffusion into a slow-moving stream, occupying the principal portion of the area of the place to be ventilated, and gathering together again in a smaller channel by which it escapes, where the velocity of movement increases as the area diminishes. In ordinary apartments, where nothing more can be afforded, two openings at different levels will always give much relief, the one usually admitting cold, and the other, which should be as high as possible, discharging hot and foul air. Where one opening only is made for ventilation, one part of it admitting and the other discharging air, the nearer the ceiling it is placed the more effectually does it act.

Ventilation.

A crowded room, in which fresh air enters on every side with the most gentle movement and at a proper temperature, so that its impetus is not perceived, vitiated air escaping in a central stream, and all products from artificial lights being carried away by the same current, presents a perfect system of ordinary ventilation. It is presumed that double glazing is introduced to prevent down-draughts from ice-cold glass.

In public buildings, where long sittings are held, under every variety of circumstance, in different seasons, with ever-varying numbers, by day and by night, and amidst endless changes of the external atmosphere, it is impossible to regulate the ventilation satisfactorily without a power to move the air, and without appropriate valves. For this purpose ventilating chimneys or shafts, worked by fire, fanners, pumps, or screws, driven by a steam-engine or water-wheel, a jet of steam, a stream of air acting as a blow-pipe, a current of electricity, or any other power, may be used. The shaft and the fanner are usually preferred, especially the former.

The moving power of air itself is constantly used both for forcing and exhausting air. The windsail and the cowl are familiar illustrations where this power is resorted to, but the continuity of its action cannot be depended on. A chimney, a shaft, or any other external discharge of vitiated air, acts with increased power when it assumes a conical form at the top. Elaborate experiments on this subject show that this power is increased if a small part of the upper portion be inclined outwards.

A stream of water, descending in one or more tubes or flues, is often used as a ventilating power, especially where it is made to fall as a shower, in condensing poisonous ingredients or other impurities.

VII. Varieties of Ventilation.—The condition of the human frame being as various as the peculiarities of individual men, the habitations in which they dwell, the climate in which they live, and the circumstances under which they assemble for business or recreation, ventilation assumes a never-ending variety of aspect in detail, and in the simplicity or care required to insure a successful result. It is a matter of perfect indifference, in point of effect, whether air take an ascending or descending movement, or pass from side to side, descend and ascend, or move in any other compound manner, when an apartment contains only a few individuals compared with the number it can accommodate. If the air be supplied abundantly, of good quality, of an agreeable temperature, and all source of impurity be excluded, or rapidly removed, air may be made to move in any direction that may be required; and, in special cases, a lateral, or even a downward current, may be advisable, particularly in protecting works of art from the dust put in motion by a crowded peripatetic assembly, or in hospitals with incurable patients totally unable to take any care of themselves. But as a matter of economy, practice, and daily convenience, the application of heat at the lowest level, the ascent of vitiated air, and the supply of fresh air with the greatest diffusion practicable, are the most important objects in warming and ventilating all crowded apartments.

a. Natural Ventilation.—This term is used in all cases where the movement of the air arises spontaneously from a difference in specific gravity between the internal and external air. The following example illustrates this variety in its simplest form. With a single aperture, sufficiently large, in the ceiling of any apartment, and a free communication externally, cold air usually descends by one part of it, and warm vitiated air escapes by another. In improving such an arrangement, the descending air may be diffused by a porous curtain, or perforated zinc, so as to fall more widely and more gently, and the escape of the vitiated air may be facilitated by erecting a shaft or tube over the other portion. A current descending from one part of a ceiling, and escaping, when vitiated, by another, is not a satisfactory method of ventilation in crowded narrow buildings with high ceilings, especially in warm weather, as the air is apt, at times, to pass from one part of the ceiling to another. In very low rooms, this movement is not so objectionable, and sometimes affords a very valuable ventilation when the temperature is carefully adjusted.

Where force is employed to promote or insure ventilation, the three following varieties are usually distinguished,—viz., *plenum*, *vacuum*, and *compound* ventilation:—

b. Plenum Ventilation is secured in all cases where air is forced into an apartment by a fanner, a screw, or a pump. The air within, in such cases, is slightly denser than the air without, and tends to leak outwards at all crevices of doors and windows. In some cases of disease, particularly asthma, air of great density is sometimes prepared by condensation with powerful machinery in special apartments, where it affords great relief to the suffering patient.

c. Vacuum Ventilation.—In this case a shaft or large chimney, or any mechanical power, is made to act as a pump, and draw out vitiated air. The air within the ventilated building has then less pressure than the external atmosphere, which tends to leak inwards at all crevices.

d. Compound Ventilation.—In this case, both plenum and vacuum ventilation may be said to be in operation, *the vitiated air being extracted with as much power as that by which the fresh air is forced in.* This is the most perfect form of ventilation for all very crowded assemblies, and prevents draughts at doors, either inwards or outwards, when in perfect operation.

During the last thirty years, more extended ventilating works have been constructed than at any former period. In these, the application of power to insure constant ventilation; a larger supply of air than had previously been considered necessary; a great increase in the magnitude of the channels of supply and discharge; a more careful attention to the temperature, moisture, and diffusion of the entering air; and the exclusion of impurities, externally or internally, whether from malaria without, lamps and candles within, or other sources, have formed the leading objects in actual practice.

In ships, a small steam-engine, or a power from a larger engine acting on a fanner, usually gives the ventilating force where artificial power is used; while tubes extending fore and aft in the hold draw vitiated air from every cavity above and below, and discharge it either externally or below the furnace.

The laws of communication of heat, the electrical condition of the atmosphere, the indications of the thermometer, barometer, hygrometer, anemoscope, and anemometer, the preparation of medicated atmospheres for rooms, inhalation and fumigation, are all objects of great importance in connection with ventilation.

The Carbonometer is a small bent glass tube, containing some test of carbonic acid gas, as a little lime-water, with a bulbous expansion, in which it mingles freely with any given volume of air transmitted through it by the action of a syringe, or by the descent of water in a glass, or metallic apparatus connected with it. The amount of white precipitate (carbonate of lime) indicates the general amount of impurity from respiration, exhalation, lamps, candles, ordinary fuel used in heating apparatus, or from any other source of carbonic acid.

The reader who desires to extend his knowledge of this subject will find much information in parliamentary reports, particularly on the *Ventilating and Acoustic Arrangements of the late House of Commons*, and on the *Ventilation of the new Houses of Parliament, including Dr Reid's Examination at the Bar of the House of Commons in* 1852; the evidence taken at the arbitration in 1853, not yet presented to Parliament; and in Dr Reid's *Address to the Professional Men of England, Scotland, and Ireland*; in parliamentary reports on the *Warming and Ventilation of Dwellings* (1857); on the *Ventilation of Mines*; on *Education, Manufactures*; on the *Improvement of Health in Towns and Populous Districts in England and Wales.* On *Schools, Drainage, Hospitals, Prisons, and Graveyards*, the same subject is largely introduced. Dr Hale wrote the most valuable of the early treatises on ventilation. Tredgold *On Warming and Ventilating*, is a very important work. In Dr Arnott's, and in Hood's, Richardson's, Wyman's, and Bernan's treatises on ventilation, hot water apparatus, and kindred subjects, much interesting information is given. In Dr D. B. Reid's *Illustrations of Ventilation; Outlines of the Ventilation of the late House of Commons; Diagrams of the Ventilation of St George's Hall and New Assize Courts, Liverpool; Ventilation in American Dwellings*; and in his works on chemistry, and the lithographs of his lecture and experimental rooms at Edinburgh, the result of numerous experiments is given on the ventilation of public buildings, private dwellings, mines, ships, and manufactories. (D. B. R.)

Ventnor. Ventriloquism.

VENTNOR, a town of England, Hampshire, on the south coast of the Isle of Wight, 4 miles E. of Niton. It is built on a cliff, sheltered by high downs on the N. and E.; and the mildness of the climate and beauty of the situation have raised it from a small hamlet to a favourite watering-place, much resorted to by invalids. It is, for the most part, well built, and has a modern Gothic church, with a fine spire, an elegant Independent chapel, and places of worship for Wesleyans, Baptists, and other sects. There are also several schools, a bathing-establishment, and numerous villas in the neighbourhood. Pop. 3000.

VENTRILOQUISM, the art of speaking so that the voice appears to come not from the speaker, but from some distant place or object. It was at first supposed, that this was effected by forming the sounds in the stomach; and hence the name. The art, however, seems to consist in employing the vocal organs of the throat in articulation after a full breath, instead of those of the mouth.

Venus || Verde, Islands of Cape.

VENUS, in Roman mythology, was the goddess of love and beauty. Till she came to be identified with the Greek deity Aphrodite, she was one of the least important of the Roman divinities. She was fabled to be the daughter of Jupiter and Dione; but, according to some accounts, she arose from the foam of the sea. She was married to Vulcan, but was not remarkable for fidelity to her husband. Her amour with Adonis is particularly celebrated; and Æneas, the progenitor of the Roman nation, was said to be a son of Venus and the Trojan Anchises. As the goddess of love and pleasure, she has been a favourite subject with the poets, painters, and statuaries, who have striven to represent her with the most lovely forms and the most enticing graces. Her chief seats were Cyprus and Cythera.

VENUS, *Planet.* See ASTRONOMY.

VERA, a town of Spain, in the province and 39 miles N.E. of Almeria, near the shore of the Mediterranean. It consists of low houses, and clean but unpaved streets; and it has four public squares, a town-hall, hospital, and several churches and schools. Soap, nitre, and pottery, are made here; and there is some trade in these and other articles. Vera has a small harbour, and good fisheries along the coast. Pop. 8470.

VERA CRUZ. See MEXICO.

VERAQUA, SANTIAGO DE, the capital of a province of the same name in New Granada, on the left bank of the Martin, 125 miles W.S.W. of Panama. It is a well built town, and has an active trade in copper, gold dust, cotton, and dyes. Pop. 5000.

VERCELLI (anc. *Vercellæ*), a town of the kingdom of Sardinia, capital of a province of the same name, in the division and 13 miles S.W. of Novara, on the Sesia, which is here crossed by a bridge. The walls that formerly enclosed it have been thrown down, and their place is now occupied by fine *boulevards*, from which a beautiful view of the Alps is obtained. The houses are, for the most part, well built; but the streets, with the exception of a few that are broad and regular, are narrow and winding. The cathedral is a fine edifice of the sixteenth century, in the Italian style; and it has a library attached, containing, among other valuable MSS., one of the most ancient copies of the New Testament in Latin, said to have been written by Eusebius, who was bishop of this see in the fourth century. The church of St Andrew is also a fine building; and Vercelli has many other churches and convents, a royal palace, clerical seminary, gymnasium, and hospital. Silk and woollen cloth, leather, hardware and jewellery, are manufactured here; and a considerable trade is carried on in rice, the extensive fields of which, round the town, render the atmosphere somewhat unhealthy. In the neighbouring plains the Cimbri were defeated by Marius in 101 B.C. Pop. 18,253.

VERDE, ISLANDS OF CAPE. This group, situate in the Northern Atlantic Ocean, between the parallels of 14. 20. and 17. 20. N. Lat., and 22. 20. and 35. 30. W. Long., consists of ten islands, viz:—Sant' Antao (commonly miswritten St Antonio), Sao Vicente, Santa Luzia, Sao Nicolao, Sal, Boa Vista, Maio, San Thiago (the St Jago of the English), Fogo, and Brava, besides a few uninhabited islets. They form a sort of broken crescent with the concavity towards the west. The distance between the coast of Africa and the nearest island (Boa Vista) is about 200 miles. Their total area is estimated at 1240 square geographical miles. They belong to the Portuguese, and derive their name (*Ilhas de Cabo Verde*) usually erroneously written Cape *de* Verde Islands, from the adjacent African promontory of Cape Verde, or the Green Cape. The archipelago was discovered in 1446 by an expedition fitted out by Dom Henrique of Portugal, and four years afterwards settlers were sent thither. It has ever since remained in the possession of the Portuguese. These islands, however, were known to the ancients under the name of Gorgones or Gorgades; and Pliny states that Hanno the Carthaginian reached them. There is a tradition that negroes were found upon San Thiago, but the earliest writers are silent as to this, and it is most probable that all the islands were uninhabited at the period the Portuguese visited them. The new settlers, however, imported negroes from the African coast. The population now amounts to upwards of 90,000, and it would have been much greater if famine, caused by droughts and epidemics, had not frequently decimated it. The blacks and mulattoes far outnumber the whites, whose constitution is less suited to the climate than that of those fitted by nature to endure the heat of the tropics. Slavery existed here until the Portuguese government abolished it a few years ago. At that time the number of persons subjected to "involuntary servitude" amounted to about 6000. Criminals are transported hither from the mother-country, and the punishment is much dreaded. All the towns are poor dirty places; even the best have few tolerable houses. In religion, the people are Roman Catholics, extremely ignorant and superstitious, with many heathen notions and practices amongst them, brought from the African coast. All the inhabited islands have churches save S. Luzia.

Verde, Islands of Cape.

The archipelago forms one of the foreign provinces of Portugal, and is under the command of a governor-in-chief appointed by the crown. Each island has a military commandant, a few soldiers, and a number of salaried officials, such as police magistrates and custom-house directors. Here is also an ecclesiastical establishment with a bishop, dean, canons, &c.

Climate and Meteorology.—The atmosphere in the vicinity of these islands is generally hazy, especially in the direction of the continent. This haziness appears to be owing to an impalpable brown dust which is constantly falling, and is supposed to be produced by the wear and tear of volcanic rocks on the coast of Africa. With occasional exceptions during summer and autumn, the north-east trade is the prevailing wind, blowing most strongly from November to May. The rainy season is during the months of August, September, and October, when there is thunder and a light variable wind from south-east to south-west. As the wind approaches the northern tropic, the African continent becomes much more heated than the neighbouring sea, and consequently the air over that continent rises, whilst the cooler air of the sea flows in to supply its place. This explains the fact, that during summer the winds along the Gulf of Guinea, and as far westward as Cape Blanco, blow from the south-west, but all more or less from shore. As these winds come from the sea, they are loaded with moisture, and its precipitation occasions the heavy rains on that coast during the rainy season, which is coincident with these winds. The close approach of the inner margin of the north-east trade-winds, and the in-draught to the neighbouring continent during July, August, and September, necessarily tend to render the winds about the Cape Verdes very variable during these months. The Harmattan, a very dry east wind from the African continent, occasionally makes itself felt. The heat of summer is high, the thermometer ranging from 80° to 90° Fahr. near the sea. The unhealthy season is the period during and following the rains, when vegetation springs up with surprising rapidity, and there is much stagnant water poisoning the air on the lower grounds. Remittent fevers are then common. The people of all the islands are also subject to an endemic of a bilious nature in May called locally *levadias*, but the cases rarely assume a dangerous form, and recovery is usually attained in three or four days without medical aid. The droughts already spoken of are sometimes general, sometimes partial. On some of the islands rain has occasionally not fallen for three years. The immediate consequence is a failure of the crops, and this is followed by the

death of great numbers from sheer starvation. To add to the horrors, epidemics usually break out afterwards. These disastrous occurrences have greatly obstructed the progress of the colonies. In the general famine which began in 1831, and lasted three years, 30,000 persons are supposed to have perished.

Productions, Agriculture, &c.—The chief occupation of the islanders is cattle-feeding. In some of the islands the making of salt from sea-water employs a considerable number of persons. Orchil is gathered, and the indigo, castor-oil, and physic-nut plants are cultivated. The fruit of the latter is exported in large quantities to Portugal, where the oil is expressed and consumed in lamps. Maize, sugar-cane, and the mandioca plant are also much cultivated, as well as cotton, coffee, and tobacco to a limited extent. Though the soil and climate are fitted to produce many tropical fruits, these are little attended to. Cocoa-nut trees, date-palms, and bananas are seen on most of the islands. Pumkins, sweet potatoes, and the *kalo*, are generally cultivated. Wood, except in the interior of S. Antao, is entirely wanting, and the people are reduced to great straits for firing. Quails are found in all the islands: rabbits in Boa Vista, and an African bird in San Thiago and Fogo. The neighbouring sea abounds with fish, and the coral animal is at work building up dangerous reefs on submerged rocks. Turtles come from the African coast to lay their eggs on the sandy shores of these islands.

The exports consist chiefly of salt, physic-nuts, hides, coffee, maize, kidney-beans, sugar-cane spirit, and coarse sugar. The imports are cotton cloths, timber, hardware, crockery, glass, and wine. There is a considerable intercourse in the way of exchange between the islands one with another. There is a British consul stationed at Porto Grande in S. Vicente, and a vice-consul at Porto Sal Rey in Boa Vista.

Botany.—The flora of these islands has been described by Mr Barker Webb in his *Spicilegia Gogonea*, or a catalogue of all the plants as yet discovered in the Cape de Verde Islands, which forms part of the *Niger Flora*, London, 1849; also by Dr J. A. Schmidt in his *Breiträge zur Flora der Cap-Verdischen Inseln*, Heidelberg, 1852. From these works it appears that the total number of wild flowering plants amounts to 424, of which 77 are monocotyledonous, and 347 dicotyledonous. Of the former, an asparagus and 14 grasses are peculiar; and of the latter, 50 are peculiar, and these belong to the genera Euphorbia; statice (2 sp.); linaria (4 sp.); campylanthus, globularia, orobanche, echium (2 sp.); lavandula, micromeria, sarcostemma, campanula, tornabenea (2 sp.); sapota, erigeron (2 sp.); conyza (3 sp.); phagnalon (2 sp.); inula, odontospermum (3 sp.); artemisia, gnaphalium, tolpis, sonchus, rhabdorheca, cremaspora, pavetta, dialium, sœmmeringia, lotus (5 sp.); sempervivum, polycarpon, paronychia, cistus, fagonia, and forskählea. There are besides 14 ferns, two of which are peculiar. The flora is closely related in the main to that of the neighbouring continent, and is strongly impressed with a tropical character. Doubtless a large proportion of the plants have been introduced.

Geology.—These islands are all of volcanic origin, but little is known of their geological structure. As far as we are aware, Mr Darwin's examination of San Thiago (St Jago) is the fullest that has been made of any island, and that was only partial. (See his *Observations on Volcanic Islands.*) Marine shells are found embedded in tuff at Boa Vista (as we learn from Bowdich, who visited that island in 1823), showing an upheaval to some extent. In Fogo is a still active volcano several thousand feet high, which merits the investigation of geologists; and indeed all the islands would doubtless repay the student of volcanic phenomena for the time and labour bestowed in their examination. For instance, an inquiry into the circumstances under which calcareous sand is thrown upon the island of Boa Vista, and heaped up by the winds into hills 30 feet high, would probably tend to explain the origin of the superficial layer of similar sand on part of Madeira and Porto Santo.

The Portuguese divide the islands into two groups; six to the windward (*a Barlavento*), viz.: S. Antao, S. Vicente, S. Luzia, S. Nicolao, Sal, and Boa Vista; and four to the leeward (*a Sotovento*), viz.: Maio, S. Thiago, Fogo, and Brava. We shall proceed to give a short notice of each.

S. Antao, the most north-westerly of the group, has an area of 240 square geographical miles, and a population of about 21,000. Its shape is very irregular, but diagonals drawn at right angles to each other would measure about 30 miles. Its surface is very rugged, and the interior so lofty that it can be discerned from a considerable distance at sea. The Sugar Loaf, its highest mountain, is thought to reach the altitude of 8000 feet. This island is reputed to be at once the most picturesque, the healthiest, and the most fertile of the archipelago, water being abundant. On the other hand, the difficulty of passing from one part to another is very great. Improved roads have been made of late years, but formerly, it is said, the higher part of the island was only accessible by means of a rope. There is a story of a bishop who, deeming it his duty to visit every part of his see, went to S. Antao, and was drawn up by this rope. Arriving safely at the top, he gave thanks to God; but he never had courage to descend, and therefore resolved to give up the world and remain where he was for the rest of his life. There are three indifferent landing-places, of which the most frequented is Ponta do Sol, where the custom-house stands, distant more than a league from the chief town, Ribeira Grande, situate in the north-west of the island, a place of 7000 inhabitants. Tarrafal Bay is spacious and sheltered from the prevalent winds. Here is the best water in the whole archipelago, of which mariners speak with enthusiasm. The island produces good coffee, and the sugar-cane is cultivated; but the people are reputed to be indolent and inattentive to the advantages which soil and water afford them. The climate is considered salubrious. Lead is said to be obtained here, and there is a current opinion that other metals exist. Somewhere on the island is an extinct crater, from which the people declare that a wind occasionally issues so strong that it flings back any object that may be cast into the hollow. In 1855, the crop of grain and vegetables was entirely lost for want of rain, and many persons perished.

S. Vicente (St Vincents) lies adjacent to S. Antao on the east. It has a superficies of 70 square miles, and a population of a few hundreds. At Porto Grande, on the north-west coast, is an extensive and excellent harbour, and here a coasting station for British steamers has been established. The island is a wretched place, and so exposed to the fury of the north-east winds, that not a tree will flourish upon it. Its soil yields very little, and the inhabitants are supplied with grain and fruit from S. Antao. One of the mountains is thought to be nearly 3000 feet high. The hills are chiefly near the coast, the interior being a sandy depression. Some years ago the home government ordered that the head-quarters of the local government should be on this island, but the decree has never been carried out. In the summer of 1856 the people were attacked by cholera, and half of them died or deserted the island. The distance from S. Vicente to S. Antao is about 8 miles, to S. Luzia, only about 4 miles.

Santa Luzia is a small island situate between S. Vicente and S. Nicolao, with an area of about 18 square miles. The inhabitants, who are wholly occupied in attending to their cattle, do not exceed a dozen. Much orchil was formerly gathered, but of late years this branch of industry has been little attended to. A little to the south are the two uninhabited islets of Branca and Rasa.

S. Nicolao is a long narrow island of a crescentic shape, with an area of about 115 square geographical miles, and a population of about 7000 persons. The climate is not very healthy, the people having been often decimated by fevers, dysenteries, &c. Maize, kidney-beans, mandioca, sugar-cane, and vines are cultivated; and in ordinary years grain is exported to the other islands. Severe droughts are occasionally experienced. In 1855 the whole harvest was lost from want of water, and many persons died. The interior is mountainous, and has two remarkable hills which can be seen for many leagues; one has the shape of a sugar-loaf, and is near the middle of the island; the other, Monte Gordo, is near the west end, and has a height of 4280 feet. All the other islands of the group can be seen from S. Nicolao in clear weather. Vessels frequently enter Freshwater Bay, near the south-east extremity of the island, for water and fresh provisions; and the custom-house is here. The distance from S. Nicolao to S. Vincente is more than 20 miles; to Sal nearly 60 miles; and to Boa Vista, rather more than 60.

Sal, a narrow island, through whose centre passes the meridian

Verde, Islands of Cape.

of 23°, has a length of 20 miles, an area of 70 square geographical miles, with a population of about 600 persons, one-third of whom are employed in the manufacture of salt, which is largely produced and exported. Its name is derived from a natural salt-spring, at which the trade commenced; but this has now been abandoned for artificial salinas more conveniently situated. Mrs Bowdich compared the appearance of the island from the sea to a coffin of sand. In the middle are three hills, the loftiest of which attains the height of 1340 feet. A space of nearly 20 miles intervenes between Sal and Boa Vista.

Boa Vista, the most easterly island of the group, lies in Lat. 16. 5. N., and Long. 22. 55. W. Its length from east to west is about 17 miles, and its breadth from north to south is about 16 miles. Its shape is irregularly heptagonal, the coast being indented by numerous shallow bays, the largest of which, situate on the western side, serves as a road for shipping. A chain of heights traverses the middle of the island, and there are inferior hilly ranges on each side; the loftiest peak attains the altitude of 1260 feet. All the hills have basaltic summits. The plateau from which the hills rise has a height of about 60 feet above the sea, and is composed chiefly of calcareous sandstone. Near Porto Sal Rey are tuffs containing abundance of marine remains; and near the same place is a raised beach containing shells, &c. The superficial calcareous sandstone also abounds in shells. In the north-western angle of the island there is a low tract covered with loose sand, which is blown about by the winds, to the great annoyance of the inhabitants. This part is inundated with water during the rainy season; and here are some extensive salt-pans, where the sea-water is evaporated by the heat of the sun. The inhabitants are about 4500, and the island is in great part uncultivated. Horned cattle and goats are tolerably numerous. Salt and orchil are exported. With the exception of a few cocoa-nut trees, there is no wood, and in the dry season the island offers to the eye nothing but an arid waste. The little vegetation that then exists is in the bottom of ravines. Here corn, beans, and cotton are cultivated. The springs of good water are few. Porto Sal Rey, on the western side of the island, is the chief town (population 1000); and there are several villages scattered about the island. The inhabitants are negroes, mulattoes, and a few Europeans, chiefly Portuguese and English. The natives are generally above the middle height, and are well formed; many of them live to a great age. Remittent fevers occur during and after the rainy season, and diarrhœa, pectoral complaints, and ophthalmia occasionally occur. A good deal of fish is taken on the coast, and supplies the impoverished islands with much of their food. Towards the end of 1845 yellow fever broke out in the island, and carried off about a fourteenth of the population. The British government sent out a physician (Dr M'William) to inquire into the circumstances, and it was proved that the fever had been imported from the African coast by a British ship. The mean temperature of the air in April, May, and June, 1846, he found to be 73°·3, 72°·5, and 74°·7 Fahr.; and the mean daily range 5°·6, and 6°. The difference between the mean due point and the mean temperature he found to be 6°·4, 6°·8, and 5°·2, during the same months. Forty years ago there resided on this island a certain Senhor Manoel Martins, who, from the number of his slaves, his possessions on the different islands, and his extensive commerce, had acquired great influence and power. He it was who constructed the salt-works in Sal, and laid down there the first iron railway that the Portuguese dominions possessed, for the purpose of conveying the salt from the salinas to the shore. Mrs Bowdich has given a lively account of a visit she and her husband paid to this person at Boa Vista.

Maio has a length of 15 miles, and its area is about 50 square geographical miles. The population amounts to upwards of 2000. Little of the land is cultivated, the inhabitants deriving their support chiefly from their cattle, and from the exportation of salt made in a natural pit on the coast. Fish is abundant. This island is a barren treeless waste, surrounded by dangerous rocks, where many vessels have been wrecked. The best landing-place is at English Road, on the west side. The two extremities are low, the middle elevated, with three rounded hills, the highest of which is 720 feet above the sea. Maio is 35 miles from Boa Vista, and is separated from San Thiago by a channel 7 miles wide.

San Thiago (St Jago), the largest island of the archipelago, has a length of 37 miles, an area of 360 square geographical miles, and a population of 35,000 persons. Its geological structure is volcanic, and part of it has been minutely described by Mr Dawson in his *Observations on Volcanic Islands*. Its interior is very hilly, the highest point being a pointed conical mountain called Pico de Antonio, which attains the altitude of 4500 feet. There are numerous ravines which bring down perennial streams, and in these ravines there is a good deal of cultivated ground, where crops of sugar-cane, maize, kidney-beans, rice, and mandioca are raised. Some of the produce is exported to the other islands. Spirit is distilled from the juice of the sugar-cane, and a coarse sugar is also made. The physic-nut tree is largely grown. The chief port is at Villa da Praia, a town at the southern extremity of the island, with 2000 inhabitants. At this place, called Porta Praya by the English, the governor-general and bishop usually reside. Before the removal of the coal depôt for British steamers to S. Vicente, it was better known to voyagers than any other town of the Cape Verdes, and many sailing-vessels still touch here. It stands on a basaltic plateau overhanging the bay, and presents, from a distance a not unpleasing appearance, with its numerous cocoa-nut trees, and the lofty peak of Antonio rising from behind successive steps of tableland in the background. The town, however, is a mean place, and very deficient in fresh water. The neighbourhood has a desolate aspect from its utter sterility. On entering the harbour, there is seen in the face of the sea-cliffs, and raised about 45 feet above the water, a horizontal band of calcareous stone containing marine shells, such as now exist in the sea. It rests on ancient volcanic rocks, and has been covered with a stream of basalt, which has converted it, in some places, into a crystalline marble. On the west coast an inlet penetrates several miles into the interior, but does not afford secure anchorage. In the ravine, at its head, is the town of Ribeira-Grande, the former capital of the island, which, with its ruined fort and cathedral, has a picturesque appearance. This island has no great reputation for salubrity; indeed the coast is considered dangerous to Europeans. Like the others, it has been subject to famines, and there are records of a very destructive one, that lasted three years, about the middle of the last century. Good specimens of the baobab, or monkey bread-tree, may be seen here.

Fogo.—This island is 30 miles distant from San Thiago, and lies between the parallels of 14. 42. and 15. 1. N. Lat., and 24. 8. and 24. 32. W. Long. It is of a nearly circular shape, measuring about 12 leagues from N. to S., and about 14 leagues from E. to W. Its area is estimated at 144 square geographical miles. Through the middle runs a mountainous ridge of a semicircular form, the concavity being towards the east, and about the centre there rises a volcanic cone to the height of 9150 feet. This volcano produced fire uninterruptedly from 1680 to 1713. It has been active several times since then, the last eruptions having taken place in 1847, when a current of lava flowed to the sea: the summit still emits vapour. In one part of the island there are a number of extinct craters where much sulphur could be collected. The southern part of the island is the flattest; but the whole island slopes more or less from the foot of the central ridge to the coast, which is bound by rocks. The only anchorage for vessels of burden is in Luz Bay, on the west side. Deep ravines add to the inequalities of the island, and carry off the rain as soon as it falls. Of late years there has been a scarcity of rain, and this is probably owing in some measure to the absence of vegetation. The inhabitants, with great want of foresight, have been in the habit of felling trees, without replanting, so that very few trees are now to be found. The water is good but not abundant. The population amounts to between 11,000 and 12,000. Sao Felippe, the largest town, has a population of nearly 1200. This is the only place with any commerce, and here is the best anchorage. The chief articles of produce are sugar-cane, ground nuts, sweet potatoes, and cassava, the produce of the manihor. There are few goats and swine, but horned cattle are abundant. The great majority of the natives are employed in agricultural pursuits, but they are very indolent. Their food consists chiefly of the vegetable productions before mentioned, with beans, maize, and fish, and their habitations are wretched huts. The only houses with any pretensions to comfort are at S. Felippe. This island is reputed to be one of the healthiest of the group; but in addition to the usual endemic, remittent and intermittent fevers manifest themselves in October and November, the intensity of which is in proportion to the abundance of the rains. In July 1855 there was an outbreak of cholera, the origin of which could be traced to a Sardinian vessel which landed her passengers, afflicted by this disease, for a few days at S. Felippe. Upwards of a fourth of the entire population was attacked, and nearly 650 persons died.

Brava, the most southerly and the smallest but one of the group, has a triangular shape. Its area is 36 square geographical miles, and its population amounts to nearly 6000, so that it is the most densely populated of all. Its distance from Fogo is about 12 miles, from San Thiago nearly 60. The interior is mountainous, but near the coast the soil is comparatively fertile, its agricultural productions numerous, and much maize is exported. The people, however, are miserably poor, and have suffered repeatedly from the failure of their crops in seasons of drought. Whalers resort to this island for refreshment, and by their means the scanty resources of the population are eked out. This island is usually covered by a dense atmosphere, otherwise its high land would be seen from a great distance. (J. T. J.)

Verden ‖ Vergilius.

VERDEN, a town of Hanover, formerly capital of a duchy of the same name, in the province and 21 miles S.E. of Bremen, on the right bank of the Aller, which here divides into two arms, and is crossed by a large bridge. It is walled, and contains a Gothic cathedral, two other churches, a town-hall, gymnasium, hospital, and barracks. Tobacco, beer, and brandy are made here, and there is some trade in corn and cattle. Pop. 4670.

VERDUN, a town of France, capital of an arrondissement in the department of Meuse, on the Meuse, which here becomes navigable, 28 miles N. of Bar-le-Duc. It is enclosed by walls and bastions, and further defended by a citadel constructed by Vauban, and separated from the town by an esplanade planted with trees. The houses are generally well built, but the streets are badly paved, and many of them very steep. The Meuse flows through the middle of the town, and divides into five branches, which unite again outside the walls. Among the public buildings the most remarkable are the cathedral, episcopal palace, public library, and cavalry barracks. There are also here courts of law, a college, episcopal seminary, and various schools and hospitals. The principal manufactures are of sugar-plums, and *liqueurs*, for which Verdun is famous; but the town has also sugar-refineries, breweries, dye-works, tanneries, &c.; as well as a considerable trade in manufactured goods, wine, fruit, and oil. Pop. (1856) 12,742.

VEREJA, a town of European Russia, in the government and 62 miles W.S.W. of Moscow, on both sides of the Protva. It is an ancient fortified town, and has four churches, important tileworks, and tanneries; and it carries on a considerable trade in agricultural produce. Pop. 5310.

VERELIUS, Olaus, or Olaf Werl, a celebrated Swedish antiquary, was born at Ragmildstorp, in the diocese of Linköping, on the 12th February 1618. Having studied at Linköping, Dorpat, and Upsala, he in 1648 set out as tutor to two young Swedish nobles, on a tour through Denmark, Germany, Holland, Switzerland, Italy, and France. On his return to Sweden in 1651, he was made professor of rhetoric in the University of Dorpat, and the following year he was appointed quæstor to the University of Upsala. In 1662 he obtained the chair of national antiquities, and in 1666 was nominated royal antiquary and assessor in the Royal College of National Antiquities. In 1676 he was appointed librarian to the university, a post of honour conferred on scholars only after long and distinguished services. Verelius died on 1st January 1682, and is the author of numerous able and learned works, chiefly on Scandinavian antiquities.

VERGE, in *Law*, signifies the compass of the king's court, which bounds the jurisdiction of the lord-steward of the household.

VERGERS, officers of the courts of law in England, who carry white wands before the judges. There are also vergers of cathedrals, who carry a rod tipped with silver before the bishop, dean, &c.

VERGILIUS, or Virgilius Polydorus, an eminent historical writer of the sixteenth century, was a native of Urbino in Italy. He was sent to England in 1501 by Pope Alexander VI., to collect the tax called *Peter-pence*. Soon after his arrival there he obtained the rectory of Church-Langton in Leicestershire, and in 1507 was made archdeacon of Wells. In 1514 he seems to have fallen into disfavour, was deprived of his collectorship, and was thrown into prison for a time. He continued in England during the reign of Henry VIII. and part of that of Edward VI., whence it is concluded that he was but a moderate papist. In 1550, being now an old man, he requested leave to revisit his native country, and was accordingly dismissed with a present of 300 crowns, and permission to hold his preferments to the end of his life. He died at Urbino in 1555. His principal work is his *History of England from the earliest times to the end of the reign of Henry VII.*, in Latin. It was undertaken at the command of Henry VII., and was published in 1534. His style is clear and neat, but he is much blamed for partiality and even falsehood. There is much truth, however, in the statement that he was too much of a historian for the period in which he lived, and that he incurred odium from the manner in which he treated the prejudices of the English people. Besides his *Historia Anglica*, he is the author of a small collection of proverbs, *Proverbiorum Libellus*, which appeared at Venice in 1498; *De Rerum Inventoribus*, 1499; *Dialogi de Prodigiis*, 1531; and other works, some of which passed through several editions. 2 vols. of an English version of his history have been reprinted by the Camden Society in 1844 and 1846.

Vermicelli ‖ Vermin.

VERMICELLI, a paste made of wheat-flour, and formed into long slender tubes or threads like worms, by forcing it with a piston through a number of small apertures. It differs from *macaroni*, which is substantially the same, only by being made into smaller tubes.

VERMILION, a bright and beautiful red colour composed of quicksilver and sulphur, in great esteem among the ancients, under the name of *minium*.

VERMIN is a general term employed to denote any noxious animal, and is applied to such creatures as are obnoxious to man, or the animals under his charge.

In this extended sense, then, the gamekeeper finds vermin in most of our native quadrupeds, except those which it is his pleasure or business to preserve; as also in such birds as may in any way molest his "preserves." For these he usually employs the corrupted, but yet with him distinctive term, of "varment," whilst the insect pests which annoy him get the title of vermin.

We propose in this article to briefly review the kinds of creatures to which the term is applied, with notices of the nature of their injuries and their remedies; and with this view we shall direct the reader's attention, 1*stly*, to the quadrupeds; 2*dly*, the birds; and, 3*dly*, the insects, which would appear to be his more particular enemies.

The following list will be found to include all the quadrupeds to which the name can apply, with the natural Orders to which they belong.

Natural Order.	Genera and Species.	Common Name.
Cheiroptera.	Vespertilio species.	Rats, flitter mice.
	Talpa vulgaris.	Mole, oont, want. Mouldiwarp (Scotch).
	Erinaceus Europæus.	Hedgehog.
Insectivora.	Sorex areneus.	Shrew.
	... fodiens.	Water shrew.
	... remifer.	Oared shrew.
Carnivora.	Meles taxus.	Badger, brock.
	Lutra vulgaris.	Otter.
	Mustela vulgaris.	Weazel.
	... erminea.	Ermine, stoat.
	... putatorius.	Polecat, fitchew, foumart.
	... furo.	Ferret.
	Martes foina.	Common martin.
	... abienum.	Pine martin.
	Felis catus.	Wild-cat.
	... ... var domestica.	House-cat.
	Vulpes vulgaris.	Fox.
Rodentia.	Sciurus vulgaris.	Squirrel.
	Myoxus avellanarius.	Dormouse.
	Mus messorius.	Harvest mouse.
	... sylvaticus.	Wood mouse.
	... musculus.	Common mouse.
	... rattus.	Black rat.
	... decumanus.	Norway, or brown rat.
	Arvicola amphibius.	Water-rat, vole.
	... agrestis.	Short-tailed field-mouse.
	... pratensis.	Bank, vole.
	Lepus timidus.	Hare.
	... cuniculus.	Rabbit, coney.

Vermin. *Bats.*—If we look at the end of the squire's barn we shall usually see some of the vespertilio there nailed up with outstretched wings; they have, however, no stronger evidence against them of *felonious intent* than being found in the so-called "keeper's larder," where they have attained their ignominious position through ignorance, as they are perfectly harmless, and still the superstitious fears with regard to them are among the very curiosities of superstition.

Moles—are common in all parts of England especially in the midland counties, and in the south of Scotland, but are absent in Ireland. The mole is seldom or never seen above the surface of the ground, except when forced out of its subterraneous abode by excessive drought and heat, by inundations, or by very hard frost. In size it is a little larger that the dormouse, and smaller than the common rat, measuring from five to six inches in length, exclusive of the tail. The male is considerably larger than the female. The body is completely covered with very fine glossy black hair or fur, softer and finer than silk, or the fur of the beaver, inclining to a brownish hue on the abdomen.[1] Its nose is long, and resembles that of the hog; its eyes are very quick and perceptible when the animal is alive. Instead of external ears, it has openings protected by the fur, which are admirably fitted for their purpose, as the hearing of few animals is more acute. Its neck is very short, and its body is thick, round, and muscular, terminated by a tail about an inch long. The fore-legs have more the appearance of hands growing out of the body, turned outwards and backwards, like the hands of a man when swimming. These legs are very strong, and are each furnished with five claws. The hind legs are longer and weaker than the fore ones, being only used in progressive motions; whereas the others are constantly employed in digging and boring the ground, or in scraping and throwing back the earth when loosened; for, while the mole is excavating, it is always obliged to draw the loosened earth backwards, and to lift or shove it above the surface of the ground in the same way. Its teeth are beautifully white, and consist of forty-four in all, viz., six upper and eight under incisors, two upper and two under canines, and seven molars on each side above, and six on each side below. Its food consists almost entirely of earth-worms and a few insects.

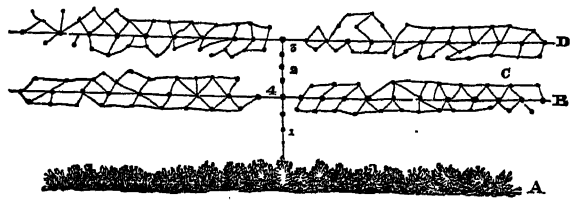
The male and female go together about the end of March or beginning of April, and most of them produce their young in the beginning of June, a few so early as in the last week in May.[2] The female brings forth her young only once a-year, the number varying from one to nine at a birth, and five or six being the average number. She carries her young about nine weeks, that is, from the last week in March or the first in April, till the last week in May or beginning of June. When the season arrives for the male and female going together, if their domiciles are not connected by old workings, the solitary mole will leave his place of abode in the night, and travel a considerable distance above ground to meet with a companion.[3]

The season for trapping moles in Scotland commences on the 20th of August, and ends on the 31st of May in each year, or occasionally a week or two later if the winter be a severe one.

About forty years ago, when steps were taken to clear the moles from the estates of his grace, Henry, duke of Buccleuch in Scotland, a man was appointed to each five thousand or six thousand acres of land, for two or three of the first years of a twenty years' lease; and so much success attended the plan, that two men were sufficient to keep fifty thousand Scottish acres of land pretty clear of moles during the remainder of the lease. And had it not been that there were several intervening patches of land, where the moles were not trapped at all, and where their propagation was kept up, one man would probably have sufficed for the purpose.

The most common way of taking moles, is by traps set in their walks or runs; and the best for this purpose are the wooden ones made by the bobbin-turners in the neighbourhood of Kendal and elsewhere, and sold at about twopence each. Sixty of these traps, with as much mole-twine as may be bought for eighteenpence, a few sticks, a small bodkin, and a mole-spade, equip the mole-catcher, and will serve him for a year without any additional outlay. With these materials, in good ground, where the moles have not before been disturbed, he will capture three hundred dozens the first season. Before commencing operations, the traps should be steeped in water, and covered in the ground for a day or two, to remove any peculiar smell which may belong to them. Vermin.

In the subterraneous runs of the mole, as among the streets of towns and villages, there are certain walks more frequented than others, and hence entitled to the name of thoroughfares.



The dots in the above diagram represent the molehills, and the lines the walks or streets communicating between them, which serve the double purpose of a dwelling and a trap for worms, upon which the mole feeds. It is probable that all these streets, or at all events a large proportion of them, are traversed every twenty-four hours, more especially when food is scarce. It is also obvious that certain parts of these walks must be more frequently passed than others.

A may be supposed to be a hedge near which the mole will spend much of its time in wet, cold, or stormy weather; B and D are two ridges adjoining to the hedge, where it is much engaged in fine weather; and C the furrow between those ridges. Let fig. 1 represent the walk conducting from the hedge to the first ridge, and fig. 2 a continuation of the same walk between the first and second ridges. Figs. 3 and 4 are mainwalks on the ridges. Nos. 1 and 2 are the walks that will be most used, and therefore are the places where the mole-catcher would place his traps. Nos. 3 and 4 are the next best, in consequence of there being only a single road or passage in each place, and not, as to the right and left of them, a variety of byways. In many cases the inexperienced may be unable to determine which is a main run, in consequence of the ground being apparently all worked up together. In such a case he should endeavour to find a walk in a hedge-bottom, or in crossing the ditch to the hedge, or where the mole goes to water, or in the crossing of a gap-stead or gateway, or in a footpath, or furrow, or sheepwalk, or along the side of a drain. In such places as these, the ground is generally pretty solid, and it may be assumed as a general rule, that the mole never likes to make a great number of walks where the ground is hard, or where it is frequently trodden on. When the mole-catcher has surveyed the ground, and made up his mind where to place his trap, as at Nos. 1, 2, 3, and 4 he may strike his spade into the ground in a right line between the hillocks, and if he finds the ground hollow, he has discovered the walk, and he may there make a hole to set his trap in. Care must be taken not to make this hole too large, and it ought to be about a quarter of an inch lower than the bottom of the walk, so that the mole may have a gentle descent into it. The earth ought also to be well filled in upon all sides, so as to exclude the light, and at the same time not to interrupt the mole in its passage; for upon discovering any interruption, it will be apt to make a new road by the side of it, and after having its suspicion excited, it will be very difficult to take it afterwards.[4]

---

[1] The observations on the structure and habits of the mole, and on the mode of trapping it, have been communicated by Thomas Yeadell of Preston, for many years practically engaged in the art of mole-catching.

[2] Yeadell comes to this conclusion from his observation of the state of the female about this time, and from frequently having taken the whole litter of young in the nest, which is easily found, from its being made in the centre of an unusually large hillock. Although the mole is here stated to breed only once a-year, it is the recorded belief of some observers that two broods are annually produced, one in spring or early in summer, and another in autumn. The more usual and characteristic period, however, we believe to be the spring, and this accords with the practical observations of continental naturalists on the subject.

[3] This is a circumstance which Yeadell conceives to be proved in various ways; first, by his frequently having found the workings entirely abandoned in particular places in the months of March and April; secondly, by finding unusually large numbers of moles together at this time; and, thirdly, by incidental circumstances, such as taking a mole which had lost his tail, or had been deprived of a hind leg. In 1809 Yeadell took a mole without a tail, and the following year he took one wanting a hind leg, both of which had been twisted off, in traps of his own, at the distance of a mile or more from the place where they were at last taken. The most frequent cause of the mole changing its ground arises from inundations. When the rivers rise rapidly and cover his workings, he is obliged to abandon his subterranean abode, and swim for his life, which he can do with the buoyancy of a water-rat.

[4] Sometimes, when Yeadell has met with a mole which had been rendered cunning from the string of a trap having broken, or from its having been caught by the tail or by a hind leg, which it had twisted off, and escaped, he has successfully resorted to the various stratagems. The first of these is to form a cake of softish earth about half an inch thick, to be plastered over both ends of the trap, so as effectually to interrupt the passage. The mole, upon reaching this obstacle, immediately sets to work to remove it, and no sooner has

Vermin.

The mole has ever been an object of persecution; but we are far from convinced that the hundreds of these creatures which one frequently finds tied to the branches of a tree, are wholly to be considered as *fruits of evil*. His common food, the eggs and larvæ of wire-worms and other insect pests, deserve no little consideration, and our experience makes us conclude, that while moles stay in a place these creatures must be there: if they retire, their food has been destroyed, soon, however, to increase if he quits his old hunting-ground for a new one. On this account we have introduced moles to some situations with advantage, and reports are not wanting of several instances of preserving moles for the good they do the farmer. It is true that in pasture the hillocks they make are unsightly, but the advantage of spreading the fine mould of these heaps over the grass well repays the labour; and besides the grass is benefited by the check upon wire-worms and other larvæ which they continually destroy.

The *Hedgehog* is a much abused creature, as the charges upon which he is executed, namely, *sucking cows and eggs*, have never been proven, but, on the contrary, he is ever active in the destruction of slugs, snails, and various insects, for which he ought more properly to be protected.

The *Shrews*.—Of these we need only mention the field-shrew, which was formerly held in great dread from the notion that in creeping over cattle, or even man himself, he caused, most extraordinary to relate! palsies, paralysis, &c., and hence such afflictions were said to be due to being "*mouse crope*," the remedy for which was to keep a piece of "*shrew* ash" in the house, the mode of preparing which is described by Gilbert White as follows:—"Into the body of an ash-tree a deep hole was bored with an auger, and a poor devoted shrew mouse was thrust in alive, and plugged in, no doubt, with several quaint incantations, long since forgotten." The twig of a tree so prepared was applied to the affected part.

These animals do good rather than harm, as they feed entirely on insects; but it was in all probability their external likeness to true mice, which are objects of dread to foolish people, that the horrors related of shrews were invented as a sort of justification of the strange cruelty to which they were subjected.

The *Badger*, the *Otter*—are both considered legitimate objects of "sport." Happily, however, the delights of badger-baiting and otter-hunting are daily becoming less frequent by the rarity of both species, though it seems sad that the courage of these creatures should result in their extinction, though it is not unnatural, considering that their enemies are much more brutal than the animals themselves.

The *Weazel*, and its congeners, with the *Marten*, may all be referred to as among the most savage of our quadrupeds. They attack rats, mice, poultry, and game. In fact, the ferret, which is a native of Africa, is kept and even bred with us for use in ratting and rabbit-hunting; whilst the other species are detested by the gamekeeper, and ruthlessly destroyed accordingly, and, where game is of paramount importance, not without considerable show of justice.

The *Wild Cat* is no welcome tenant of a game-preserve, and is indeed a treacherous and dangerous animal, which, fortunately, is daily becoming rarer; but the domestic cat is usually a gentle creature, though not without enough courage to delight a savage nature in hunting it.

The *Fox* is, inconsistently enough, called a "varment," to justify the hunting of it, whilst it is most sedulously preserved for the continuance of the sport; and it is a matter no less curious than interesting, that noblemen have kept up establishments at the cost of many thousands per annum (we have heard of as much as L.100,000) for the exclusive purpose of fox-hunting. We shall not deny the excitement of the chase; but we do say that fifty couples of hounds, with from two to three hundred mounted horsemen, if they do catch their fox, are hardly worthy of the honours which poets and painters have lavished upon them; and were the fox-hunter by profession at all a thinking animal, he would omit much of the self-laudation in which he so liberally abounds.

The *Squirrel* and *Dormouse* are both sufficiently innocent in their actions to entitle them to omission from a list of vermin. The squirrel is accused of barking young trees, but this must be under extreme cases of scarcity of nuts and beech-mast, their usual food; still he is ruthlessly destroyed by the keeper, which is to be deplored, as he is truly an ornament to our woods.

The *Wood Mouse* sometimes increases to such an extraordinary extent, that it does considerable damage to young plantations, eating the roots and decorticating the young plants. In such a case these animals are best taken in holes of about 12 to the acre, made as follows:—They are from 18 to 20 inches in depth, about 2 feet long, and 1½ foot wide, made broader at the bottom than the top. In these should be placed a few bits of Valerian root, which will entice many, whilst lots will fall in inadvertently. It was calculated that in this way, in the Government Dean Forest, upwards of 30,000 of these creatures were destroyed in a few months.

Vermin.

For the *Common Mouse*, the various traps in use, with the aid of the cat (which is especially useful for this purpose), will mostly be found sufficient; but if not, they readily take the phosphorus paste to be presently described; nux vomica or stavesacre will be sufficient.

Rats.—Of these, the brown or Norway rat is everywhere, the black or the so-called old English rat daily becoming scarcer. The rat is among the greatest pests we have to inquire into. Being omnivorous in his appetite, he will destroy lard, cheese, grain, and almost anything that is at all edible, besides garbage of all kinds. By his holes and passages he undermines houses and out-buildings, and indeed his whole habits render him a nuisance wherever he is found. On this account various methods have from time to time been extolled for his destruction. He is hunted, trapped, and poisoned. However, as regards trapping, it is usually a slow and uncertain method, on account of the creature's cunning,—a characteristic that has to be met even in poisoning. He is attracted by some essential oils, as oil of aniseed or caraway. Oil of rhodium has been much extolled for this purpose; but it is now seldom or never to be got genuine. Arsenic is the poison commonly used; and to do so with effect, their haunts should be supplied with slices of bread and butter until they eat it unsuspectingly, when finely powdered arsenic may be spread over fresh slices. This method has the disadvantage of leaving their dead bodies to putrefy about the buildings, which is said to be obviated by the following method, which was communicated to the Royal Agricultural Society by Dr Ure:—"Melt hogs' lard in a bottle plunged in water heated to about 150° Fahrenheit; introduce into it half an ounce of phosphorus to every pound of lard; then add a pint of proof spirit, or whisky; cork the bottle firmly after its contents have been heated to 150°, taking it at the same time out of the water, and agitate smartly until the phosphorus becomes uniformly diffused, forming a milky-looking liquid. This liquid being cooled, will afford a white compound of phosphorus and lard, from which the spirit spontaneously separates. It may be poured off to be used again, for none of it enters into combination, but merely serves to communicate the phosphorus, and diffuse it in very fine particles through the lard. This compound, on being warmed very gently, may be poured out into a mixture of wheat-flour and sugar incorporated therewith, and then flavoured with oil of rhodium or not at pleasure. The flavour may be varied with oil of aniseed, &c. This dough, being made into pellets, is to be laid in rat-holes. By its luminousness in the dark it attracts their notice, and, being agreeable to their palates and noses, it is readily eaten, and certainly proves fatal. They are soon seen issuing from their lurking-places for water to quench their burning thirst and bowels, and they commonly die near the water." The compound just described is one of the best for the destruction of mice, for which put it in little pellets near their holes and about an infected field, and it commonly destroys the whole of them.

The *Vole* or water-rat is harmless enough. His food will be the wild plants of the water-side; however he does mischief by boring holes in the clay with which porous canals are stopped. From such places they are readily driven by dog and gun.

The *Hare* and *Rabbit*, though so rigidly preserved, and for whose sake the keeper wages such interminable war against all "four-footed beasts," are in reality the most mischievous creatures we possess. What fine crops of wheat and other grain, clover and the like, have we not seen destroyed by these creatures. However, as long as these evils are supposed to be counterbalanced by the sport and food they yield, so long will hares and rabbits be countenanced, and so long too shall we be considered as heretical in placing them in this list at all.

Birds.—Some of these are even objects of greater hatred to the keeper than beasts, many, as the birds of prey, on account of killing young hares, pheasants, and partridges, others, as the magpie, on account of superstitious fears which they inspire in the minds of the vulgar. With regard to the first of these, it is however

---

it dug its way through the earth, and against the trigger, than the trap strikes, and it is taken. When this stratagem failed, he was accustomed to set a dead mole upright upon its hinder part, with its head standing up into the centre of the trap, so as to touch the trigger; and whether from the combative propensity of the mole, or from its desire to relieve a companion, it rushes at the dead mole, displaces the trigger, and is taken. The last stratagem he never found to fail. In all cases, but more especially in those of a difficult nature, care ought to be taken to have the trap and strings in perfect order, using a strong stick for a spring, so that the animal shall be firmly secured.

Vermin. questionable whether they do not do mankind more good than harm. Their usual food will be the smaller birds, mice, and the like; and though the magpie and jay occasionally aids his repast with a little fruit, yet the slugs, snails, and insects which they destroy is incalculable.

Rooks, again, have a bad character; but, as says Mr Jesse in his *Gleanings of Natural History*, "In order to be convinced that these birds are beneficial to the farmer, let him observe the same field in which his ploughman and sower are at work; he will see the former followed by a train of rooks, while the sower will be unattended, and his grain remain untouched." We have looked most carefully into the actions of rooks, and we consider them a great blessing in an agricultural district. That some of the smaller birds do occasional mischief in our gardens we will not deny, but still we cannot help concluding that there is much misconception as to its kind and extent. As thus the gardener of a neighbour of our own puts some wheat steeped in decoction of nux vomica (crow-fig) "*to kill ther mischiefious sparrows*," as he had accused them of eating the buds of his gooseberry trees. Well, the sparrows get killed, and the gardener fancies he has caught the right bird; but not all, as it was the bullfinch that ate the gooseberry buds, but only when he had made the groundsel and other weed-seeds scarce. We are then no advocate for the destruction of birds, as none of them do us unmixed evil, but many perform the most essential service, and their sweet songs and pretty ways are more than an equivalent for their peccadilloes, so that after all the world at large is in their debt.

Insects.—Many insects, in the different states of existence through which they pass, are exceedingly troublesome and destructive. Sometimes they spread their devastations in the state of *larva* or *grub*, and sometimes in that of perfect insect.

Of the coleopterous insects, the grub of the cockchafer, which is a brownish or chestnut-coloured beetle, commits the greatest ravages. This beetle appears during great part of the summer, the most plentiful in May or June, and hence is called the *May-bug*. It flies only in the evening, and lodges during the day under the leaves of trees, which it devours, and is sometimes in such numbers as to defoliate whole woods. The beetle deposits its eggs in the earth, and from these are hatched white or bluish grubs, that feed on the roots of grass, corn, and other vegetables during the whole summer. In the winter they lie deep in the earth; but in the spring, as vegetation advances, they rise to the surface, and renew their work of destruction. In this state they continue for four, five, or six years, before they change to the chrysalis state, in which they remain till the month of May, when the perfect insect appears. As these insects require so many years to assume the perfect form, they only appear occasionally in sufficient numbers to be extensively destructive to the crops of grain, or vegetables in general. Their numbers, however, have often produced great alarm, and even excited the attention of governments to offer rewards for an effectual method of destroying them.

In the spring season, if the weather prove warm when the land is ploughed up, these grubs are generally so near the surface as to be turned up with the plough; and being thus exposed, they are picked up and devoured by various birds, which, it is suggested, should not be disturbed or driven away in this salutary labour. When these grubs infest meadow-land, it has been proposed to drown them in their holes by overflowing it, but it is supposed that this plan would not be successful, even where it is practicable, unless there is a bed of clay immediately under the soil, to retain the water for a sufficient length of time. A more efficacious way is recommended to prevent the increase of the grubs, by destroying the flies in May or June, before they have deposited their eggs. This may be done by shaking and beating the trees and hedges in the middle of the day; and, as this is a work which may be performed by children, it is a less difficult task than would at first sight be imagined. Domestic fowls are remarkably fond of these beetles, so that a double object is thus gained, the destruction of the beetles and the procuring of food for the poultry.

Some species of the *dermestes*, and also of the genus *ptinus*, are exceedingly destructive, in the cabinets of naturalists, and also to furniture. Various methods have been recommended to stop their ravages. We believe the most effectual is spirit of turpentine, when it can be properly applied. A solution of corrosive sublimate is sometimes employed, but it should be recollected that it seldom fails in time to produce some chemical change on animal and vegetable matter. Objects of natural history, as birds, animals, &c., are sometimes exposed to the moderate heat of an oven, or before a fire, for several hours; but this method will also be attended with injurious effects, unless practised with great care. Insects which infest furniture have been destroyed by the application of oil, and allowing it to remain for a day or two, before the furniture is rubbed up. Japanned or varnished furniture may be secured from the effects of these insects, by recoating it, when they are in the larva state, by which they are deprived of air. Railing, and other works out of doors, which are exposed to the weather, are sometimes eaten with insects, and particularly by some of the larvæ of the genus *curculio*. The wood thus attacked may be prevented from farther ravages, by a fresh coat of paint. Vermin.

The earwig is a destructive insect in the flower, kitchen, and fruit garden. To prevent their depredations, it has been recommended to take them with the hand, when they come out during the night in search of food. They may be taken also by rolling up a piece of paper, and hanging it up on the plants which they infest; for in these places they take shelter through the day. Another method of destroying them has been mentioned, and that is to watch them towards morning with the view of discovering the haunt to which they resort during the day. This may perhaps be a melon-frame, dunghill, or heap of rubbish; and the removing of it will destroy the greater number of those troublesome insects.

The small insect which commits such depredations among turnips, by eating the seedling leaves as soon as they appear, as frequently to destroy whole crops, is supposed to be a small black polished beetle, belonging to the genus *Altica*. It does not seem to be well ascertained whether this small beetle, which is better known by the name of turnip-fly, commits its ravages in the larva or in the beetle state. It is said to prefer the leaves of the common radish to those of the turnip; and it is therefore recommended to sow radishes along with the turnips, to prevent the destruction of the latter.

Of the insects belonging to the order *hemiptera*, there are some which are exceedingly destructive. The cockroach, a native of the warmer parts of America and the West Indies, is a very troublesome and a very voracious insect. It has been introduced into this country, and particularly into the seaport towns, in consequence of commercial intercourse. It comes out to feed in the night-time, and eats of almost everything that comes in its way. Cockroaches are easily taken by the following method. Cover the outside of a deep glass or basin with paper; introduce some bits of bread or sugar into the basin or glass, and set it in a place frequented by the cockroaches. They creep up by means of the paper on the outside, and drop into the vessel; but in consequence of its smooth polished surface, they cannot effect their escape. In the same way crickets and beetles may be taken and destroyed. It is quite unnecessary to speak of the means of destroying the myriads of locusts which not unfrequently infest eastern countries, and particularly Egypt and Syria; for no means are likely to be devised which promise to resist the effects of such a host of foes, by whose ravages every green thing is consumed; but the insect itself becomes, among the poorer inhabitants of those countries, a partial substitute for the fruits of the earth which it has destroyed. The insects are taken, and reduced to powder, and converted into a kind of meal.

The common or the bed bug is a very troublesome and a very common inmate in the crowded houses of large towns. Its usual haunts are the crevices of wood, and particularly those pieces of furniture which are usually kept in the warmest corners of the apartment. Cleanliness will perhaps be found the best preservative against the introduction and increase of these insects; but sometimes even the greatest care and attention are ineffectual in keeping houses entirely free from them. When it can be conveniently done, they are completely destroyed by immersing the furniture in boiling water, or by baking it in an oven; and by filling up the crevices or holes which were their haunts with glazier's putty, their return and increase will thus be prevented. But a very effectual method of destroying bugs is to wash the places which they frequent with spirit of turpentine, and then to fill up the holes as already mentioned. It is a curious circumstance in the history of those insects, that some persons entirely escape from their attacks, while to others they are exceedingly troublesome and distressing. It is said that lavender-water, sprinkled over the bedclothes, often prevents their approach.

The small moth which, in the caterpillar state, commits ravages on woollen cloths, furs, and other animal substances that remain for any length of time in dark undisturbed places, may be destroyed with the greatest certainty and facility, by exposing the substances on which they are suspected to make their depredations to the vapour of spirit of turpentine, or brushing them with a brush dipped into the same fluid. This should be done about the months of September or October; but their effects may be prevented by placing the cloths, furs, &c., which are likely to become their residence, in an airy situation, about the months of July and August.

The different kinds of lice are very numerous. Every animal has its peculiar species, and even mankind are not free from this pest. It is often the consequence of indolence and nastiness: and it is observed that the lice which infest any animal increase prodigiously when that animal becomes languid and sickly. We believe that the application of spirits of turpentine, already so often recommended, would also be effectual in this case; but mercurial preparations afford a certain remedy against these insects. For this

Vermont. purpose a very small quantity of what is called mercurial ointment may be employed. At the same time it ought to be recollected that cleanliness is the best preservative.

It is perhaps more difficult for mankind to secure themselves and their habitations from the visits of the common flea. Cleanliness may however do much even in effecting this; and, in particular, it appears to us that it would be extremely useful, frequently to rub up with a piece of cloth the more inaccessible parts of furniture or apartments, or perhaps it would answer better to employ a small hard brush. By the less accessible places, we mean the corners and crevices of rooms and furniture where dust is apt to collect, and especially the canvass part of a bed. We are persuaded that spirits of turpentine might also be found useful for the destruction of these very troublesome insects. The Scottish myrtle (*Myrica gale*, Linn. a plant very common in low and moist moorish places in this country, is said to be an excellent remedy, in consequence of its powerful aromatic odour, against the attacks of these animals. For this purpose, the plant is strewed about the apartment or bed which is infested with fleas. (J. B—N.)

VERMONT, one of the United States of North America, bounded on the N. by Canada; E. by New Hampshire; S. by Massachusetts; and W. by New York. It lies between the river Connecticut and the long tapering basin of Lake Champlain; stretching from 42. 44. to 45. N. Lat., a distance of nearly 160 miles, and from 71. 25. to 73. 26. W. Long., with a breadth expanding pretty regularly from 45 miles in the S. to 90 in the N. It has an area of 10,212 square miles.

Mountains. The most striking natural feature of this tract is the mountainous range called the Green Mountains, which traverse the state from north to south, and passing into Massachusetts, there take the name of the Hoosic Mountains. In the centre of the state this ridge is divided into two, of which the one called the Height of Land runs north-east to Canada, and the other, taking a north-westerly direction, sinks down in the northern part of the state. The Green Mountains, from whose verdure this state derives its name, are from ten to fifteen miles wide, and are much intersected by valleys; they are watered by numerous springs and brooks, and are covered with evergreen trees and shrubs nearly to their summits. There are many good farms among the mountains, and much of the land upon them is suitable for grazing. The highest points are Mansfield Mountain, rising to 4359 feet; Camel's Hump, 4188 feet, both in the north-western ridge; and Killington Peak, further south, 3675 feet in height. Ascutney, a detached elevation near Windsor, rises to the height of 3320 feet above the level of the sea.

Rivers. The Connecticut forms the eastern boundary of the state. Onion River passes through Montpellier, the capital, into Lake Champlain at Burlington. Otter Creek is a principal branch of Onion River. Lamoile and Missisque are considerable streams north of the Onion. In the Green Mountains rise many smaller rivers, which at once beautify the country by the picturesque scenery of their banks, and promote its manufactures by the mills which they turn in their course. Those which run towards the east are tributaries to the Connecticut, and those whose course is towards the west discharge their waters into Lake Champlain.

Lakes. Lake Champlain, between this state and New York, is a beautiful sheet of water, 115 miles long, and from one to fifteen wide. It discharges at its northern extremity by the river Sorel into the St Lawrence, and contains upwards of sixty islands, of which Motte, and North and South Hero, are of considerable size. Besides the rivers which flow into it from the Green Mountains, it receives many from New York, on the western shore. The Champlain canal connects it with Hudson River and the New York and Erie canal. Lying extremely convenient to facilitate the commerce of the state both with New York and Montreal, it is navigated by a number of steam-boats and lake vessels. Memphremagog is a considerable lake, 25 miles long and 3 broad, lying partly in Vermont and partly in Canada, receiving a number of streams from this state, and communicating by the St Francis with the St Lawrence. Vermont.

Minerals. The prevailing rocks belong to the stratified primary group, embracing mica and talcose slate, gneiss, primary limestone, argillite, &c. On the western border there is a narrow strip of transition limestone. These rocks afford good building materials, and marble is quarried and carried out of the state. Iron is found in great abundance; and there are also here magnetic iron ore, copper, lead, and zinc. Pyrites or sulphuret of iron, is found at Strafford and Shrewsbury; and large quantities of copperas are made here annually.

Forests. Vermont was originally covered with a dense forest, a large part of which still remains, although considerable encroachments have been made on it in clearing land for cultivation, and in felling trees for timber. The mountains produce hemlock, spruce, and fir; the lower grounds, various species of oak, pine, maple, elm, hickory, beech, birch, ash, butternut, and basswood, and the cedar grows in wet places. Ginseng, sarsaparilla, sassafras, snakeroot, lobelias, &c., are also among the products of the forest. Maple-sugar is made in large quantities for domestic use and exportation, and pot and pearl ashes, and lumber, are also exported.

Soil, climate, and agriculture. Although on the whole mountainous, Vermont is by no means a poor or unproductive country. The valleys of the rivers contain extensive tracts of rich alluvial land; and even the more elevated portions afford good pasture for cattle, and especially for sheep. The climate is severe but healthy. During the long winter the cold continues steady and is sometimes intense; but the spring is not liable to the raw winds from the ocean; and in summer the heat is very great. The temperature ranged in 1851 from 17° below zero in winter, to 92° above it in summer. The extent of cultivated land in 1850 was 2,601,409 acres, being more than a third of the whole area; and there were produced in the same year, 535,955 bushels of wheat, 176,233 of rye, 2,032,396 of maize, 2,307,734 of oats, 104,649 of pulse, 4,951,014 of potatoes, 42,150 of barley, 209,810 of buckwheat, 3,400,717 lb. of wool, 12,137,980 of butter, 8,720,834 of cheese, 6,349,357 of maple-sugar, 249,422 of wax and honey, 866,153 tons of hay, &c. Of live stock the state contained 61,057 horses, 348,668 head of cattle, 919,992 sheep, 66,278 swine, and 218 mules and asses.

Manufactures and trade. Though inferior in respect of manufactures to most of the other New England states, this country contains a great abundance of water-power; and had, in 1850, 1835 manufactories, each producing more than L.100 worth of goods annually. Of these, 9 were cotton factories, employing 241 hands, and producing yarn and cloth to the value of L.40,850; 72 were woollen factories, employing 1393 hands, and producing goods to the value of L.329,000; 37 forges, furnaces, &c., employing 530 hands, and producing wrought, cast, and pig iron to the value of L.144,333; 152 tanneries, producing L.122,400 worth of leather; and a number of breweries, producing 800 barrels of ale. A considerable trade is carried on chiefly by way of Lake Champlain. In the year ending June 30, 1858, the exports from Vermont amounted in value to L.201,176, and the imports to L.457,006. The tonnage of vessels entered in 1851–2, was 60,488, of those cleared 57,579, and of those owned in the state 5657. Internal communication is facilitated by a number of railways; the whole length of the lines in operation in January 1859 being 528 miles.

Religion and education. According to the census of 1850, Vermont contained 564 churches, with accommodation for 226,444 people. Of this number 168 belonged to Independents, 123 to Methodists, 88 to Baptists, 25 to Episcopalians, 10 to Presbyterians, and the remainder to minor sects. Education is well attended to here, as generally in New England. Besides common schools, receiving a large amount of public money, and attended in 1850-1 by 90,110 pupils; there are in the

Vernet || Vernon.

state 3 colleges, 2 medical schools, and a large number of flourishing academies.

The form of government is republican; the governor, lieutenant-governor, senate, and house of representatives being all elected annually by popular vote. The senate consists of 30, and the lower house of 230 members. Vermont is represented in the National Senate by 2, and in the house of representatives by 3 members. The judicial establishment consists of a supreme court, of 3 county courts, and a court of chancery. For the year ending August 31, 1859, the public revenue amounted to L.36,633, and the expenditure to L.37,272. Vermont is divided into 14 counties, and the capital is Montpelier. Pop. (1850) 314,120, of whom 709 were negroes.

VERNET, Claude Joseph, a celebrated marine and landscape painter, was born at Avignon on the 14th of August 1714. He early displayed a taste for drawing, and from his father, who was a tolerable painter, he received his first lessons in art. At the age of eighteen, he went by sea to Italy with the view of perfecting himself as an historical painter, and it was then that his talent for marine painting was first awakened. At Rome he became pupil to B. Fergioni, a distinguished marine painter. At first he had to struggle with poverty, and had frequently to work for daily bread; but his talents were not long in bringing him into notice, and he speedily rose to eminence. In 1743 he was made a member of the academy of St Luke, and about the same time he married Miss Parker, the daughter of an English officer. With the exception of a journey of some length to Greece, he remained for twenty years in Italy, during which time he produced many eminent works of art; enriching the Borghese gallery and the Rondanini palaces with some of his finest productions. The fame of his works having at length reached his native country, he was invited by Louis XV. to Paris. Complying with this request, he set sail from Italy, when a violent storm arose, and such was his enthusiasm that, when the sailors were trembling for their lives, he caused himself to be bound to the mast in order to feast his eyes on his favourite subject. Soon after his arrival he was elected a member of the French Academy of Arts, and was commissioned by the government to execute paintings of the principal seaports of the kingdom. Nearly ten years of his life were spent in this work, the results of which are fifteen pieces, now in the Louvre. In 1766 he was elected one of the council of the academy, and the king gave him apartments in the Louvre. He died in 1789.

VERNON, a town of France, in the department of Eure, on the left bank of the Seine, here crossed by a bridge, 13 miles N.W. of Mantes. It consists of narrow crooked streets, lined with old timber-framed houses, which have a somewhat venerable appearance. It has an old Gothic church, a college, and fine boulevards, occupying the site of the former fortifications. There are here no manufactures of any importance, but some trade is carried on in corn, wine, and building-stone. Pop. 6463.

Vernon, Edward, a distinguished English admiral, was born at Westminster on the 12th November 1684. He was descended from an ancient Staffordshire family, and his father was for some time secretary of state to William III. Young Vernon, in opposition to the wishes of his father, determined to go into the navy. He first went to sea with Admiral Hopson, and was present at the destruction of the French and Spanish fleets in Vigo Bay in 1702. In 1704 he served under Sir Henry Rooke at the battle of Malaga, and next year was appointed to the command of the Dolphin. In 1707 he was transferred to the Royal Oak, and in 1708 to the Jersey, in which he was sent to the West Indies as rear-admiral under Sir Charles Wager. In 1715 he commanded the Assistance in the Baltic, and in 1726 the Grafton in the same sea. In 1727 he obtained a seat in Parliament as member for Penryn, and in the next Parliament he represented Portsmouth. He however rendered himself so obnoxious to the ministry by his opposition, that they were glad of an opportunity to rid themselves of his presence. He was accordingly, in 1739, appointed to command a squadron destined for the West Indies, and set sail from Spithead with six ships, on the 23d of July. On the 22d November he took the town of Porto-Bello after a vigorous resistance, but being without a sufficient land-force to keep it, he destroyed its fortifications, and then abandoned it. In 1741 he made his unsuccessful attempt on Carthagena. During the rebellion of 1745 he was appointed to guard the coasts of Kent and Sussex, in which he acquitted himself with his usual ability. He soon after got into a quarrel with the Lords of the Admiralty, and having disregarded their orders, his name was struck off the list of admirals. Though he continued to retain his seat in Parliament, in which he represented Ipswich, he took little more part in public affairs; and died suddenly at his seat at Nacton, in Suffolk, on the 29th of October 1757.

Verona

VERONA, a fortified town of Austrian Italy, capital of a delegation of the same name, in the crown-land of Venice, on the Adige, 22 miles N.N.E. of Mantua. It is one of the most beautifully situated towns in Italy, at the foot of the offsets of the Alps, on a rapid river which flows through a rich and varied landscape. It is surrounded with very strong defences, recently erected by the Austrians; and it forms, along with Peschiera, Mantua, and Legnago, the celebrated Quadrilateral, which is the key to northern Italy. Verona is also interesting for its rich historical remains and its literary institutions. It is divided into two unequal parts by the Adige, which flows in a circuitous course through the town, and is crossed by four bridges, one of which is a handsome stone one of three arches. The town has on the whole an antique but not a dilapidated appearance. The principal approach to it is through a short but wide street lined with magnificent buildings, and many of the other streets and squares are equally fine. The houses are, many of them at least, of vast size, and the best of them as well as the most remarkable public buildings, are the work of the architects Sanmicheli and Palladio. Of the many elegant squares in Verona, the finest are the Piazza Bra, Piazza dei Signori, Piazza del Erbe, and the Mercato Vecchio. The churches are about forty in number, and all more or less remarkable for their architecture, or for the paintings and ornaments they contain. The most important of them is the cathedral, said to have been built in the time of Charlemagne. It exhibits a combination of different styles of architecture, and some parts of it are very fine. Of the pictures that it contains, the most beautiful is the "Assumption of the Virgin," by Titian. Near the cathedral stands the episcopal palace, a large building in the oriental style, overhanging the river. Many of the other churches are very ancient, and some may be traced up to the eighth century. Another remarkable feature of Verona is the number of splendid palaces it contains; some of them belonging to private persons, and others devoted to public purposes. Of the former, one of the most beautiful is the Palazzo Canossa, built by Sanmicheli, begun in 1527, and completed in 1560, being a most tasteful and richly ornamented building. The Palazzo Bevilaqua, by the same architect is also very fine, but has unfortunately been left unfinished; and the Palazzo Ridolfi is remarkable for a curious historical picture of the "Coronation of Charles V. at Bologna." The ancient palace of Theodoric, which must have been, while it remained entire, a most splendid building, after having been much injured in former times, was at last entirely destroyed by the French in 1801. The palace of the Scaligeri, who were for a long time the lords of Verona, is now the municipal buildings, and has a fine cam-

Veronese, Paul ‖ Versailles.

panile tower rising to the height of 300 feet. Other fine buildings are the Palazzo Publico, built near the Roman amphitheatre and in harmony with its style; the Palazzo del Consiglio, built in the fifteenth century, and containing statues of the great men that have sprung from Verona, among whom are Pliny the younger, Cornelius Nepos, Vitruvius, and Catullus; and the Palazzo della Ragione, a very ancient building, containing the courts of law. Verona abounds in Roman antiquities, and the most remarkable of them is the amphitheatre. Its date cannot be determined with certainty, but it is probably not so old as the time of Augustus. The exterior has at present rather a ruinous appearance, as it was so much damaged by an earthquake in 1184, that only four of its seventy-two arches are standing; but the interior is in excellent preservation, although it is disfigured by the erection of a small wooden theatre on the arena. The arena is oval in form, 248 feet in length by 147 in breadth; and from it rise, one above another, forty-five rows of seats, calculated to accommodate 22,000 spectators. The access to the seats is easy, and the passages leading to them are spacious. The building is kept in good repair, and the parts that may get damaged from time to time are renewed. Verona is the see of a bishop, and contains a lyceum, episcopal seminary, three gymnasiums, an academy of painting, another of agriculture commerce and arts, a botanic garden, two valuable public libraries, and several theatres. It is celebrated for its dyeworks, and has also woollen and cotton factories, silk-mills, and a considerable trade in silk, grain, oil, &c. Pop. (1851) 51,091.

VERONESE, PAUL. See CAGLIARI.

VERSAILLES, a town of France, capital of the department Seine et Oise, in a plain 11 miles W. of Paris. It covers a large space of ground, and is divided into two parts by a fine avenue, forming part of the road from Paris. This avenue is nearly half a mile long and about 300 feet broad. Nôtre Dame is the name of the part of Versailles to the north, St Louis that of the part to the south of it; so called from the parish churches in each. The whole town is modern, consisting of straight streets, crossing each other at right angles, and lined with splendidly built houses. Besides the principal avenue, two others—those of St Cloud and Sceaux—all planted with fine elm-trees, diverge from the *Place d'Armes* in front of the palace, and separated from it by a court. To the palace the whole town may be said to owe its existence; with it Versailles rose, flourished and declined. While it was merely a small village in 1627, Louis XIII. erected here a small hunting-lodge, which his more magnificent successor enlarged and embellished, until it became one of the most splendid royal residences in Europe. It was the ordinary seat of the court under Louis XIV., XV., and XVI., till the Revolution; and it was here that latter event began with the meeting of the states-general, May 5, 1789. Here, too, on the 20th of June of the same year, the deputies of the people took the famous oath in the tennis-court, called the *Jeu de Paume;* and here, on the 5th and 6th of October, a hungry mob from Paris forced their way into the palace, and conveyed the king and his family to the capital. From that time Versailles ceased to be a royal residence. The palace remained in a state of great neglect until Louis Philippe restored it, and made it a national collection of paintings, and other monuments illustrative of the history of France. The town front consists of a centre and two wings, forming three sides of the court that opens on the Place d'Armes. The garden front also consists of three parts facing different directions; and this is, in the estimation of many, one of the finest pieces of architecture in existence. It consists of eighty-six Ionic columns, arranged in groups of six or eight, each group surmounted by a cornice, on which there are as many statues as pillars below. The interior consists of a vast number of saloons and galleries most richly and artistically decorated. In connection with the palace, there are a chapel, a theatre, gardens, and a park; besides a large range of buildings formerly occupied by the attendants of the court. The park contains many fountains, sheets of water, pieces of sculpture; and the two smaller palaces, called the Great and Little Trianon, with their respective gardens. Versailles is the see of a bishop, and has two churches, a royal college, normal school, ecclesiastical school, public library, theatre, hospital, barracks, and prison. Firearms, clocks, and watches, jewellery, hats, hosiery, wax-candles, pasteboard, earthenware, and glass, are made here; and some trade is carried on in corn, firewood, fruit, &c. Pop. (1856) 29,956.

Versetz ‖ Vertot.

VERSETZ, or VERSCHITZ, a fortified town of the Austrian empire, in the Hungarian Banat county, and 41 miles S. of Temesvar. It is the seat of a Greek bishop, and has the ruins of a castle, various schools, and cavalry barracks. In the neighbourhood, wine, rice, and silk are produced. Pop. (1851) 17,748.

VERT. See HERALDRY.

VERTOT, RENÉ AUBERT DE, a lively and elegant, though not a very profound or accurate historian, was born at the castle of Benetot in Normandy, on the 25th of November 1655. He was the second son of a gentleman allied to several distinguished families, but possessed of little or no fortune. He was educated in the college of the Jesuits at Rouen; and having made choice of the ecclesiastical profession, he secretly withdrew from this seminary, and, after an interval of ten months, his family ascertained that he had betaken himself to the convent of the Capuchins, at Argentan. He was not however to be diverted from his design; and having made his profession, he assumed the name of brother Zachary. But the austerities of this order were so prejudicial to his health, that he was induced to exchange it for one of milder rules. Having obtained a brief from the pope, he entered the abbey of the Præmonstratenses at Valsery in 1677. He became secretary to Colbert, general of the order, who nominated him prior of Joyenval. The canon law prohibits a person who has quitted one order, from obtaining any office or benefice in another; and although he had procured a dispensation in due form, he yet encountered so much opposition, that he was induced to exchange his priory for a cure, depending on the order, at Croissy-la-Garenne, near Marley. Here, at the age of thirty-four, he produced his earliest work, *Histoire des Révolutions de Portugal*, Paris, 1689, 12mo. He afterwards obtained another cure in his native district of Caux; and this he exchanged for a third, in the immediate vicinity of Rouen. His last benefice was amply endowed, and rendered him very easy in his circumstances. He continued his historical labours with new ardour, and produced various other works. His next work bears the title of *Histoire des Révolutions de Suède*, 1696, 2 tom. 12mo. In 1710, he published his *Traité de la Mouvance de Bretagne*. A more elaborate work is his *Histoire des Révolutions arrivés dans le Gouvernement de la République Romaine*, 1719, 3 tom. 12mo. The Grand-master of Malta had appointed him historiographer of the order, with the privilege of wearing its cross. In order to evince himself worthy of the honour which had thus been conferred upon him, he produced a copious work, entitled *Histoire des Chevaliers Hospitaliers de S. Jean de Jerusalem, appellés depuis les Chevaliers de Rhodes, et aujourd'hui les Chevaliers de Malte*, 1726, 4 tom. 4to. Other honours had likewise been bestowed upon him. He became an associate of the Académie des Inscriptions et Belles Lettres. He was appointed "Secrétaire-interprète," and afterwards "Secrétaire des commandements," to the Duchess of Orleans. He had apartments in the royal palace, and received a considerable salary. But these honours and emoluments could not secure the enjoyment of good health,

Vertue || Verviers.

and the latter years of his life were passed in much bodily infirmity. He died on the 15th June 1735, in the eightieth year of his age. Some of his dissertations are to be found among the *Mémoires* of the Academy. A posthumous publication of Vertot appeared under the title of *Origine de la Grandeur de la Cour de Rome; et de la Nomination aux Evêchés et aux Abbaies*, Lausanne, 1745, 12mo. On the constitution of the Roman senate, he had been consulted by Lord Stanhope; and in 1758 his answer was published by Hooke, who added his own observations.

VERTUE, GEORGE, an eminent English engraver and antiquary, was born at London in 1684. At the age of thirteen he was apprenticed to a Frenchman, at that time the principal engraver of arms in London; but three or four years thereafter his master failed in circumstances and returned to his own country. The next two years of Vertue's life were spent at home, after which he engaged himself with Michael Vandergucht, with whom he remained seven years. He then, in 1709, set up for himself, and had the good fortune to speedily come into notice. He obtained the patronage of Sir Godfrey Kneller; and a print of Archbishop Tillotson, which he engraved for Lord Somers, was much praised, and gained him the interest of that nobleman. About 1711 he became a member of the Society of Painting, instituted in London under Sir Godfrey Kneller. A large head of George I., after Kneller, which he engraved, was much admired, and brought him a large increase of business. To his love for his own profession he joined an ardent spirit for antiquarian research. This led him to visit various parts of England, and gained him the friendship of the Earl of Oxford, the Earl of Winchilsea, Lord Coleraine, and others. In 1717 he was appointed engraver to the Society of Antiquaries. In 1730 he published his set of twelve engravings of celebrated English poets, which is reckoned to be one of the best of his works. This was followed by the portraits of Charles I. and the royalists who had perished in his cause. His next great work was his portraits of the kings of England, &c., for the translation of Rapin's *History of England*. The latter years of his life were saddened by the loss of friends, among whom were his patron, the Earl of Oxford, in 1741, and the Prince of Wales in 1751, in whom he had found a warm and generous patron. He died on the 24th of July 1756, and was buried in the cloisters of Westminster Abbey. The works of Vertue are very numerous, and are in high repute for their accuracy, though they are generally considered to be deficient in spirit. A complete list of them is given by Walpole in his *Catalogue of Engravers*. During his journeys through England, he had made it his business to collect *Anecdotes of Painting in England*, which were, after his death, published by Horace Walpole under that title, in 5 vols. 4to.

VERULAM. See BACON.

VERVIERS, a town of Belgium, on the Vesdre, in the province and 14 miles E.S.E. of Liège. It is divided into an upper and a lower town, and, with the exception of a few good houses, is meanly and irregularly built. The chief public buildings are the town-hall, three churches, college, and theatre. There are also law-courts, several schools, and hospitals. Verviers is chiefly remarkable for its manufactures, especially for that of broad cloth, of which it is one of the principal seats. About 40,000 hands are employed in this branch of industry in the town and surrounding country; and the Belgian army is supplied with clothing chiefly from Verviers. Flannel, serge, merino, &c., are also made here; and the town has dyeworks, soapworks, and breweries. Pop. 20,000.

VESALIUS, ANDREAS, the greatest anatomist of his age, and the father of modern human anatomy, was born at Brussels in 1514. He belonged to a family which for several generations had distinguished itself in the science of medicine, and his father was apothecary to the Princess Margaret, daughter of the Emperor Maximilian, and ruler of the Netherlands. Up to this time the study of human anatomy could scarcely be said to have had any existence. Dissections of the human body were considered as in the highest degree impious, and medical men were content to draw their knowledge of anatomy from the study of dogs, monkeys, and other animals. This, however, would by no means content Vesalius, who early distinguished himself by his passion for anatomy, and by the fearlessness with which he exposed himself to reproach and danger in order to obtain human subjects. After receiving his early education at Louvain, he went first to Montpellier, and afterwards to Paris for the study of medicine. In the latter city he studied under Gonthier, Sylvius, and others, and so distinguished himself that he soon became chief assistant to his master Gonthier. In 1535, in order to obtain better opportunities for study, he attached himself to the army of Charles V., then at war with France. In 1537 he was appointed professor of anatomy at Padua, and afterwards, by request, he delivered lectures at Bologna and Pisa. In 1543, when only twenty-eight years of age, he published his great work, *De Corporis Humani Fabrica*, which placed the study of anatomy upon an entirely new basis, and, according to Senac, discovered a new world. The boldness with which he attacked and demolished the old system brought upon him the hatred and ill will of all who were of any note in the profession. In spite, however, of all opposition, Vesalius' fame was much increased, and in 1544 the Emperor Charles V. appointed him his chief physician. Having to be constant in his attendance at court, he seems from that time to have done little to increase his knowledge of anatomy. On the abdication of Charles V., he held the same post under Philip II. of Spain. About 1564 he quitted Madrid suddenly, on a pilgrimage to Jerusalem, the occasion of which is commonly reputed to have been as follows. A young Spanish nobleman whom he had attended being supposed to be dead, he obtained the consent of his friends to open the body, in order to discover the cause of his illness. When proceeding with the operation the heart was observed to beat, and in consequence Vesalius was accused by the friends before the Inquisition. The king interposed, but could only save him on condition of his making a pilgrimage to the Holy Land. The result however was disastrous, for on his return he was shipwrecked, and thrown upon the island of Zante, where he perished on the 15th of October 1564. The whole works of Vesalius were published, with life, by Boërhaave and Albinus at Leyden, in 2 vols. folio, 1725. (See ANATOMY.)

Vespasian || Vespucci.

VESPASIAN. See ROMAN HISTORY.

VESPERS, in the Church of Rome, denote the afternoon service; answering, in some measure, to the evening prayers of the Church of England.

VESPUCCI, AMERIGO, a distinguished navigator, who has given name to the new continent, and who contested the honour of its discovery with Columbus, was born at Florence on the 9th of March 1451. His family was of some distinction, and his father was a notary in that city; but he was educated by his uncle, a man of great scientific reputation, and made great proficiency in astronomy, geography, and the sciences connected with navigation. He was destined for commercial pursuits, and in 1486 he seems to have been residing in Seville as factor to the wealthy Florentine house of Juanoto Berardi. In 1489 we find him at Florence, and in 1493 he again returned to Seville; and on the death of Juanoto Berardi, in 1495, he was placed at the head of the factory. The news of the discoveries of Columbus excited him to give up business and to explore those newly discovered countries. According to the account, attributed to himself, he left Cadiz on 20th May 1597 with four vessels, under the command of Alonso

de Hojeda, and after 37 days sailing reached America, coasted along the continent for several hundred leagues, and returned to Spain on 15th of October 1599. Were this the case, then he would undoubtedly have the right to be considered the discoverer of the American continent; but Humboldt has incontestably shown, in his *Histoire de la Géographie du Nouveau Continent*, vol. iv., that this voyage could not have taken place till 1799, and even acquits Vespucci of any intention of deceiving, the account having been published in Lorraine without his knowledge or consent. The friendly feeling that continued to subsist between him and Columbus, and afterwards his family, gives force to that hypothesis. Vespucci made another voyage to America, in December 1599, under Pinzon. Induced to enter the service of the King of Portugal, he made two more voyages, in 1501 and 1503, under the auspices of that monarch. Disappointed in his expectations, he afterwards returned to Spain, and in 1508 obtained the appointment of principal pilot, which he retained till his death, which took place at Seville on the 22d February 1512.

VESTA. See CYBELE.

VESTALS, among the ancient Romans, were priestesses of the goddess Vesta, and had the perpetual fire committed to their charge. They were at first only four in number, but afterwards increased to six; and it does not appear that their number ever exceeded six, among whom was one superior to the rest, and called *vestalis maxima*. The vestals were chosen from six to ten years of age, and obliged to strict continency for thirty years,—the first ten of which were employed in learning the ceremonies of religion, the next ten in the performance of them, and the last ten in teaching them to the younger vestals. The habit of the vestals consisted of a head-dress, called *infula*, which sat close to the head, and from whence hung certain laces called *vitta*,—a kind of surplice of white linen, and over it a purple mantle with a long train to it.

VESTIBULE. See *Glossary to* ARCHITECTURE.

VESTRY, a place adjoining to a church, where the vestments of the minister are kept; and also a meeting at such place, consisting of the minister, church-wardens, and chief men of most parishes, who make a parish vestry or meeting. By custom there are select vestries, being a certain number of persons chosen to have the government of the parish, make rates, and take the account of church-wardens, &c.

VESUVIUS, a celebrated volcanic mountain of southern Italy, one of the principal and most active of the European volcanoes, is situated near the east shore of the Bay of Naples, 10 miles E.S.E. of the city of that name. It is unconnected with any mountain-chain, but rises in majestic solitude from the plain of Campania. It is about 30 miles in circumference at the base, and at a certain height divides into two points—the Somma, whose highest peak, the Punta del Nasone, is 3747 feet above the sea; and Vesuvius proper, which, at Punta del Palo on the northern brim of the crater, attains an elevation of 3949 feet. The height, however, of the eruptive cone, and even its form, are frequently changed by eruptions. At the commencement of the Christian era, Vesuvius was considered an extinct volcano. The first recorded eruption took place A.D. 79, when the cities of Herculaneum and Pompeii were destroyed, and a great number of persons lost their lives, among whom was the elder Pliny. Since that time about fifty-six great eruptions have taken place exclusive of numerous smaller ones. One of its most terrible eruptions was that of 1538, when Monte Nuovo was forced up in two days to the height of 413 feet, and with a circumference of 8000 feet. Another happened in 1631, which covered with lava most of the villages at its foot, and sent forth torrents of boiling water. The great eruption of 1779 was witnessed by Sir William Hamilton, who has given an account of it. At first it sent forth white sulphureous smoke resembling bales of cotton, exceeding the height and size of the mountain at least four times; and in the midst of this, stones, scoriæ, and ashes were thrown up not less than 2000 feet. Next day a fountain of fire shot with such height and brilliancy that the smallest objects could be clearly distinguished at any place within six miles or more of the mountain. But on the following day a more stupendous column of fire rose three times the height of Vesuvius, or more than two miles. Among the huge fragments of lava thrown out during this eruption, was a block 108 feet in circumference and 17 feet high, and another 66 feet in circumference and 19 feet high, besides thousands of smaller pieces. The eruption of June 1794 was even more terrible than this, and destroyed the greater part of the town of Tolle de Greco. It has been well described by Breislac, who estimates one of its streams of lava, on that occasion, to have contained upwards of forty-six millions of cubic feet. During the early part of the present century the top of Vesuvius had become a rough rocky plain covered with blocks of lava and scoriæ, and rent by numerous fissures from which clouds of vapour issued. By the violent eruptions of 1822, however, all this was thrown out, and replaced by a vast elliptical gulf or chasm three miles in circumference and perhaps 2000 feet deep. One of the greatest eruptions in modern times took place in May 1855, when vast floods of lava poured down the sides of the mountain, spreading desolation in every direction, and destroying the village of Cercolo. Before its close eleven cones were in active operation, the discharge from which was so great that at one time a total falling in of the mountain was dreaded. Since that time several eruptions have taken place, the last being in August 1859.

VESZPRIM, or WESPRIM, a town of Hungary, capital of a county of the same name, on the Sed, 60 miles S.W. of Buda. It is the see of a Roman Catholic bishop, and has a fine cathedral, episcopal palace, Piarist college, and gymnasium. Some trade is carried on in the corn and wine raised in the neighbourhood. Pop. (1851) 11,275.

VETERINARY SCIENCE.

THE knowledge and the enlightened treatment of the diseases of domestic animals have, in this country, been elevated to the rank of a science only within the last fifty years. Previously to that time, the art of Farriery consisted in the traditionary lore of the worker in iron, *faber ferrarius*, or smith; and in later times, in the professional skill of a few medical practitioners, who were not, however, sufficiently careful to ascertain the many striking differences which exist between the economy of man and that of the lower animals. The modern term *veterinary*, derives its origin from the Latin *veterinarius*, an adjective denoting relation to beasts of burden. The same word, used as a substantive, signifies a person who has the care of such beasts. The etymology is, however, involved in considerable obscurity. The first veterinary school was founded at Lyons in the year 1761, and another was founded at Alfort, near Paris, in 1766. In the year 1792 the Veterinary College of London was established, and it is to this date that the origin of the science in this country may be correctly assigned. More recently a school of veterinary medicine has been founded

Veterinary Science.

in the northern metropolis, under the patronage of the Highland and Agricultural Society, so that the art no doubt will continue, as it lately has done, to make steady and rapid progress.

The science of veterinary medicine must evidently be based upon a minute and accurate knowledge of the structure and functions of all those animals which may require its aid, as also of the disorders and accidents to which these are exposed, and the various resources, whether natural or artificial, available for their cure. This opens a wide field, and shows the value of the light which may be borrowed from collateral sciences. From the paramount importance which man attaches to every thing which concerns himself, human anatomy, and the sciences of medicine and surgery, have from time immemorial been prosecuted with the keenest assiduity. Natural history has long had its numerous and enthusiastic votaries, and hence so much knowledge on the subjects of comparative anatomy and physiology. If there be analogies of structure between man, and "the humbler partners of his mortal pilgrimage," when both are in health and strength, sure we are these are not fewer or less striking, when they are labouring under the many ills to which they alike are heirs. From these various sciences much valuable information has undoubtedly been gleaned in aid of that which is now to engage our attention; and we cannot too strongly impress upon the veterinary student, that before he is competent to learn the art of healing, he must have an accurate knowledge of the anatomical structure, and the physiology, of the domestic animals. For the acquisition of this primary branch of the science, we must refer him to the several articles concerning them in our previous volumes,[1] and to the approved elementary treatises, of which a list is supplied at the close of this article; confining ourselves to such general allusions concerning these matters, as may be unavoidable in the course of the following observations. Our space being very limited, we must endeavour to instruct, more by a useful classification and nomenclature, and the exposition of correct principles, than by entering into matters of detail.

Inflammation.

We commence with a few general remarks on INFLAMMATION. When a part, like the white of the eye, becomes red, hot, pained, and swollen, it is said to be in a state of inflammation, and the symptoms are chiefly ascribed to a morbid state of the blood-vessels, there being an increased determination of blood to the part. This disease may be excited in any part of the surface, by a wound or other irritation; and there is no internal organ which is not liable to attack, and often without any very apparent cause. Hence inflammation, in one form or other, is the most common disorder which is encountered, and withal the most fatal. It is most apt to occur where there is a plethora, or general fulness from over-feeding and insufficient exercise; and is excited by over-exertion, by sudden changes of temperature, and by checked perspiration. It has several modes of termination, of which resolution, or the gradual subsidence of the disease, is the most favourable: another mode is effusion of the serum, or watery portion of the blood, where temporary swellings and dropsies are occasioned; or of coagulable lymph, by which morbid adhesions and growths are produced; another termination is suppuration, or the formation of matter, and finally, there is gangrene or mortification. It is sometimes very rapid in its progress, or *acute*, at others it is slower, and is then styled *chronic*. When the inflammation is local, limited in extent, and somewhat external, warm *fomentations*,[2] or *poultices*,[3] which are a kind of fomentations, or cold applications,[4] may each be applied with advantage according to circumstances. Fomentations open the pores of the skin, promote perspiration, and so lessen swelling and tension, and assuage pain and inflammation; while cold applications promote evaporation, subdue inordinate action, and so assist in restoring health. When the symptoms are acute, and the disease spreads, as it is prone to do, the whole frame more or less participates, and symptomatic fever is the result.

Veterinary Science.

Concerning the occurrence, in the domestic animals, of SYMPTOMATIC FEVER, produced by accident and disease, as injury of the foot, or inflammation of the eye, there can be no doubt whatever. This complaint corresponds in every respect, except its exciting cause, with the SIMPLE INFLAMMATORY FEVER, a disease whose existence has been denied by some, but on very insufficient grounds. "In so plain a point of practice as this," says Mr Percivall, "we might as well attempt to deny the existence of inflammation in horses as of fever." Its first symptoms, which may not be always easily detected, are dulness and heaviness, hanging down the head, and disinclination to move. This will probably be followed by chilliness, marked by a staring coat, coldness of the surface and extremities, and sometimes an actual rigor or shivering fit: to this succeeds a warm skin, a hot and dry mouth, redness of the eyes and lining membrane of the nose, a quick, full, and hard pulse,[5] rapid respiration, with apparent labour rather than pain; there is also loss of appetite, costiveness, high-coloured and diminished flow of urine, and increased sensibility. The causes most frequently apparent are over-exertion, sudden increase of temperature, and plethora; they are often obscure. The disease appears sometimes as an epidemic, as stated by Mr Gibson: "I have frequently had several cases of this fever at the same time, and in different places, where no visible cause could be assigned for it." The indications of cure are the same as in symptomatic fever, venesection usually not requiring to be carried far, or often repeated. Returning to symptomatic fever, we remark, that the treatment consists in the vigorous employment of what is called the ANTIPHLOGISTIC REGIMEN. Of this the most important item is *blood-letting*, general and local, the former being infinitely the most important.[6] With this must be combined purging, or rather the administration of laxatives, with the object of removing irritation, and diminish-

Fever, symptomatic.

Simple inflammatory.

[1] Anatomy, and Comparative Anatomy, in vol. ii. and iii.; Physiology, vol. xvii.; Horse, vol. xi.

[2] Clean water is the best FOMENTATION. It should be as hot as the hand can bear it, yet not hot enough to pain the animal. In fomenting the horse, the groom rarely has enough of water, and he does not continue the bathing long enough to do any good. If the leg is to be fomented, get a pailful of water as hot as the hand can bear it; put the horse's foot into it, and with a large spunge lave the water well above the affected part, and keep it constantly running down the whole limb. Foment for about half an hour, and keep the water hot by adding more.

[3] POULTICES should be formed of those materials which best maintain heat and moisture, and they should be applied as warm as possible, and can be safely borne. They are usually made of bran mash, turnips, or oatmeal porridge. Linseed meal alone makes the best of poultices, and some of it should always be added to the other ingredients. Wet bandages act as poultices.

[4] Of COOLING LOTIONS cold water is the menstruum. It may be made colder by the introduction of a little salt or ice; sal ammoniac and vinegar may be added for the same purpose. The object is to reduce heat, and promote evaporation. The addition of a little spirits is made with this object.

[5] Of the horse, the natural PULSE is from 35 to 45 beats in the minute; under fever it rises to 80, 90, and 100. The most convenient spot to examine it is at the edge of the lower jaw, a little before the angle, where the maxillary comes from the neck, to be distributed over the face. The pulse is one of the most important indications in all serious disorders.

[6] BLEEDING. In the horse, and cattle, sheep, and dog, bleeding, from its greater facility and rapidity, is best performed in the jugular or neck vein, though it may also be satisfactorily performed in the *plate* and *saphena* veins, the former coming from the inside of the arm,

Veterinary Science.

ing the watery part of the blood.[1] Large warm injections should at once be resorted to, and they are often of signal benefit:[2] the food must be regulated and restricted,[3] and the temperature attended to. *Diaphoretics* may often be employed with advantage,[4] and associated with them smart friction over the whole body, by wisping and hand-rubbing.[5] When the inflammation is local, counter-irritation should be employed; in acute cases most effectually by blisters.[6]

Veterinary Science.

Low fever.

As there are no good grounds for denying the existence of Simple Fever, so we are persuaded there are as few for denying the occasional visitation of LOW FEVER, however much it may be generally overlooked. It has been confounded with other grave complaints, but was very generally the essential disease in those murrains which were so common in former days, and which acquired other and most unsatisfactory appellations. It is well observed by

---

and running up directly in front of it to the jugular; the latter, or thigh vein, running up the inside of that limb. Either the fleam or lancet may be used. When blood is to be drawn, the animal is blindfolded on the side to be operated upon, and the head held to the other side; the hair is smoothed along the course of the vein by the moistened finger, the point selected being about two inches below the angle of the jaw. The progress of the blood towards the heart is to be obstructed, and the vein thus made sufficiently permanent and tense. A large-bladed fleam, and a good-sized lancet are preferable, as the benefit of the operation is much increased by the rapidity with which the blood is drawn. From 8 to 12 pints is a moderate bleeding for the horse and ox, regulated in some degree by the size. From 12 to 16 or even 20 pints is a large one; and sometimes, in skilful hands, it is expedient to bleed till fainting is induced, and the animal drops down under the operation. The vessel in which the blood is received should be such that the quantity can readily be ascertained. When this is sufficient, the edges of the wound are to be brought accurately together, and kept so, by a small sharp pin being passed through them, and retained by a little tow. It is of importance, in closing the wound, to see it is quite close, and that no hairs or other foreign bodies interpose. For a time the head should be tied up, and care taken that the horse does not injure the part.

LOCAL BLEEDING may be performed in the *palatine* vein, in a line backwards between the middle or central cutting tooth and the second, and a little more than an inch within the teeth. The division is made by means of the bistoury, and the artery as well as the vein is sometimes wounded; hemorrhage, however, may here be readily commanded. In the *foot* it may be performed at the union of the crust and sole, by cutting down with a searcher or fine drawing knife. For stopping it, a pledgit of tow may be applied, and the shoe tacked over it.

[1] PHYSICING, which in stable language is the term used for purging, is employed for improving the condition when in indifferent health, and as a remedy for disease. The medicines chiefly used are, for *Horses*, Barbadoes aloes, dose from 3 to 9 drachms, croton *bean*, from a scruple to half a drachm, or *cake*, from half a drachm to a drachm, to which may be occasionally added, calomel, from one drachm to a drachm and a half; for *Cattle*, aloes, in a dose somewhat larger than for the horse, Epsom salts (very uncertain in horses), or common salt, dose from a pound to a pound and a half, with some stimulus, as ginger, anise, or carraway seed; also Linseed oil, dose 1 pound, and croton oil, 15 to 20 drops, or the bean and cake, the same as in the horse. For *Dogs* aloes prove uncertain, and jalap, dose 1 drachm, is far surer, and better when combined with calomel, 2 grains; croton oil, dose 2 drops, also valuable, and the bean 5 grains, and syrup of buckthorn, dose an ounce. These, it will be observed, are average doses for full-grown animals; in the young and small, they should be less, in the large they may require to be greater; but much injury has often been done by too large doses, too frequently repeated. To the Horse, physic is usually administered in the form of a bolus, or *ball*, to Cattle by drinking or *drenching*, though for both either way may be employed. A ball is conveniently made of linseed meal, molasses, and the active ingredient, whether purgative, diuretic, or cordial; it should be softish, and about the size of a pullet's egg. In administering it, the operator stands before the horse, which is generally unbound, and turned with its head out of the stall, with a halter on it. An assistant stands on the left side, to steady the horse's head, and keep it from rising too high; sometimes he holds the mouth, and grooms generally need such aid. The operator seizes the horse's tongue in his left hand, draws it a little out, and to one side, and places his little finger fast upon the under jaw; with his right hand he carries the ball smartly along the roof of the mouth, and leaves it at the root of the tongue: the mouth is closed, and the head held, till the ball is seen descending the gullet on the left side. When loath to swallow, a little water may be offered, and it will carry the ball before it. A hot, troublesome horse should be sent at once to a veterinary surgeon. Instruments should if possible be avoided; and adding croton farina to the mash often answers perfectly well. *Drenches*, on the whole, operate more speedily than balls, and are sometimes necessary. As many horses and cattle have been killed by the practice, (some of the fluid being forced into the lungs,) though heedlessly regarded in stables, and even in books, we advise that becoming caution should be employed, that no unnecessary force be used, that they never be given by the nostrils, and especially that if the slightest irritation is occasioned in the windpipe, the animal shall immediately be set at liberty, that by coughing he may free himself of the offending matter. Physic is given to a dog by pouring it over his throat with a spoon, or he may be made to bolt it in a thin slice of meat; the syrup of buckthorn he will often lick spontaneously.

The horse must undergo *preparation for physic*, which is done by gently relaxing the bowels. During the day previous, his food should be restricted to bran mashes, a quarter of a peck being sufficient for a feed, and this, with his drink, should be given warm; corn should be withheld, and hay restricted. He may have walking or trotting exercise morning and evening. The physic is given on an empty stomach, early in the morning; immediately afterwards a bran-mash is given; that over, the horse goes to exercise, for perhaps an hour, and is watered when he returns. The water should be as warm as he will take it, and he should have as much as he pleases throughout the day; bran mash should be given as often as corn usually is, and better warm than cold; if both are refused, bran may be tried, but no corn, and but little hay. Sometimes gentle exercise may be given in the afternoon, and also next day. The physic usually begins to operate next morning, though it rarely takes effect in twelve hours, frequently not for thirty. When the physic begins to operate, the horse should stand in the stable till it *setts*, which may be in twelve hours.

[2] INJECTIONS, though easily administered by means of the old ox bladder and pipe, are still more conveniently given with a syringe. For laxative clysters for the horse or cow, from a gallon to 12 pints of warm water, or gruel, at the temperature of 96°, with a couple of handfulls of salt, or two ounces of soft soap, prove most useful. Stronger ones may be obtained, by adding a few ounces of aloes to the mixture. In cases of diarrhœa, or over-purging, the injection should consist of a few pints of warm gruel, to which is added an ounce of catechu electuary, or from half a drachm to a drachm of powdered opium. The only art in administering a clyster, where, however, there is often bungling, and even injury, by wounding the rectum, is to avoid frightening the animal, anointing the pipe well, and gently insinuating it, before the fluid is forced up.

[3] In general, bran mashes, carrots, green meat, and hay, form the sick horse's diet, gruel and tepid water his drink.

[4] DIAPHORETICS are those medicines which have a tendency to produce perspiration and sweating. Some of these are of a hot and stimulating quality, and these must be avoided in febrile disorders. The others are neither very numerous nor powerful. Emetic tartar, dose from one drachm to two drachms, and fox-glove in powder, dose one drachm, are the most powerful. Nitre, in doses of 3 or 4 drachms, is often combined with these. Sulphur, in doses of 4 or 5 ounces, is sometimes useful.

[5] When two men are employed on each side, the effect and benefit are often surprising.

[6] BLISTERING PLASTERS are never applied to horses. An ointment is always used, of which rather more than half is well rubbed into the part to be blistered, while the remainder is thinly and equally spread over the part that has been rubbed. When there is any danger of the ointment running, and acting upon places that should not be blistered, they must be covered with a stiff ointment made of hog's lard and bee's wax, or kept wet with a little water. The bedding must be removed when the leg is blistered, and to prevent the horse slipping, the stones may be covered with a little short litter or saw-dust. The horse's head must be secured in such a way that he cannot reach the blister with his teeth. Put him into a narrow stall, and tie his head firmly to the rack. When the blister has become quite dry, the head may be freed, and the horse let down. Sometimes it remains itchy, and the horse rubs it; in that case, he must be tied up again. If he get very tired, and threaten to go down on his haunches, put the beads on his neck, let go the head, and give a good bed. When the blister is quite dry, put some sweet oil upon it, and repeat it every second day. Give time, and no work, otherwise the horse may be blemished by the process.

an eminent pathologist, that as local inflammation gives rise to constitutional febrile symptoms, so idiopathic fevers of all kinds, in their turn, often give rise to, or at least are accompanied by local inflammatory symptoms. The old farriers mistook these local symptoms for the fever which produced them, and we fear the error is sometimes committed in our own days. The characteristic symptoms are general disturbance of the circulation, and feeble, rapid pulse, weakness, prostration of strength, determination of blood to particular, but, in different instances and epidemics, very different parts, producing pain, and manifesting a tendency to inflammation, but of a degenerate kind, so that the very texture of the tissue becomes disorganised. The progress of the disease is often rapid, and the result very fatal. In some cases, the lungs or heart are attacked, in others the liver, bowels, or even some external part of the body. This we believe to be the true history of such diseases as the *quarter-evil*, the *black-quarter*, the *joint-felon*, and various *braxies*, which figure so conspicuously in the older works, and whose ravages were attended with such fatal consequences to the agriculturist. In some well-ascertained instances, nineteen individuals have died out of every score which has been attacked. To the possible recurrence of such complaints, the veterinarian should not shut his eye; and, in actual practice, we have witnessed mischief where these circumstances have been disregarded, and where bleeding, though not excessive, has been pushed too far, with the object of relieving the local complaint, to the considerable sacrifice of life. In these cases, we have changed the treatment, administered wine and other cordials, instead of debilitating remedies, and thus have arrested the progress of mortality.

Osteology.

In the study of the veterinary art, the ground-work is OSTEOLOGY, inasmuch as it relates to the most fixed and stable part of the frame, and so becomes the guide and directory to the relations and actions of all other parts. In accordance with this fact, we shall first direct attention to the Osseous system.

Diseases of bones.

DISEASES *of* the bones are common, but the only ones we shall mention are *Exostosis* and *Necrosis*, under which *Caries*, or ulceration, and *Anchylosis*, may be included.

Exostosis.

EXOSTOSIS is an osseous tumour, originating from a bone, in which the periosteum is always necessarily involved, there being thickening of this membrane, and deposition of osseous matter by it, in many cases, not less than by the bone itself. It may generally be the result of some local injury, though unquestionably it may occur from other causes. There is no bone which it may not attack; and an exostosis, as large as a child's head, has been seen on some of the bones. The attending pain seems to vary, and to be greatly dependent upon the extent to which the circumjacent parts are involved, as does also the degree of lameness it may produce. With a few exceptions, the disease does not often force itself upon notice. The appropriate remedy, very uniform in its beneficial results, is counter-irritation, by frequent, and if necessary, smart blistering, firing, or setons. In some cases, it may finally call for excision. The exceptions just alluded to, are the diseases known under the names of *bone-spavin*, *splint*, and *ring-bone*, which no doubt afford specimens of the disease. But it is moreover true, that, in these instances, other tissues than those named are implicated, and often primarily; so that we shall

Necrosis.

postpone their consideration. NECROSIS is the death, more or less extensive, of the whole or part of a bone. An effort is made by nature to throw it off from the frame, by exfoliation; and it is often wonderful to observe what is effected in this way. The disease is not, however, often witnessed in the lower animals, so we need not dwell longer upon it. ANCHYLOSIS, or a bony union of parts of a joint which were naturally free, and played on each other, often occurs, the result of long-continued irritation and inflammation of the parts implicated.

Fractures.

FRACTURES are not uncommon among domestic animals; although, from the frequent attendant violence, many of them are beyond the reach of art. Thus is it generally with *fracture of the skull*. Sometimes the ridge of the *orbit*, at its outer and upper part, is fractured by falls, and more frequently by blows: the detached portion may be replaced, and retained by stitching the skin, and bandages. The spinal processes of the vertebræ are sometimes fractured, and *caries* of these parts occurs from injuries of the saddle. The ribs, too, are subject to fracture, and the sacrum, from falling backwards, when paralysis of the tail occurs. The extremities, however, are most liable to this accident, including the femur and tibia, the scapula, humerus, elbow, fore-arm, cannons, pasterns, and coffins. Fracture of the leg occurs on the road or street, the rider or driver not knowing whether the accident has occurred in the fall, after it, or in trying to avoid it. It may be that the fracture is produced by a blow from the opposite foot. When the end of the bone protrudes through the integuments, the fracture is called *compound*, and the prospect of a successful issue is then greatly diminished. It is a great error to suppose that a horse's bone, once broken, cannot unite; it does so as readily as in man. When the attempt is not made, it is on account of the cost and trouble. When an animal is highly valued, the cure may be wisely undertaken, and successfully accomplished, by the application of splints and bandages, the sufferer not being slung. In sheep, fractures heal with great facility; and also in the dog.

Muscular system.

On the MYOLOGY, or muscular system of the lower animals, we shall say but little. It consists chiefly of two parts,—of what constitutes generally the body or belly of the muscles, popularly called flesh; and of shining *tendons*, into which these *muscular fibres* are inserted, forming strong elastic cords, which are fixed into the bones and other parts which are to be moved or compressed. These tendons generally lie over and round the joints, thereby strengthening them. To these must be added the *aponeuroses*, which are tendinous wrappers or binders, of various thickness, which cover various sets of muscles, and occasionally connect them to each other, and to the bones beneath. These constituent parts of the muscular system, and especially the last, are generally esteemed the seat of

Rheumatism.

RHEUMATISM; a disease from which the lower animals are not altogether exempt. It is generally produced by sudden exposure to cold and rain, damp and drought, after being overheated. Sometimes it is more general, accompanied with pain, lameness, and fever: in other cases it is local. One form of the *Chill* of Mr White, resembles *Rheumatic fever* in man. A few hours after violent exercise, especially if the horse has been plunged into a river, or washed freely with cold water, and then placed in a current of air, it may be found almost incapable of moving, and can scarcely be led out for examination without difficulty, and this by metastasis, may change into *acute founder*. With this there is quick pulse and rapid breathing. The pain may be generally diffused, or local. Sometimes it is confined to the muscles of the chest, when it forms the *chest-founder* of Gibson, and many farriers. The term *anticor* is sometimes applied to this disease affecting the breast, but it is also applied to any uneasiness or swelling of the part. The disease often falls upon the loins in oxen, constituting the *chine-felon* of older writers, and arising from the same causes as those mentioned above. Sometimes it shews itself at one or more of the joints, forming the *joint-felon*. We have witnessed acute rheumatism in the elbow and stifle, though rarely; but frequently in the fetlocks, after catarrhal affections. The treatment in all these com-

plaints consists in bleeding, moderate purging, with fomentations and embrocations to the swellings. The disorder called the *founder* in dogs, is this disease, usually produced by the same class of causes, and requiring the same kind of remedies. In addition to bleeding and purging, hot baths, and a dry and comfortable kennel, with small doses of colchicum and antimony, are the most successful remedies, followed by regular exercise.

Joints.

Besides the tendons already mentioned, and the accurate fitting of the bones into one another, having their extremities covered with *cartilage*, a substance in firmness and elasticity approximating to caoutchouc, the JOINTS are greatly strengthened by what are properly called *ligaments*, and which consist of strong tendinous cords, passing from bone to bone, and most firmly binding them together. Internal to the cartilages, and lining the cavity of the joint, is a fine vascular membrane, designated the *synovial*, whose office is to secrete the joint-oil: and to finish these details, we have only to add one other fact, namely, that wherever friction occurs, as of a tendon upon a bone, there is found what is called a *bursa*, which is nothing else than a fine bag, which secretes a lubricating fluid, so facilitating the motion. All these parts, it will be understood, enter directly into the formation of the joints; and when these exquisite structures are considered, and their extreme liability to accidents, it will at once be perceived how complicated and important these injuries and diseases must necessarily be. We now return to the diseases of the bones already named, to which we shall add those of the other parts just mentioned.

Bone spavin.

After the exposition already given of the pathology of exostosis, the somewhat complicated examples of it, to which we now proceed, will not occupy us long; and the description of one will nearly serve for the others. BONE SPAVIN occurs in the lower part of the hock. It is usually observed as a small hard tumor, at the top of the shank bone, and of the inner splint bone, and the lower wedge bones. It seems to be produced from stress or over-work, occurring especially in young horses, and at first is commonly attended with pain, occasioning considerable lameness. The ligaments and cartilages have probably been injured; the periosteum and bone inflame, swell, and throw out ossific matter, and, unless care be taken, the disease spreads to the other wedge bones, and to the astragulus, thereby involving the hinge-joint of the hock, a result most anxiously to be avoided. The treatment, which should commence early, is mainly counter-irritation, by repeated smart blistering, firing, setons, punching, and long rest and ease. Under the treatment specified, many complete cures have been effected, and with no return of the disease. From the want, however, of sufficiently active treatment, and of due patience, only partial relief is very often obtained. The horse is rendered unfit for quick and hard work, and remains spavined for life. The circumstance of the lameness diminishing in the chronic state, under exercise, is explained by the principal seat of motion, between the astragulus and tibia, being free, and the stiffness and pain being felt chiefly in some less important parts of the articulation.

The splint.

The SPLINT or *splent* now requires little more for its elucidation than being defined. It acquires its name from its seat, occurring always on one of the splint bones of the leg. A tumor, which feels hard, appears between the knee and fetlock, and generally upon the inside of the leg. Its nature, causes, symptoms, and cure, entirely correspond with those of the last-named disease. The deformity often appears in a chronic state, gives no great trouble, and finally may disappear.

Ringbone.

RINGBONE has acquired its name from its form, usually shewing itself just above the coronet, where it is an ossification of the lateral cartilages, from compression and irritation. Though generally commencing at this point, it is apt to spread, producing anchylosis between the large and small pastern bones. It occurs more frequently on the hind than the fore feet. If sufficient time be not allowed for the active use of means, the whole joint may be involved, and become useless.

Abscess.

ABSCESS, the result of inflammation, more or less acute, is a circumscribed swelling, containing matter in the surrounding cellular membrane, which forms a cyst for containing it, the matter or pus being a product of the inflammation. This pus generally must procure vent for itself, and, as a general principle, in that direction where the resistance is the least. Thus it usually comes to the surface. Often, however, it does not; the abscess bursting in another direction, the matter escapes, and a SINUS, fistula, or PIPE, so designated by farriers, occurs. These sinuses burrow especially among the fasciæ, tendons, joints, and other parts lately alluded to. Abscess may occur in any part of the body; and the object of art ever is, to expedite its formation, and to afford a free and speedy evacuation, especially when from its locality, there is risk of sinus. When sinuses form, they must be freely opened; sometimes by counter-opening to that extent, that the matter shall have the most direct and safest exit. In this connection two complaints require mention. POLL-EVIL is a name derived from its proximity to the head. The cranium is sustained on the neck by the help of *ligamentum nuchæ*, or pack-wax, a broad and strong ligament, altogether of a peculiar nature. It not unfrequently happens that, from a horse's raising his head violently against the manger, or bruising it with the halter, or from cruel blows of brutal stablemen or carters, an injury is inflicted. To a certain extent it may be superficial; but in addition, from the contusion of the inner surface of the ligament on the bones, inflammation is often excited in the soft parts beneath. Hence the secretion of pus, which could never work its way through the pack-wax; and hence it burrows deep, and in different directions, till serious injury is done far and near, not sparing, sometimes, the bony processes. So soon as the disease is discovered, the treatment is plain, and if judicious, effectual. The probe must instruct, and openings and counter-openings may be made freely, but with discretion; and the sinuses, wholly or partially freed, may speedily, by means of stimulants, be induced to assume a healthy action. FISTULA OF THE WITHERS, from the pressure and irritation of the saddle, forms another instance in which these sinuses are apt to run deep, and produce much mischief. Hence all injury from this cause requires watching. By pressure we may ascertain the earliest formation of pus; and the abscess should be opened. After sinuses are formed, the principle of treatment is the same as just specified. Tents, or dossils of lint, put within the lips of the wound, may sometimes be required.

Sinus.

Poll-evil.

Fistula of withers.

Diseased bursa.

To the BURSA, so generally spread over the body, we have already made allusion; and in turning to their diseased condition we may affirm that this arises almost solely from an increased effusion into their cavity, produced by a strain of the tendon passing over them, or from increased friction in over-exertion, whereby they become enlarged, tense, painful in themselves, and still more by the irritation they produce in the neighbouring parts. Sometimes the swelling is enormous, and it is matter of surprise there is comparatively so little local and constitutional disturbance. These swellings are popularly called WINDGALLS—*Ganglions* in man. Small windgalls may long exist without apparent injury, but they are always unseemly; and when fresh we should endeavour to remove them. Cold evaporating lotions are sometimes tried; but we believe smart counter-irritation, by strong and repeated blisters, is much more likely to be useful. In obstinate cases firing is much practised; and though we believe that, in this and other complaints, this painful remedy

Ganglions

Veterinary Science.

has been, and still is, much abused, yet, administered discreetly, it is too valuable a remedy to be discarded. If the firing does not succeed, we advise puncturing the cyst, applying compress and bandage, and healing the external wound, where there is any difficulty, with the help of the actual cautery.[1] This being the nature and the treatment of windgalls generally, we can speedily dismiss those which, from peculiarity of position and importance, have figured as distinct and peculiar diseases.

Bog-spavin.

BOG-SPAVIN, sometimes called BLOOD-SPAVIN, occurs in nearly the same position as bone-spavin, but is much softer in its texture, and elastic. Its causes are the same as those already mentioned. The circumscribed tumor obstructs the return of the blood from the neighbouring veins, which consequently swell; hence the name BLOOD-SPAVIN, and hence the unwarrantable practice of removing a part of the vein. This is a serious disease, though the symptoms are not so acute as in bone-spavin; the lameness is less, though it is obstinate, and constitutes unsoundness.

Blood-spavin.

Capped hock.

On the treatment we have nothing to add. CAPPED HOCK is named from its position, the back projecting point of the joint. It is usually produced by blows, often inflicted by the horse itself, by kicking in harness, or in the stable. If not speedily dissipated, the tumor is apt to become callous and obstinate.

The curb.

The CURB is another enlargement at the back of the hock, but three or four inches under its projecting point. The complaint is produced by an injury of the ligament which connects the os calcis with the metatarsal bone, and consists of a thickening of the ligament and cellular membrane. It occurs from a sudden sprain, in a race, an extraordinary leap, or severe gallop over heavy ground. The swelling is not great, but at first the complaint is usually attended with lameness. Some horses are termed *curby-hocked*, implying that they labour under a species of malformation, in consequence of which the ligament in question is more liable to be injured than in other hocks.

Thorough pin.

WINDGALLS are very common above the fetlock. THOROUGH-PIN, a swelling both on the out and inside of the hock, is an affection of the bursa at the back part of the joint, with an effusion of the lubricating fluid. If the tumor on one side be pressed, the fluid is forced into that of the other side; hence the name. The symptoms arise either from the bursa, surrounding the perforans tendon, passing round the back part of the hock, being disturbed, or from the capsular ligament itself being involved.

Veterinary Science.

Synovial membranes

AFFECTIONS OF THE SYNOVIAL MEMBRANES, so serious in their nature, are almost always the consequence of external injury. When the joints are laid open, especially the larger ones, the danger is great from the inflammatory fever, and the result is often fatal. The opening is sometimes witnessed in the *stifle, hock, elbow,* and *fetlocks,* but most frequently in the fore *knee.*

At elbow.

Broken knee.

In the former of these joints it is generally the result of puncture, either accidentally or through brutal usage; the swelling is rapid and extensive, and the attending inflammation most hazardous. The opening into the knee joint is the result of coming down, with severe BROKEN KNEE. Under this term is included the slightest division of the skin, as well as the most formidable; and here no injury is trifling. The worst should at once be ascertained by accurate examination. If slight and superficial, the wound may be bathed twice or thrice a-day with Goulard's lotion; swelling and inflammation require repeated poultices; any tendency to proud flesh must be repressed with burnt alum, or blue stone.

Exposed knee joint.

The appearance of synovia at once demonstrates the nature of the accident; and the limb must then be moved as little as possible, as the rubbing of the ends of the bones on each other is most injurious. The great object here, as in the case of the other joints, is to endeavour to close the orifice, and if possible to anticipate inflammation and fever; and unless this can be effected the animal must be destroyed. By the careful application of plaster, sometimes stitching, applying paste or flour, by skilful bandaging, and complete rest, the puncture has been, and may be healed at once. For the same object white vitriol is applied, and the cautery is often useful. The synovial membrane itself is not to be cauterised, but the superficial parts. If the first application has not been successful in the course of a few days, a second may be tried; and five or six applications have at last rewarded the practitioner's skill.

Sprains.

A SPRAIN, or *strain,* is violence inflicted, with extension, often rupture and displacement, upon the soft parts of a joint, including cellular membrane, tendons, ligaments, and all other parts forming the articulation. The dislocation or disruption may be complete, or it may be a mere bruise or stress; and innumerable are the shades of difference between these extremes. Effusion of the fluids is an attending consequence. Parts of vital importance, as in the neck or back, may be implicated, and the accident be immediately fatal or wholly irremediable; on the contrary, they

---

[1] As it is necessary to explain how this may be safely accomplished, we shall say a few words on the proper mode of securing animals. TWITCHING. A *twitch* is an instrument composed of a noose of cord, attached to the end of a stick; and twitching consists in fixing the noose on the upper lip of the horse, and twisting it rather tightly. From the great pain it can be made to produce it exercises great control over the animal, and makes it stand quiet. The matter is very simple, and, when required, can be applied in the field as well as in the stable. CASTING is the term used for throwing down a horse or bullock, and so keeping it. In the former animal this is done by means of *hobbles,* strong straps and cords particularly arranged, which are first attached to the feet and then suddenly drawn together, so that the animal must fall, the fall being regulated by one man at the head and another at the haunch. Even when most skilfully performed, from the act of falling and the struggles after it, many accidents have occurred to man and horse. In the case of the ox you take a long rope, double it, and tie a knot in the middle about a yard from the end, so as to leave a noose of sufficient size to go round the bullock's neck; which being put on, the two ends are to be brought between the fore-legs, and round the hind pasterns, then back again and through the noose. By standing in front of the animal, and drawing up the ropes quickly, so that the hind legs are drawn towards the chest, it is easily thrown down; while in this situation the ropes are to be secured, and any operation may be safely performed. The veterinary surgeon also employs the *side-lines, barnacles,* and *trevis,* so much used on the continent; for the particulars concerning which we must refer to the works named at the end of the article.

In FIRING, or applying the cautery, casting is a frequent preliminary. The part should previously have been shaven or the hair clipped as short as possible. The operation consists in drawing lines, which had best be parallel, about half an inch asunder, on the affected part with a red hot iron, with a small smooth rounded edge. No part is in a fit state to be fired when the skin is hot or inflamed, and the skin should never be deeply penetrated by the iron. According to the heat of the point, so should be the velocity and lightness of touch, and a brown marking from the singing is all that is required. After the firing the horse must be laid up for three or four days to prevent his injuring the part. If the irritation produced is less than was intended, it may be promoted by means of blistering ointment. When it is wished to moderate it or heal it, the treatment is the same as after blistering. Counter-irritation is also effected by means of the seton and the rowel. The SETON consists of a piece of tape or soft cord passed under a portion of the skin by the seton needle; the ends may be tied together, the cord may be moved every other day from side to side, being previously lubricated with oil of turpentine or blister ointment. Thus the amount of irritation may be regulated; and the practice is often resorted to for relieving deep-seated and painful affections. The ROWEL is only a seton under another form. In applying it an incision is made in the skin to the extent of about an inch, by pinching it up and cutting it with a bistoury or rowel scissors. The cellular membrane round the wound is then separated to the extent of about an inch, so as to admit a dossil of tow, which is better than leather, smeared with digestive ointment. A discharge is soon produced, which has a tendency to relieve any deep-seated neighbouring morbid action.

may be to that extent only, that with time and care, restoration may be accomplished. They constitute a very serious class of cases. The marked symptoms are pain in the injured parts, and inability of motion, sometimes complete. The treatment is at first rest, a regulation of the local action and constitutional disturbance, according to circumstance, by venesection, general and local, the antiphlogistic regimen, fomentation, bandages, and other soothing remedies; and, when the sprain is of an older date, counter-irritation, friction, and gentle exercise.

Of the neck.

A sprain of the NECK is commonly the result of a violent fall upon the head, as in hunting, or in a steeple-chase. The spinal cord may be severely injured, and, according to the precise situation, there may be instant death, or hopeless paralysis. In other cases, without serious injury of the cord, there is displacement of some of the bones, with a slight twist of the neck and head. In such a case there may be recovery, with permanent distortion. A sprain of the

Back.

BACK may occur in the field or upon ice. The hind feet slip backward, as in leaping a ditch, and the violent effort the horse makes to recover his footing appears to be the cause of the injury. The bones of the spine may thus be partially separated, or the stress may be so slight as to attract no attention till the horse cools. In aggravated cases art can do nothing; the milder ones must be treated

Shoulder.

according to the principles already laid down. SPRAIN of the SHOULDER assuredly occurs, though *shoulder-lameness* is often imputed when the disease is totally different; hence the importance of discrimination. It is more frequently produced by a slip or side fall, than by fair and violent exertion. On examination there may be neither heat nor swelling in the part; but there will be unwillingness to move the joint; the animal will extend it and raise the leg as little as possible; there will also be soreness in the articulation on pressure, and a peculiar drawing up of the leg. If there be difficulty in coming to a decision from the symptoms, we must take the limb in hand, and observe if the movements of the shoulder-joint give pain. A mild blister often effects a cure; and the constitution is seldom disturbed. Rest must be secured. Regarding the sprains

Hip-joint.

of the HIP-JOINT, usually called *whirl-bone*, or *round bone*, our remarks would so much correspond to those just delivered, that we shall not repeat them. The STIFLE-JOINT, and the HOCK are occasionally sprained, and such accidents are marked by swelling of the part, and dragging of the leg.

Patella.

The PATELLA is sometimes dislocated, and the ligaments torn, when the leg is dragged and powerless. The knee-pan should be reduced by drawing the leg forcibly forwards, pressing the patella into its place. The FETLOCKS and PASTERNS are also subject to sprain, and to be involved in the injury of the *perforating flexor of the foot* and the *suspensary ligament*, which are primarily concerned in

Breaking-down.

BREAKING-DOWN. Two injuries are described under this name. One is merely a *sprain* of the back-tendons, usually in the fore-leg; it may be so slight as to escape notice till the horse cool, or it may be such as to produce marked lameness from the first. The other, or *true breaking-down*, is said to consist in a *rupture* of the tendons and ligaments: it occurs suddenly, and generally when the horse is at full speed; it rarely happens in both the fore-legs at once. The horse stops instantly, or he falls; on rising he is seen to rest on his fetlocks, the toe turned up, the sole looking forward. Some able writers have denied the possibility of the fracture of the ligament; but the true pathology here regards not one ligament or tendon, but all the parts which form the back parts of the joint. Sometimes they are partially torn. When the fetlock does not wholly come to the ground, the foot, skilfully treated, may become as useful as ever; when both fetlocks come down the horse can seldom be recovered. This accident sometimes leads to a contraction or drawing up of the leg, which ultimately knuckles over at the fetlock. For the relief of this, the tendons must be cut; an operation proposed twenty years ago, and now coming into general use.

The human hand has been the subject of much and deserved admiration, and the horse's foot is scarcely less an object of wonder. It is also a highly vital and complicated organ, essential to the well-being of the animal, and pre-eminently exposed to injuries. On a minute knowledge of its structure, and the uses of its various parts, depends the successful treatment of its multitudinous and important diseases, which, early and accurately discriminated, may often be speedily remedied, while, mistaken and neglected, they proceed from bad to worse, till the animal is good for nothing.

Weakness of the foot.

We here say nothing of WEAKNESS OF THE FOOT, which is rather an original infirmity, than a distinct disease, though it leads to many. Animals so formed should never be put to fast and heavy work, for which they are wholly unfit. Neither shall we say much regarding

Shoeing.

SHOEING; a most important art, on the enlightened and careful practice of which, much of the horse's welfare depends. The great principle is to afford a good and level bearing, while the nails, in giving sufficient attachment, do not injure the quick. The bearing is to be supplied only to the crust; and the toe especially must be kept short. When there is any tendency in the hoof to contract, the nails in the inner quarter, which is the weaker, should be placed well forward, so as to confine the play of the back part of the foot as little as possible. Sometimes the extremities of the heels are turned up, which is called *calking;* and additional parts are put to the toe, for the purpose of giving purchase in draught; but these additions are unnecessary for the protection of the foot, and only increase the liability to injury and disease. It occasionally happens in shoeing, that a nail may injure the tender parts beneath; an accident which

Pricking.

goes under the name of PRICKING, and which is also caused by wounds inflicted on the sole, by broken glass, sharp flints, &c. As soon as the tenderness is perceived, the cause should be most carefully investigated. Hard pressure near the injury may show that the nail is the cause; when the shoe must be removed, and the part freely pared and opened. What is to be feared is inflammation and suppuration, proceeding to sinuses. Where irritation is considerable, rest, and cold lotions, and a laxative may be prescribed; when at all threatening, the foot should be enveloped in warm poultices. The disease somewhat advanced, forms

Quittor.

a *whitlow*, which is called PIPES or QUITTOR, in which we find that the sinuses have run deep. It may be in several directions, mounting up to the coronary ligament, causing severe and protracted lameness. The cure may be both painful and tedious, but the principle is clear: free vent must be procured for the matter, all pressure and irritation must be removed, the parts must be soothed by poultices, and the sinuses must be gently stimulated to healthy action, by solutions of white or blue vitriol, or corrosive sublimate. It is sometimes recommended to plug up the sinuses with strong caustics, to urge them to assume a healthy instead of a diseased action. The plan may occasionally succeed, but the action is violent, and will often aggravate the disorder it is intended to remove. Mild dressings and rest will complete the cure.

Corns.

CORNS are usually the consequence of the irregular pressure of the shoe on peculiarly formed hoofs. Judging from analogy, these annoyances would be supposed to consist of hard cuticular excrescences pressing on the tender parts beneath; instead of which, they are mere bruises, generally produced by the heel of the shoe, which, from the extravasated blood, assume a reddish or dark colour. These bruises affecting the sensitive parts beneath, do not act otherwise than injuries from other causes. They usually occur only in the fore-feet: their site is almost invariably in the inner quarter between the bar and

crust, at the heel. If they advance to mischief, it is precisely such as has been described under the head of quittor, and must be treated in a similar way.

Acute founder.

These injuries, it will be observed, produce inflammation of the internal parts of the foot, which somewhat approximates, but yet is different from, that acute inflammatory affection of the parts, which is known under the name of ACUTE FOUNDER, and whose primary seat seems to be the laminæ of the coffin-bone, (hence called *laminitis*,) and the other sensitive parts within the hoof. This disease comes on after great stress and over-exertion, and especially when, after the feet have been battered, and the animal over-heated and exhausted, it is exposed to cold and damp. This however is not the only cause. We have already seen, when treating of rheumatism, that by something like metastasis, the morbid action moderating in the chest, assails the parts now under review. Still more curious is the fact, that when an animal has gorged himself with dry meat, for example at the corn-bin, if he escape a disease of the stomach, of which more anon, this same acute founder is an occasional consequence. Hence, then, though the disease may be caused by local injury, yet the constitutional agency must not be overlooked. The symptoms are such as this view suggests. They appear more frequently in the fore than the hind feet; they may attack the fore-feet only, or all the four. First, there is pain manifested, by a general disinclination to move, fidgetiness, and an unwillingness to throw the weight on the inflamed feet. The mischief is very readily and unequivocally detected, by pushing the animal backwards; if he winces under this, and is still unwilling to move, it is an unerring indication of the existence of the disease, whether in its mere local or constitutional manifestation. In violent cases, however, the complaint speaks for itself. The foot on examination is perceived to be hot, pain is produced by a slight blow, the neighbouring arteries pulsate violently, the animal cannot stand without difficulty, and will ere long drop down from the violence of the agony, sometimes resting his muzzle on the affected member. With this there is symptomatic fever in its acutest form. The results of the local inflammation need not be detailed, the effusion of serum, and formation of pus being substituted for the healthy secretions. The whole crust may be separated from the sensitive foot, leaving the stump bare and exposed; or, if checked, the separation may be partial, or wholly absent, and there may be no greater mischief, than by and by, the appearance of a slight depression, or ring upon the crust. The treatment will be anticipated; it is the antiphlogistic, with an energy commensurate to the violence of the symptoms. The bleeding may be local, though to this we should not attach peculiar importance, further than thereby effecting an opening in the sole, so giving vent to matter, and saving the coronet. The shoes should be removed. In slight cases, the free application of cold should, with the constitutional treatment, command the symptoms. If the crust has separated, more or less, by suppuration, its bearing edge must be removed as soon as possible, and the weight thrown on the sole to prevent pumiced feet; and after this, the hoofs may be re-

Pumiced foot.

produced in a perfect state. PUMICED FOOT is one of those diseases which result from acute founder. In it the sole becomes flat, or even convex, thereby allowing the central and sensitive parts to press on the ground, to their speedy detriment. The complaint appears to arise from a morbid secretion of the laminæ, and also of the sole, whereby the coffin-bone has no adequate support. This is most apt to occur, if the animal is put to work too soon after the inflammatory attack, and when the sensitive laminæ have not sufficiently recovered their healthy condition, the crust, moreover, being apt to curve towards the toe. Sometimes the previous inflammatory action is so obscure, as not to be detected, and the defect in the horny defence is the only evidence of its previous existence. This disease is most apt to appear in horses with wide feet, much exposed to hard roads and pavement; its progress is usually steady, though slow, and many horses are rendered perfectly useless by it. We should ascribe this in some degree to insufficient remedies being employed for its cure. What is desiderated is time, perfect rest, and improvement of the secretory organs, by stimulating the coronet to a healthy secretion of crust, and chiefly by supporting the sole.

Navicular disease.

CONTRACTION OF THE FOOT. NAVICULAR DISEASE. GROGGINESS. Great has been the pains taken by able veterinarians to elucidate the disease known under the above names, concerning the vast importance of which in this country, there is but one opinion. By high authority it has been called "the curse upon all good horse flesh," (though, in passing, we remark it is rather the infliction of man, than of any higher power;) and, coinciding with this, is the statement, that the public have sustained greater loss of valuable horse flesh from the havoc of this disease alone, than from all the catalogue of diseases to which the limbs are liable. Unfortunately, however, there is not more uniformity of sentiment concerning the importance, prevalence, general history, and result of this disease, than there is diversity of opinion concerning its pathology; or rather we should say more accurately, its proximate cause. It is universally agreed that the hoof in its healthy and normal state is roundish, and largely endowed with the property of elasticity. When we attach to it an iron shoe, this natural play is impeded; and that this result of domesticity has much to do with the disease, some way or other, is universally allowed; the complaint being unknown among horses in their natural state, and nearly so in other countries where they are as much esteemed and used as in our own. How then, and to what extent does this shoeing operate? Some contend that the contraction of the crust, thus produced, is the true origin of the evil; that this fetters the sensitive parts within; that the sole becomes externally concave, internally convex; that the soft elastic parts are absorbed; that the frog becomes the rock of danger; the capsular membrane of the navicular joint is injured; in a word, that "the navicular-joint disease is the general seat of the chronic lameness of the foot." Many years ago, the present writer took a part in this controversy, and endeavoured to demonstrate that the primary and permanent disease is established in the synovial capsule, between the tendon and navicular bone, and arises generally from strain and over-extension of the tendon, where it passes under the navicular bone. More recent and able writers have since contended that "the inflammation of the little plates covering the coffin bone, is the most usual cause;" and that a degree of inflammation, inferior to that causing acute founder, produces all the sad results. It would be tedious to mention all the discordant opinions which, with much ingenuity, have been promulgated upon the point; but we still believe that the injury of the synovial capsule of the navicular joint is most generally the primary and proximate cause. though we do not contend it is the only cause. Mr Turner, again, thinks that the hardened frog is the rock on which most valuable horses strike; but he allows it is not the sole one; and so it is with other speculations. Why then appear to differ, when substantially we agree? Not that we are here arguing for concession which will compromise the truth; but we hold, that the united persevering ingenuity of scientific men has fully illustrated the nature of this disease; that it has predisposing causes, such as want of paring, shoeing, and still more, bad shoeing, hereditary tendency of particular breeds, and high condition; for it is a disease not of the agricultural, but of the high-bred horse. In like manner, it has manifest exciting causes, such as strain of the tendon, and over-exertion, pressure on the sole, as from travelling with a

stone in the foot; and there is the tight shoe exciting irritation of the foot, which, hot and uneasy in the stable, is aggravated by occasional and violent exercise, until the capsular membrane, tendon, laminæ, cartilage, and bone, one after another, and together, are involved in a degree of subacute and inveterate disorder, which has given too much occasion to all the hard things which have been said against it. The symptoms of the early, and, in a practical point of view, the most important stage of the disease, are a peculiar shifting of the feet, and shortness of the step; whilst a degree of heat is found in the foot, more especially about the heel and coronet. There is a continued pointing, or holding the foot in a relaxed position; dryness of the hoof, throbbing of the pastern arteries, and pain on pressure, in the hollow of the pastern. The other parts of the limb are clean and fine; there is general tenderness of the foot on pressure, with tripping and stumbling; finally, the foot is contracted. In the treatment, all possible attention must be paid to the shoeing; the sole should be thinned, the bars pretty freely removed, and the toe made short. The other predisposing causes must, as far as possible, be removed; and the exciting, especially the overtasking, often so inconsiderately and cruelly, the generous nature of our noble steeds, whose dashing, rapid, and firm action, is so frequent a cause of all the mischief. Finally, the proximate cause must be combated, not by clips on the heels, or screws, or jointed shoes, but according to the principles laid down for the relieving of irritation and inflammation; cooling diet, laxatives, blistering, supplying due moisture to the hoof,[1] and turning out. Time, and skill, and care, may thus do much.

Cutting.

The foot and leg of the horse are liable to various external injuries, some of which are inflicted by the one limb wounding the other. CUTTING, BRUSHING, INTERFERING, are said to take place, when the one foot strikes and wounds the opposite fetlock; and they usually occur in young and timid horses with ill-formed legs. The habit requires either a particular form of shoe, with which the shoeing-smith is familiar, or so putting on the shoe that the crust will project beyond it. A boot is sometimes required. The

Speedy-cut.

SPEEDY-CUT is an injury of the same kind, where the leg is struck higher up, and when the horse is going fast. In these cases the leg must be covered with a boot. In the

Overreach. Tread.

OVERREACH the wound or bruise is produced on the heel of the fore-foot by the hind one in travelling. The TREAD is the same kind of injury upon the coronet of the hind foot, either by the tread of another horse, as often happens in cavalry regiments, or by a false step of the other limb. The Overreach is the consequence only of fast paces. A semicircular wound is made; the skin being raised like a flap, which folds backwards and downwards. The injury is done not by the toe, but by the edge of the inner rim of the shoe. Sometimes a part of the skin is quite scooped out. These injuries should not be disregarded, for if neglected they produce Quittor. All that is usually required is to wash the wound well, put into it a pledgit of tow dipped in Friar's balsam, and bind it up with a bandage. If the cure is not at once effected, and a slough forms, the disease is called a

Core.

CORE, and requires for its cure only a continuation of the same remedies, with poultices.

One of the functions of the coronary ligament is to secerte the matter answering to the nail in man, which goes to form the crust or external wall of the hoof in animals. When a part of this band has been wounded or injured by disease, it can no longer perform its functions

False quarter.

aright, and hence the disease called FALSE-QUARTER. It appears in very different degrees, sometimes forming quite a cleft or fissure, and sometimes exhibiting in the diseased part only a somewhat modified and inferior kind of horn. The secretion is, in short, to different extents deficient and irregular, which exposes to further injury, is accompanied with more or less tenderness, making the part incapable of bearing the pressure of the shoe, and often causing lameness. The primary attention in the treatment must be given to the diseased coronary band, removing as far as possible the cause, by careful paring, protecting and cherishing it, sometimes with digestives, sometimes by blistering. The fissure should generally be filled with some mild ointment, or with tar, as dressing, bound on by a coarse tape, and covered with a coating of pitch or tar. When the animal is kept at work, the shoe should be so applied that the pressure be not imposed on the diseased part. A SAND-CRACK is also a fissure of the crust, and differs principally in this, that it does not necessarily proceed from a previous injury or known disease of the coronary band. It may happen in an instant, from a false step; and hence a horse, though he may spring a sand-crack within an hour after purchase, cannot be returned on that account to the seller. Into this crack, or perpendicular division of the hoof, the sand or dirt enters. It occurs in both fore and hind feet, and in the former usually in the inner quarter, in the latter, in front, the principal stress being there; it arises from dryness and brittleness of the crust; sometimes it does not penetrate through the crust, and then it causes no lameness. It must not, however, on that account be neglected. It should be carefully rasped out, and treated as advised under the last-named disease, the shoe being so modelled as not to press upon the crust under the crack. Firing may be occasionally necessary. When it penetrates to the quick, pain and lameness ensue, and fungous growth may appear, which must be removed by opening out the fissure, and by stimulants or escharotics, after the inflammation has subsided. The sole should be kept sufficiently moist, the hoof occasionally pared, and the horse turned to grass. The crack will, with time, recede from the coronet, till at length it totally disappear.

Sand-crack.

The THRUSH or *Frush* primarily attacks the frog, and appears to arise from the continued application of moisture, dirt, and other irritating matters, though it is sometimes supposed to owe its origin to a wound of the frog, or a contraction of the hoof, whence it proceeds to the external parts. Horses of all ages, and even the unshod colt, and in all situations, are subject to the disease, and it appears more frequently in the hind feet than the fore. Among its first symptoms is a discharge of offensive matter proceeding from the cleft, and gradually pervading the whole frog. If neglected, the entire foot may become involved. The sooner, therefore, that the primary disease is cured the better; and cleanliness and astringents are the appropriate remedies. After being thoroughly cleaned out, the excavation may be filled with calomel, which generally cures; or with pledgits of tow dipped in warm tar, or some escharotic wash, every night, and retained sometimes during the day. The general health should be attended to, and exercise not neglected. The term SEEDY-TOE has been applied to a chronic form of softening and local irritation, which, beginning between the crust and sole, gradually spreads round the foot. It seems to be aggravated, if it be not sometimes occasioned, by mire and gravel insinuating itself into the altered texture of the edge of the sole: sometimes inflammation of the sensitive parts beneath is assigned as the cause. The treatment is the same as that of the complaints with which it is associated.

Thrush.

Seedy-toe.

CANKER is usually a mere extension and aggravated form of the preceding diseases, from want of care and attention, though sometimes it follows other injuries. The

Canker.

[1] Tow, moss, cow dung mixed with clay to give it consistence, and Cherry's felt pads, are the best materials for STOPPING. Clay alone is apt to get too hard, though it may answer for great heavy horses, whose work is slow, and whose heels are raised from the ground by high calkins. Tow and moss, after filling the sole, must be packed a little under the shoe, and can be wetted as required. Where the hoofs are naturally weak and brittle, they require additional or more frequent softening.

sensible frog, instead of secreting horn, produces a fungous growth which pervades the whole sole, and ultimately extends to the entire secreting surface of the foot. It is most commonly seen in, and is almost peculiar to the heavy breed of cart horse, which is often peculiarly exposed to the exciting causes, and sometimes, it would seem, there is a strong hereditary predisposition. Those with white feet are most liable to attack, and the hind feet more than the fore. After it has existed for some time, the disease is difficult of cure. The principle on which the cure must be conducted, is the removal of the diseased sole and fungous growths, so giving free vent to the morbid discharge, by means of the knife and escharotics; lunar caustic, and caustic potash, likewise being often highly useful; and this effected, astringents, escharotics, and pressure are to be employed. M. Feron regarded tar and sulphuric acid in the proportion of four ounces of the former to two drachms of the latter, as a specific. Cleanliness, perseverance, and time, will effect a cure.

Foul of foot.

FOUL OF FOOT in cattle resembles the diseases we have just been describing in the horse, and in fact is nearly identical with them. Sometimes there is a conspicuous crack between the claws of the hoof, followed by inflammation and secretion of offensive matter; and at other times a tumor appears above the coronet, between the hair and hoof, attended with pain and inflammation: sometimes the mischief is owing to foreign bodies finding lodgment about the hoof. The remedy for this complaint is removal of such foreign bodies, simple ablution, astringent washes, as of alum, sugar of lead, and white vitriol, and dressings with some stimulant, among which equal parts of soft soap and turpentine has been much commended. According to Mr Skerret, three or four dressings never fail to produce a cure. It is alleged the constitution sometimes participates in the disease, if it does not produce it, as in the case of the murrain. In these cases cleanliness, bleeding, a laxative, and sometimes poultices may be required.

Foot-rot.

FOOT-ROT is the name given to this kind of disease as exhibited in sheep, among which it commits such disastrous and ruinous consequences, attacking, if neglected, the whole flock, so that in feeding they actually crawl on their knees, before they become its victims. Hence it is regarded in the last degree contagious. After a good deal of investigation, however, we have arrived at a different conclusion; and we discover in its history nothing more than the results of that domestic state to which we have subjected this useful creature. By nature, not unlike the goat, it frequents the summits of the lofty mountains, where its hoofs, altogether analogous to those of the horse, are exposed to much tear and wear. When from these alpine regions we transfer the sheep into our grassy lawns, our moorish lands, or sandy soils, this wearing away of the crust is put an end to; it grows long, and proves a great encumbrance. In this state it is exposed to many injuries, among others from the long grass of the pastures, and itself necessarily injures the soft parts beneath; and hence lameness, inflammation, suppuration, to the extent of casting the hoof, are the consequences. We have not here space fully to prosecute the subject, and must therefore take the liberty of referring to another quarter for a more ample elucidation of the subject.[1] The circumstance of the disease occurring epidemically arises, we conceive, from the whole flock being placed in precisely similar circumstances. The symptoms of the disease are quite analogous to those so largely dwelt upon in the horse; and we would insist upon prevention rather than cure. We advise the providing the flock with regular walks, similar to their natural ones; or that they should be made to walk on the hard road, or to be put regularly into a fold with a hard and gravelly bottom. Long rough grasses should be cut down in their pastures. Regarding the treatment, suffice it to say, that the principal points to be attended to, are paring away the detached hoof, and dressing the surface with some caustic, of which butter of antimony is the best.

Leg evil.

LEG EVIL, or BLACK LEG, is a term much, but not very definitively, used among shepherds, for various disorders of the limb, some of which are sufficiently formidable. One of them begins at the hoof or knee, and soon makes the animal quite lame. The part is covered with small blisters filled with a dark-coloured fluid, and the skin now breaks out in sores. The complaint is said to be highly contagious, and separation accordingly is enjoined between the sound and unsound. The wool is to be removed from the diseased part, the sores, after being well washed, are to be dusted with burnt alum, and the whole limb to be wrapped in a cloth spread with Turner's or a more stimulating cerate. Another disease, which also goes under this name, is a chronic rheumatic affection, now in one limb and now in another. The joints become stiff and somewhat swelled, and the lameness is obstinate; but the disease, although tedious, is not fatal. A third disease corresponds to quarter-ill in cattle.

Diseases of the digestive system. Teeth.

Leaving the all-important instruments of movement, we proceed to the internal parts, and commence with the DIGESTIVE SYSTEM. We begin with the TEETH. The history of the dental apparatus furnishes the most specific evidence regarding the AGE of the individual, especially in early life; and hence the importance of minute acquaintance with the following particulars respecting the horse. The foal at birth has no teeth; but in a few days, two above and two below: the central, make their appearance, and soon after four others, on the sides of these; in three or four months more, other four, the *corner* teeth, as they are called, appear. These twelve in front of the mouth continue without alteration until the colt is about two and a half years old, when he begins to shed his teeth. The two central teeth above and below are the first that fall out, and the new teeth, called also horses' teeth, are much larger and stronger than the former. Between the third and fourth year, the next incisors above and below, fall out, and are replaced in like manner; and between the fourth and fifth year the corner teeth are changed. When the animal is about a year old, four molars appear in each side of each jaw, and when about eighteen months, a fifth. At the age of two and a half, the first temporary molar drops out, and a permanent one takes its place; at three and a half the second, and at four and a half the third. About this time the sixth and last molar appears, and is a permanent tooth. During the fourth year the tusks or tushes appear. The change which takes place between the fifth and sixth year, is the gradual wearing down of the outer edge to a level with the inner. At seven the outer incisors have become a little longer, and the black mark smaller; at eight the mark is generally lost. After this period, a judgment is to be formed by the cavities in the upper teeth. About ten, the central teeth have lost their marks, the two next have but little left, though they are still readily seen in the upper corner ones; by the twelfth year they too have also disappeared. The tushes, like the incisors, gradually change their form. At first they are small, sharp, and shell-like, with a concavity on their inner surface; the teeth become gradually larger, and the concavities less, and at about the age of eight they are nearly lost. About twelve, the inside of the tusk becomes somewhat rounded in form, and ere long is quite round, blunt at top, and of a yellow colour. This colour, with advancing years, pervades all the teeth. The age of the ox and sheep, in their earlier years, is ascertained by a similar acquaintance with the changes of their dental apparatus; in later years

[1] Quarterly Journal of Agriculture, vol. ii. p. 852.

from their horns, a year being allowed for every ring, answering to the shedding of their coat; and three additional in the ox, for the space between the oldest ring and the tip.

Diseases of the teeth.

The DISEASES OF THE TEETH attracting attention are but few. The edges of the grinders, at all ages, are apt to get rough, wounding the inside of the cheek, and so interfering with mastication. These asperities must be filed down with the rasp. Not unfrequently the growth, especially of the grinders, is irregular; a process of one of them often projects, injures the opposite jaw, and interferes with the proper discharge of their functions. The cure is to reduce this tooth to the level of the others by means of the rasp, forceps, or chisel, or, if loose, to remove it.

Themouth.

Proceeding to the MOUTH, we remark, that its lining membrane, including the tongue, is apt to be affected with

Aphthous thrush.

APHTHOUS THRUSH, a crop of small vesicles or pustules, which may go on to ulceration. This would appear to be a disease of the mucous follicles, and requires the greater attention, as it is sometimes associated with strangles. These symptoms are seen in the horse, and also frequently in cattle and sheep, commencing with small blisters, and the peeling off of the cuticle of the tongue and mouth, whereby much difficulty is experienced in taking food; and fever is sometimes present. In these cases, laxatives, antacids, such as chalk and diaphoretics, should be prescribed, and an astringent wash to the parts, as of borax and alum.

Lampas.

LAMPAS is often described as a painful swelling of the lower bars of the palate, projecting above the surface of the front teeth, and interfering with feeding, as a disease of young horses, connected with the shedding of their teeth, and occasioning fever. It is not, however, so much a disease, as a natural and salutary process, which, in general, is best let alone, and in which cruel remedies, such as firing, should never for a moment be thought of.

Tongue.

The TONGUE is liable to various injuries. Frequent trouble is given in all the domestic animals, from the lodgement of sharp irritating substances about the tongue, throat, and teeth. The offending body may be a needle, thorn, or sharp bone; and in consequence, the animal declines his food, appears sick, and may froth at the mouth; so that in the dog we have known this accident mistaken for *rabies*. In cases of this sort, the parts should be carefully examined, and on the removal of the offending body, the cure is readily accomplished. Inflammation of the tongue occurs spontaneously in the lower animals, as sometimes in man; but is more frequently seen as the result of accident. Awkwardness and violence in administering balls and drenches are frequent causes; and the horse, in sleep, sometimes severely bites his tongue. From the violence used in administering physic, we have seen the inflammation run so high, as to terminate in gangrene. The disease is characterised by great swelling and prolongation of the organ, thereby impeding mastication. Free bleeding from the part, by scarification by a sharp knife, and general bleeding, are the most efficient remedies, and sometimes a part of the organ must be cut off. If only a couple of inches are removed, no alteration is produced in feeding; but if double or more be removed, the animal cannot drink till it gets its nose under water, when it can produce a vacuum, and employ suction. From the same kind of rough handling, the frænum is often torn, so occasioning ulceration and soreness; but with mild dressing, the sore soon heals. Sometimes we have seen the injury so extensive, that amputation of a part of the member became necessary. The hemorrhage from excision is seldom troublesome.

The blain.

The BLAIN, as originally described in cattle, consisted, we believe, in an obstruction of the ducts of the sublingual glands, whereby the saliva was confined, occasioning a tumour at the root of the tongue, which produced protrusion of that member, and threatened suffocation. This disease is likewise known in man. All that is required is to make a free opening with the lancet. By an extension of the term, the name is applied to the occurrence of vesicles, or small blisters in this locality, which pervade the frænum and the gum. They occur in the horse as well as in cattle, going on to troublesome and protracted inflammation, sometimes threatening mortification. Scarification may be used, and strong solutions of alum and borax, with tincture of myrrh, and Friars' balsam.

Parotid.

The PAROTID is the most important of the salivary glands, largely secreting this important fluid, and pouring it, through its duct, into the mouth. With the situation of the gland, and the course and termination of the duct, every veterinarian must be familiar, that he may avoid injuring them, and be able to heal them; no easy task, when they have been divided. The principle of cure is sufficiently evident. In the case of the duct, it is to bring the divided ends as closely together as possible, and to keep them there, at the same time preventing the escape of any saliva from the wound. This may be tried by the skilful application of a fine pin, scarifying the edges, if fistulous, and keeping the integuments closely approximated. To rouse these parts to the adhesive inflammation, the cautery is sometimes used; but we have found a strong solution of corrosive sublimate, (ten grains to the ounce,) more efficacious. If we fail in this method of cure, an artificial opening or canal, as much as possible in the natural course, must be made between the divided part and the mouth; and when this is thoroughly established, we must connect with it the part of the duct coming from the gland, healing up the superficial parts. CONCRETIONS sometimes occur in the duct. We have seen them occasionally as large as marbles, rattling in the cheek like dice. If troublesome, and requiring to be removed, this must be effected from the inside of the cheek, or if from the outside, the wound must be dressed very carefully with a pin, as in bleeding. In certain cases of cold and sore throat, the gland may inflame and swell, becoming conspicuous, when it forms MUMPS; as do also the other salivary glands, especially the submaxillary, constituting what the farriers call VIVES. For these complaints cruel modes of treatment used to be adopted, which happily are abandoned. Reduced feeding, possibly bleeding, blistering, and time, are all that are required. Sometimes these glands become involved with others, in strangles, when they will again come under notice.

Wound of duct.

Œsophagus.

Concerning the ŒSOPHAGUS, to which we next proceed, the only complaint to which we shall allude is that of OBSTRUCTION. This may arise from tumours and schirrus, to which we may subsequently advert; now we shall insist only on what is called CHOKING, or obstruction of the passage by a large morsel of food, witnessed more in cattle than in horses, and most frequently when they are feeding upon turnips, potatoes, carrots, and such like. The obstruction usually occurs at the bottom of the pharynx and commencement of the gullet, not far from the lower part of the larynx, which we have seen mistaken for the foreign body. The accident is much more serious in ruminating animals than in others, as it immediately induces a suspension of that necessary process, and of digestion, followed by a fermentation of the food, the evolution of gases, and all those frightful symptoms, which will be noticed under the disease *Hoven*. The difficulty in breathing, and the general uneasiness of the animal, usually direct at once to the nature of the accident, which examination brings under the cognizance of the eye and hand. No time must be lost in endeavouring to afford relief; and the first thing to be tried is, by gentle friction, and pressure of the hands upwards or downwards, to see and rid the animal of the morsel. Failing in this, we mention first, the great virtue we have frequently found in the use of mild lubricating fluids, such as warm water and oil, well boiled gruel, &c. The gruel is grateful to the animal, which freely tries to gulp it, and

Obstruction.

often succeeds. Whether this is owing to the lubrication of the parts, or to the natural action superinduced, it is unnecessary to inquire; but the fact we know, that a few pints of warm gruel have often proved successful in removing the obstruction. If this remedy should be ineffectual, the foreign body may perhaps be within the reach of the small hand which a kind dairymaid may skilfully lend for the purpose. If this good service cannot be procured, the common probang must be used, the cup-end being employed. Other and more complicated instruments have been invented, acting upon various principles, some, for example, on that of bruising the obstructing body, and the use of these requires considerable skill. Disappointed in all, we must finally have recourse to the knife. We have cut into the œsophagus in the horse, merely twitching, without casting him, and extracted the foreign body with facility. Great care may afterwards be requisite, as the gullet does not always very readily unite, and death sometimes follows. The best treatment, we are persuaded, consists in applying a stitch or two of the interrupted suture, of fine catgut, so closing the divided parietes of the gullet, and healing the external wound at once by the first intention; the cure is promoted by the application of a carefully graduated pad and bandage. The food must be spare and soft.

Œsophagotomy.

Abdominal viscera.

In passing to the ABDOMINAL VISCERA, we shall premise a short account of *crib-biting* and *wind-sucking*; practices which are said to increase the tendency to indigestion and colic, and to lower condition, rendering those animals which practise them unsound. A CRIB-BITER derives his name from seizing the manger, or some other fixture with his teeth, arching his neck, and sucking in a quantity of air, with a peculiar noise. After a time the abdomen is evidently enlarged. The habit is most common in young horses, but is infectious, and unless the offender is secluded, spreads widely. The best remedy is a muzzle made for the purpose. It consists of an iron rack, so wide as to allow the horse to seize his food, and yet so narrow as not to permit the passage of the teeth; and this should be applied so long as the practice is persisted in. The strap round the throat is in common use. WINDSUCKING consists in swallowing air, without fixing the mouth. The horse arches his neck, mops or smacks his lips, fills his mouth with air, and swallows it. It may be prevented by applying the strap, which when studded with one or more sharp points or prickles, opposite the lower part of the jaw, will effectually prevent the animal's assuming the position in which he sucks in air.

Crib-biting.

Wind-sucking.

Costiveness.

COSTIVENESS, a complaint to which, from the great changes in their feeding, all the domestic animals are peculiarly liable, is interesting not only on its own account, but also as leading to other and more dangerous disorders. Calves are very subject to it, when first put on dry meat; and it is highly necessary they should speedily be relieved, as colic and enteritis are the frequent consequences. In the horse it is very apt to occur from eating old luxuriant grass; and it is then occasioned by the felting together of the woody fibre, whose length interferes with its division, so that it accumulates in great masses. This is most apt to occur in the rectum, and to an extent not to be overcome by the most strenuous efforts of unassisted nature. The same state is also seen in dogs. Hence the manual assistance which from time immemorial has been rendered by the farrier, under the name of RAKING and BACK-RAKING, introducing the hand or finger into the rectum, and emptying its contents. In some cases this is imperiously required; but in many we conceive the practice might well give place to the use of injections with the help of the syringe. In proceeding to afford relief by physic, some preparatory care is necessary, concerning which we refer to a former page. The bowels once cleared, the tendency should be met, and counteracted, by appropriate food.—In this connection we may mention, that several cases have occurred to us where the bad health of horses seemed owing to ACIDITY IN THE STOMACH. In these, the appetite was lost and vitiated, so that old lime and dirt were preferred to wholesome food. The animal was dull, the coat staring, with a tendency to perspiration, the pulse being natural. Loss of the cud in cattle and sheep sometimes arises from the same cause. Having noticed the craving for lime, we prescribed magnesia, and found great and immediate benefit, so that, we conceive, administering magnesia or carbonate of soda merits more extensive trial.

Acidity.

That there are cases of pure SPASM OR CRAMP OF THE STOMACH AND INTESTINES, can admit of no reasonable doubt, although they may often be overlooked and misunderstood. In the horse, it is said to occur most frequently in the ilium. It comes on suddenly, and the pain in the part is intense. The animal shifts his posture, looks at his flank, paws violently, strikes his belly with his feet, lies down and rolls about. In a few minutes the pain ceases, and the horse shakes himself, and begins to feed; but, on a sudden, the spasm returns, with the painful symptoms; ere long there may be another remission, to be followed by another paroxysm, till it terminate in permanent relief or violent inflammation of the parts. Among the most common causes of this complaint, are the drinking of cold water when the animal is heated, sudden exposure, under such circumstances, to cold and damp, mechanical obstruction, especially from foreign bodies, and over-feeding upon green meat. The distinguishing symptoms between colic and inflammation, into which it is so prone to run, are, that in the former there is no previous cold fit, the pulse is comparatively little affected, there are intervals of relief, and pressure on the abdomen does not aggravate the suffering, but relieve it. The treatment must be prompt, and it consists in the immediate administration of anti-spasmodics, of which laudanum and turpentine are among the most powerful. An ounce or two of laudanum, and three ounces of turpentine, in a pint of linseed oil, often afford instant relief. If we are disappointed in this result, venesection should be immediately practised, as bleeding is the most powerful of all antispasmodics; fomentations, or smart counter-irritation should be applied to the abdomen; large warm injections prescribed, and laxative medicine; soft meat alone should be permitted; the horse should be kept comfortably warm, and have gentle exercise for a day or two.

Stomach and bowels.

Spasmodic colic.

Indigestion.

The food, after being subjected to the process of mastication, passes into the stomach, where it should undergo the still more important one of *Digestion*. This is chiefly effected by the agency of a peculiar secretion of the organ called the gastric juice, which possesses a solvent power superior to that of any other in nature with which we are acquainted. Even if meat be tainted, it corrects that taint, and when the ingesta have a strong tendency to acidity or fermentation, it arrests or suspends that tendency. This occurs in man, and in the lower animals; though many accidents are apt to interfere with its healthy exercise, these varying with their varying structure and habits. The stomach of the horse is small, and incapable of containing much at a time, so that it soon passes off. The stomach of the ox and other ruminants is complicated, the food passing from pouch to pouch, until the process of digestion is completed. Whatever interferes with the healthy discharge of this function, will naturally lead to INDIGESTION, which, in the lower animals, unlike to what occurs in man, leads directly to disease of the most rapid and fatal character. Of the predisposing causes—to turn first to the horse—one of the most influential is any thing which interferes with mastication. Hence the prejudicial effect of eating too fast, whereby there is a deficiency of the com-

minuting process, and a paucity of saliva, and hence the evil of the dental apparatus being impeded in its play. Another, and if taken singly, perhaps the most important cause, is a surfeit, overloading the stomach with more than it can manage, especially after a long and fatiguing fast, exhausting the vital powers. White mentions three cases he had known where a horse had got to the corn chest during the night, and was dead before morning. Other causes, however, are to be added, one of which is over-drinking. If the horse drinks largely at the time when he feeds, it washes the food from the stomach ere it has undergone the salutary changes above alluded to, and thus is prone to fermentation. Sudden change of food is another cause, as from soft to dry; and some articles more than others, turnips, carrots, potatoes and grass, more than hay or oats, and peas more than barley. Another cause is being put to hard work on a full stomach. When from such causes as these the stomach is oppressed, indigestion arises, and under one of two forms; the food either undergoing no change, forming a dangerous load, or running rapidly to frightful fermentation. The former is less alarming, and treatment will do much: purgative drenches and injections are to be administered. It is in this state of matters that *acute foot founder* is apt to arise, as noted above, where its appropriate treatment is mentioned. In the latter alternative, where fermentation occurs, one of the most fatal and fearful diseases of our domestic animals is produced. The horse may be seized on the road, and if pushed to a fast pace, it is often certain death. He slackens his pace, wishes to stop, and attempts to lie down. Sometimes he falls down as if shot, the moment he is stopt; at slow work he sometimes quickens his pace, and is unwilling to stand. In the stable he paws the ground with his fore-feet, lies down, rolls, sometimes quite over, or lies on his back. When the distension is not great, he may lie tolerably quiet for several minutes, but when considerable, he neither stands nor lies a minute, and is no sooner down than he rises again; he generally starts all at once, and again throws himself down with great violence. He strikes the belly with his hind-feet, and often looks anxiously to his flanks, sits up as a dog, and sometimes attempts to vomit. As the disease proceeds, the pain becomes more and more intense, the horse darting himself about with terrible violence; every fall threatens to be his last; perspiration runs off in streams, and his agony appears extreme. The belly usually becomes swollen, and distended with gas. On dissection, the stomach is frequently burst, the belly full of its contents, and of gas, and the diaphragm ruptured. When death is delayed, the bowels are found inflamed, often twisted, and sometimes burst. The treatment consists in arresting the fermentation, and re-establishing the process of healthy digestion, which is to be effected by the most powerful stimulants and carminatives. Several formulae we supply below.[1] These must be administered as a drench; the abdomen should be rubbed; the animal should be walked slowly about, and supplied with a good bed, and room to roll about. If there be no relief in half an hour, a second dose may be given, and ere long, if still required, a third. The probang too may sometimes be introduced, and the relief it affords, is sometimes considerable. In the majority of cases, this treatment will succeed, if the bowels have not been previously inflamed or burst. This form of the disease is nearly confined to heavy draught horses, which are long in the yoke, have keen appetites, and devour greedily, and with them it is very common. The complaint has received various names in different places, such as *Gripes, Colic, Flatulent Colic, Spasmodic Colic, Frett, Batts, Enteritis*, or *Inflamed Bowels*, and *Acute Indigestion*, &c. This superabundant, not to say confused nomenclature, is annoying not only to the ignorant, but even to the well-informed, and should be rectified. The disease corresponds to *Tympanitis* in man, and the old name HOVEN is perhaps the best.

HOVEN. BLOWN. FOG-SICKNESS. The name Hoven universally expresses the occurrence of the above disease in cattle and sheep, the structure of whose digestive organs renders them peculiarly liable to the complaint; while the sudden changes to which they are exposed in feeding, prove exciting causes. Thus it is often witnessed in animals removed from confinement and winter feeding, to the luxuriance of the clover field; and in house-fed cattle, from the exhibition of rich food, such as pease meal and beans, often supplied to enrich their milk. We have already mentioned that it sometimes proceeds from obstructed gullet. The symptoms bear so close a resemblance, both in their progress, and termination in rupture and death, to those so fully described above, that we shall not repeat them. The treatment mostly corresponds, and it must be equally prompt. The mixture of the oils of linseed and turpentine is nearly a specific. In addition, the probang is often used with advantage; but so violent and rapid are the symptoms, that recourse must sometimes be instantly had to the operation of PAUNCHING, which, though apparently a desperate remedy, is generally attended with success. The place for puncturing the paunch is on the left side, in the central point between the lateral processes of the lumbar vertebræ, the spine of the ilium, and the last rib. Here the trochar may be introduced without fear. If air escape rapidly, all is well. The canula may remain in for a day or two, and on withdrawal, little or no inconvenience will usually manifest itself. If no gas escapes, we must enlarge the opening freely, till the hand can be introduced into the paunch, and its contents removed, as we have sometimes seen in prodigious quantities. This done, we should close the wound in the divided paunch with two or three stitches of fine catgut, and carefully approximate and retain the sides of the external wound, and with rest, wait for a cure, which is often as complete as it is speedy.

Hoven.

Paunching.

The BRAXY, so fatal in sheep, comes to be considered here. It has been divided into several varieties, as *bowel sickness, dry braxy*, &c. The disease particularly attacks sheep when in good condition; and when they are suddenly deprived of their wholesome food, and forced to feed upon coarse grass and heather, &c. Constipation appears the exciting cause; violent inflammation succeeds, with much agony to the sufferer; great tendency to swelling, so that the viscera and the abdominal cavity sometimes burst; and withal, a tendency to mortification and sinking, so that after speedy death, the touch of the viscera, and even the carcase, is intolerable. The disease is often stated to be hopeless; but if met early, and treated on the principles already laid down, this gloomy view should not be taken.

Braxy.

Associated somewhat with the last disease as to cause, yet differing materially as to symptoms, is the STOMACH STAGGERS, whose immediate cause is usually stated to be in the stomach, while some of its most conspicuous symptoms affect the brain, which we are persuaded is decidedly implicated; hence its compound name. Mr White con-

Stomach staggers.

[1] Linseed oil raw, one pound; oil of turpentine, from two to three ounces; laudanum from one ounce to two ounces;—the whole administered as a doze. Or hartsborn, from half-an-ounce to an ounce; or chlorate of lime, half-an-ounce given in two pints of tepid water. The following tincture may sometimes be kept in readiness:—Take good spirits, whisky or brandy, two pounds; ginger, three ounces; cloves, three ounces; digest for eight days, and add sweet spirits of nitre, four ounces. Half a pint of this tincture is a dose, in a quart of warm water. In cases of pressing urgency, from one ounce to two ounces of tar may be added to half a pint of spirits, and given diluted, with great prospect of advantage, especially to cattle.

siders that the complaint is caused by enormous distension of the stomach; in a marked case, sixty pounds of hard and imperfectly-masticated food having been found in the viscus, the coats being stretched and attenuated; and an approximation to this state being seen in many others. The horses most liable to the disorder are such as have been exhausted by hard work, unwholesome food, and old age. The disease often makes its appearance first after a long fast, and over-work, but frequently also when the horse is at grass. Hence it has been supposed that the quality of the food acts as a cause, especially rank grasses, and noxious weeds, such as the common rag-weed. It has often been regarded as infectious, but perhaps is only endemic. It appears most commonly among agricultural and cart horses, which sometimes have fallen victims in scores. In a few cases, it seems to proceed to regular *Hoven*. The most prominent symptoms are the horse's hanging his head, or resting it in the manger; appearing drowsy, and refusing food; the mouth and eyes being tinged of a yellowish colour; there is twitching of the muscles of the chest, and the fore-legs appear suddenly to give way, though the animal seldom falls; the pulse at first is not affected, but in four or five days inflammation of the bowels or lungs supervenes; the belly is costive, and the dung hard and slimy. Lockjaw frequently occurs before death. The best treatment is to endeavour first to empty the stomach of its load, and then to excite the process of digestion. For the former of these intentions, the stomach-pump may be employed, though it is not so applicable in animals as in man; or tepid water should be administered in large quantities, which, passing speedily from the stomach, is supposed to remove much of the load. Searching and stimulating laxatives are also indicated; most of all croton; also such as aloes and calomel, with ginger or carbonate of ammonia. To these means should be added enemata, and, by and bye, some slight cordial. If the head symptoms are prominent, the temporal artery or jugular vein may be opened, and blood drawn with advantage. Finally, there must be steady exercise, and frequent and careful feeding, under which treatment many cures are effected. The FARDLEBOUND of cattle and sheep is, we believe, nothing more than a modification of this disease. In this variety it has been ascertained that the *maniplies* are most involved, its secretions are suspended, and its contents become dry, hard, and caked, one solid mass. Though the constipation is great, yet there is sometimes the appearance of a slight purging, which may deceive the practitioner.

Fardle-bound.

Gastritis. INFLAMMATION OF THE STOMACH is not a common complaint in any domestic animal, and is induced chiefly from over-doses of purgatives, and mineral poisons, especially arsenic and corrosive sublimate. In these cases the pulse is rapid, sharp, and small, the extremities cold, the respiration quick; there is also the appearance of dulness and dejection, with great debility. After the bowels are freely evacuated, oily and mucilaginous liquids should be prescribed, with a little opium; and the food should be very soft and spare. Arsenic was formerly given very freely to horses; and corrosive sublimate is still administered for a variety of complaints. In the case of an over-dose of the latter poison, white of eggs is an effectual antidote, if given in time. Without this albumen, inflammation is soon induced. For arsenic no antidote has yet been discovered. In the horse it cannot be vomited, which aggravates all the symptoms. The pain of the abdomen is made very manifest by the wistful looks of the sufferer directed to his flanks; and by the profuse perspiration, thready pulse, great weakness, violent straining and purging, terminating in convulsions and death. The stomach-pump should be used as speedily as possible: after this we must boldly use the antiphlogistic regimen, latterly somewhat supporting the strength, by bland food and anodynes.

The Peritoneum, as is well known, is a membrane which lines the walls of the abdomen, and invests all its viscera, forming the external covering of the stomach, intestines, liver, &c. Hence it bears a principal share in the acute inflammation of all these organs, which inflammation is very ready to spread from one to another, till all the inflections of the continuous membrane are involved. ACUTE PERITONITIS, then, is a very dangerous affection, attended with marked symptoms of severe general pain in the abdomen, with high fever, quick pulse, great costiveness, scanty urine, &c. Of all domestic animals, the disease occurs most frequently in the horse. It is produced by sudden chills and damp, after being over-heated, by wounds, sometimes after castration, by the introduction of air into the abdominal cavity, or by irritating substances, as happens in the escape of the contents of any of the viscera, in which case it is almost necessarily fatal. The treatment required is the antiphlogistic, in its greatest rigour, and especially at the commencement, with large bleeding, strong purging, as with croton oil, the free action of the mucous very much relieving the peritoneal membrane; also large enemata, and strong counter-irritation rubbing the abdomen with some powerful epispastic.

Peritonitis.

Besides appearing as an acute disease, peritonitis often shews itself in a chronic form, and in both of these aspects it is a common cause of ASCITES, DROPSY, or an effusion of serous fluid into the abdominal cavity. When this follows a violent inflammation, it is usually accompanied with an effusion of coagulable lymph, which more or less agglutinates the parts together, and it is highly dangerous under this form. When the inflammation is moderate, the dropsical affection is not so dangerous. Its symptoms are marked; there is tension of the abdomen, with a feeling of undulation when struck, great thirst, short breathing, and scanty urine. Together with the internal effusion, there is sometimes present anasarca of the abdominal parietes, sheath, and other parts. Here laxatives and diuretics[1] are the most appropriate remedies. In many other cases, dropsy is purely a symptomatic affection, arising not from any complaint of the peritoneum itself, but from watery effusion, the consequence of impeded circulation towards the heart. Enlargements of the liver and spleen, anomalous tumors in the abdomen, and various diseases of the heart and lungs, operate in this way. The complaint is not very common in the horse, but we have frequently witnessed it in mules and donkeys. Nor is it uncommon in cows and sheep, being often in them conjoined with a similar affection in the chest. The dog, when labouring, as he often does, under the complaint, loses his appetite, the countenance is haggard, the appearance dejected, abdomen distended, and perhaps he is finally suffocated. In these cases, temporary relief may be afforded by TAPPING with the trochar; when, from cattle, five or six gallons may be drawn off, and sometimes with permanent relief. In conducting the operation, care must be taken that the abdomen be swathed, and kept compressed. When dwelling upon the peritoneum, we must not omit to mention that both it and its folds, as in the OMENTUM and MESENTERY, are peculiarly liable to a variety of anomalous tumors, and

Ascites.

Tapping.

[1] Nitre, dose from half an ounce to an ounce; foxglove or digitalis, dose one to two drachms of the powder; cream of tartar, dose one or two ounces; sweet spirit of nitre, *Spiritus Etheris Nitrosi*, dose one or two ounces; oil of juniper, dose one to two drachms, are useful, cooling diuretics, given once or twice a-day: Oil of turpentine, and the powdered resin, are somewhat stimulant, and therefore not employed where there is fever; they are however more commonly and extensively used than any of the others, and are more certain in their effects, dose two or three ounces of the oil, and from half an ounce to an ounce of the powdered resin, formed, with half a drachm of ginger and linseed meal, into a ball, by means of palm or other oil, or of soap.

to tubercles of various kinds, often produced by inflammation, and the occasion of obscure disease and of death. Of these diseases, MELANOSIS is one of the most extraordinary. It consists of an extraneous deposition of a black amorphous mass, or masses, which most frequently appear about the rectum, but may occur in other localities: it is witnessed almost exclusively in grey horses, and particularly when they are passing from a dark to a light colour. All these cases are generally obscure during life, and are more frequently suspected than demonstrated. They are often, however, seen on dissection, and a knowledge of their occurrence is essential to satisfactory practice.

Scirrhus.

SCIRRHUS OF THE STOMACH is one of those diseases which we have occasionally witnessed in the horse, though we do not remember it has anywhere been described. It occurs at the cardiac orifice, and lower part of the *œsophagus*, but is still more frequent at the pyloric extremity. Here the thickening is sometimes immense, appearing like canker of the foot, with numerous and large granulations, several inches long, and making the part feel as if distended with food. These morbid growths produce symptoms of eructation, and of acidity and distention, as already described. Anodynes may be administered; but the disease is beyond the reach of art.

Diarrhœa.

DIARRHŒA, *Flux, Scouring*, occurs in most of the domestic animals. It supervenes as a consequence of *superpurgation*, by which the animal is much weakened, and, in the case of the horse, to his serious detriment. Physicing used to be practised far too freely and frequently; and the regulating of this fashion is one of the most decided improvements in modern practice. Diarrhœa, however, often occurs spontaneously, the result of change of food, irritation in the bowels, or chill after over-exertion. When moderate, the pain is inconsiderable; but when aggravated, the mucous membrane, which is the seat of the disease, acquires a tendency to inflammation, and griping and colicy pains are the consequence. It is most frequently witnessed in what are called *washy* animals, whose loins are narrow, with a long space between the ribs and ileum; and this remark holds good of cattle, sheep, and dogs, as well as horses. The disease should always be speedily checked. If the food be at fault, it should be regulated, and green meat should be withheld: if there be ground to suspect any existing irritation, it should be removed by a laxative; and chalk, or chalk with a little powdered opium, may afterwards be administered; this is a powerful remedy, as is also catechu. Starch gruel should be given, and cold guarded against. Some horses, in going to hunt, apparently from the excitement, are troubled with occasional diarrhœa. Starch gruel, with chalk and a small quantity of powdered opium (a drachm for a dose), will generally prevent it.

Moltengrease.

MOLTEN-GREASE, the *Gras-fondu*, is often associated with more aggravated cases of diarrhœa. It derives its name from the appearance of fatty matter, forming a crust, or partial covering to the fæcal pellet. It is usually supposed to have a constitutional origin, and to be connected with some inflammatory tendency, more especially of the mucous membrane of the lungs, or with general fever. Be this as it may, it is often produced by violent exertion in a horse, which is not prepared for it, being fat and unaccustomed to exercise. The symptoms of threatening fever are present, and venesection is often the first step in the cure; the remaining treatment is the same with that of diarrhœa.—

Dysentery.

DYSENTERY, *Cling and Breckshuach*, in sheep, is likewise an affection of the mucous membrane of the intestines. It differs from the foregoing, in having a tendency to be local, especially in the large intestine, and termination of the gut; and also in being more violent, more apt to produce febrile action, and effusion of bloody mucus and lymph-like matter, sometimes resembling membranes, and to run on to deep and troublesome ulceration. The blood is sometimes coagulated on the dung, and in such quantity as, with other secretions, to receive the name of THE BLOOD. Upon the whole, it is a more dangerous complaint than diarrhœa, and the symptoms, though to a certain extent corresponding, are more severe. Great promptitude, therefore, should be used in endeavouring to effect a cure. In cattle, it is generally easy, by administering a dose or two of salts; a single dose often at once checking the disorder. In sheep, chalk and warm milk, followed up with catechu and opium, are very efficacious. In all the affected animals, the diet must be carefully regulated, and small doses of calomel, chalk, and opium given.[1] This usually acts as a charm, altering the morbid secretions, and affording relief. Anodyne clysters may also be used, and cold must be avoided.

Obstruction.

OBSTRUCTION OF THE BOWELS may arise from a variety of causes, with which the veterinarian should be familiar, and the disease may be more acute or chronic in its nature. To the former category belong violent local spasm and inflammation, producing intussusceptio and death in a few hours. In enteritis and peritonitis likewise, there is sometimes a remarkable and very complicated twisting, which seems by its mechanical action alone to obstruct all descent of the ingesta. Herniæ, external and internal, are additional causes. To the latter class belong various tumors, which are prone to occur, and schirrous contractions of the canal itself, and the presence of foreign bodies. In all these cases the practitioner must be on the alert. On the treatment of inflammatory attacks we have already dwelt.

Intussusceptio.

INTUSSUSCEPTIO is a protrusion of an upper into a lower part of the bowel, or from inverted action, the reverse, as may be seen in the finger of a glove. It is a frequent cause of obstruction, as connected with inflammation, and is often witnessed after death: it is very common in dogs, and more frequent in sheep and cattle than in the horse. The extent to which it may occur is considerable, reaching to many feet of inverted intestine. Sometimes it is near the anus, and a part may protrude, and slough, and yet the animal recover. In a variety of this complaint, occurring in the rectum, the result of constipation, the part, impacted with hardened fæces, which it cannot evacuate, is forced onwards by the peristaltic action, and is protruded a hand-breadth, or even to double or triple that extent. In these cases, the gut must instantly be relieved, and then its return is easily accomplished.

Hernia.

Cases of HERNIA, both external and internal, sometimes occur in the horse, usually produced by violent exertion. The latter cases will usually be fatal; the former occur in the scrotum of the perfect horse. If immediately detected and reduced, the animal may be saved.

Foreign bodies.

FOREIGN BODIES, which usually produce obstruction, are called balls, and are distinguished as hair, dust, and calcareous balls.

Hair-ball.

The HAIR-BALL, very common in cattle and sheep, is produced by animals licking their coats. The hair thus introduced into the stomach, and there supplied with some nucleus, by the constant and almost violent rotatory action of the part, is speedily converted into a ball, most regularly and thoroughly felted. It may continue a long while in the stomach, and till death.

Dust-ball.

The DUST-BALL, most common in horses, derives its name from being composed chiefly of corn and barley dust, saved in grinding meal, and used as food. It owes its origin to the same phenomena occurring in the stomach, but more frequently finds its way into the intestinal canal. There are often several of them, as of the former. They are almost exclusively found in those animals which have been fed on the substance.

Calcareous ball.

Whether the CALCAREOUS BALL has a different origin, we do not know; but it is of most common

[1] Calomel, from one drachm to two drachms; chalk, from half an ounce to one ounce; opium, half a drachm to one drachm.

Veterinary Science.

occurrence, and is generally found in the intestine, often in the caput cœcum. Its comparative frequency in some localities is ascribed to the calcareous character of the district, or of the water drunk. It often acquires a great size, without pain or trouble. At other times, however, stealing on gradually, it undermines the health, and destroys life. In an advanced stage, no doubt can remain as to the nature of the disorder. The countenance is haggard, the eye distressed, the back up, the belly distended, the respiration becomes hurried, bowels habitually costive, and sometimes the horse will sit like a dog, upon its haunches. Relief may frequently be afforded. Strong purgatives and large injections must be given, and under their continued action the offending body is sometimes removed.

Worms.

Various worms, some truly, others erroneously reputed such, infect the alimentary canal in the domestic animals, and frequently occasion more alarm than is at all necessary. Of the former kind are the round worm, *teres;* the thread worm, *ascaris;* and the tape worm, *tænia.* Of the latter are various species of the extraordinary *bot,* the larvæ of the *breeze,* or *gad-fly.* In the horse, the tænia is very rare; in the dog, exceedingly common. When the horse is under-fed, his bowels are full of the teres and ascaris; and the appearance of his staring coat, want of flesh, and voracious appetite, betoken it. The teres is somewhat larger than in man, the ascaris darker. They occasion gripes and diarrhœa, but the mischief they produce is not great. The principal habitat of the ascaris is the cœcum, although they are sometimes found in countless multitudes in the colon and rectum. Turpentine is a deadly poison for all these worms; but this medicine, so harmless in man, acts most disagreeably in the lower animals. Hence it must not be given to them pure or in large quantities, especially to the dog, but mixed, in small proportion with other oils, as linseed, or in a pill, or enclosed in a piece of gut, and with these precautions, it may be found at once safe and efficacious. In dogs, the teres is the most common, especially in puppies; the tæniæ the most prejudicial. The ascaris likewise torments them. If left undisturbed, the two former often occasion *fits,* followed by emaciation and death. Iron filings, two drachms to a dose. are highly reputed as an anthelmintic for dogs; but we believe turpentine, or small doses of tartar emetic, to be more efficacious.

Bots.

The Œstridæ, comprehending the Gad or breeze flies, are not numerous in Britain. though the genus *Gasterophilus,* containing several British species, has been distinguished from the *Œstrus* by Dr Leach. It is the larvæ of the former which invade the horse, while those of the latter attack the ox and the sheep. Two species molest the horse, making the stomach and intestines their habitation; whilst in cattle, and the sheep, species of the other genus attack severally, the skin, and the cavity of the nose. Mr Blaine informs us that the dog is infested with one of these parasites, which he is disposed to consider a bot, but its history has not hitherto been investigated, and we suspect that it is merely a species of tænia, which we have often noticed.

The great-spotted horse-fly.

The great-spotted horse-fly, *G. Equi,* which is by far the most common, also makes the ass its occasional victim. Having selected the individual to which her future progeny is to be intrusted, she hovers about till she is prepared to deposit her egg. She then makes a sudden descent on her victim, and glues it to his coat, repeating the operation till four or five hundred are sometimes fixed on a single horse, the inside of the knee and shoulders being the selected localities; for the horse, in relieving irritation with his tongue, lips, and teeth, is made the unconscious instrument of conveying them into his stomach, where alone they can come to maturity. No sooner is this transfer made, than the larvæ are disclosed, and immediately fix themselves upon the inner coat of the viscus, where they hang in dense clusters, attached by their head, which is provided with sharp hooks, and their only food seems to be the juices of the membrane, without their irritating, in common circumstances, the parts. The bots, thus taking up their quarters about the end of summer, pass the whole winter and spring without undergoing any change, except that of gradually enlarging. When arrived at maturity, they cease to retain their hold on the stomach, and before this, all efforts to force them are vain, commingle with its contents, pass into the intestinal canal, and to the horror of stablemen, are ejected in multitudes from the anus. As soon as they find a convenient retreat, they change into a chrysalis, and in a few weeks more, into a fly, which takes wing, finds its mate, and thus is prepared for repeating the extraordinary process.

Veterinary Science.

Red-tailed.

The *Red-tailed horse-bot, G. hæmorrhoidalis,* is scarcely half the size of the former. This fly deposits its eggs on the lips of the horse, to the exceeding annoyance of the poor animal, which is no sooner aware of the presence of his enemy, than he tosses his head, and gallops off to a different part of the field. The larvæ taken into the stomach fix themselves exactly like the G. Equi, and differ in their future history only in this, that after leaving the stomach, and passing into the intestines, they are in no haste to make their final exit, but continue for a considerable time at the extremity of the rectum, there creating great uneasiness. Back-raking, under the circumstance, affords relief.

Ox-bot.

The Ox-Bot, *Œstrus bovis,* is about the size of the *G. Equi.* Though appropriated to the ox, this species sometimes attacks the horse. It is a cuticular insect, the eggs being deposited externally in the skin of cattle, and the larvæ inhabiting a tumor, or abscess formed round them. These tumors are usually found in the back or loins, and are often larger than a pigeon's egg. When the fly is depositing its ova, the cattle are in the extremest agitation and dismay, and sometimes become quite furious, running off, bellowing, at their full speed. The larva in its cyst gradually enlarges, while the pus that is secreted by the irritation serves for its nourishment. The tumors which are produced are called *warbles, wormals,* or *womils.* The skin and hide are permanently injured by being subjected to this process.

Sheep-bot.

The Sheep-bot, *Œ. ovis,* is thought to deposit its eggs on the nostrils of the sheep, though, from the agitation of the animal at the time, it is not easy to ascertain the fact. The larvæ soon find their way to the frontal, maxillary, and other sinuses of the face; here they adhere for a time, producing considerable inflammation. When mature, the larva wriggles from its warm abode, falls into the soil, there becomes a chrysalis, and continues dormant for about two months. We refer for more ample details to the writings of Mr Bracy Clark, who has acquired such merited celebrity for his elucidation of this and other abstruse departments of the science.

Liver.

A variety of diseases are usually enumerated as occurring in the Liver, more especially in the well-fed dray horses of London, and in stall-fed cattle.

Inflammation.

Acute Inflammation is one, in which the pain of the affected part is very obscure, and the natural language of the sufferer not very expressive; nor is the symptomatic fever marked. Here a striking analogy is noted, however, between the lower animals and man, inasmuch as there generally is a sympathetic pain in the right shoulder, so strongly marked as often to be mistaken for the principal disorder, and treated accordingly. Yellowness of the eye, and mucous membranes, and of the urine, are also present. Bleeding, and purging with aloes and calomel, are the appropriate remedies. Besides accte, there is also

Chronic.

Chronic Inflammation of this viscus, marked by enlargement and softening, and not unfrequently ulceration. The characteristic symptoms are, a languid eye, unwillingness to move, indifference as to feeding, yellowness about the mouth, unthrifty coat, high-coloured brownish-yellow urine, constipated bowels, with fæces not of the natural appearance, but either of a light

colour, from want of bile, or of a dark hue, from excess of it. Along with this, there is pain, often with lameness of the right shoulder. Under a course of laxatives with aloes and calomel, we frequently find these symptoms disappear, and health restored. If inveterate, it sometimes happens, as subsequently proved by dissection, that the viscus is quite disorganized, and frequently ruptured, when of course there is great sinking, and sudden death.

Jaundice.

JAUNDICE, commonly called the *Yellows*, is another disease which occurs, and more frequently in the dog and sheep than in any other of the domestic animals. Enough has already been said to elucidate its symptoms and treatment.

The rot.

The true pathology of the ROT in sheep was long ago pointed out by the late professor of agriculture at Edinburgh, to be "a direful ruin of the general health and constitution, which supervenes from deficient or depraved aliment." In Scotland it is agreed that it never occurs where there is an adequate supply of good pasture, and rank grasses are held universally to occasion it. Dr Coventry moreover stated, that if not rendered desperate by fatal complications, every flock and every sufferer may be recovered by simple means, seasonably used. When all the powers of the constitution are once prostrated, other and hopeless diseases undoubtedly appear, of which character are pulmonary consumption, and the disorganized liver, which have attracted so much attention. With this disorganization are conjoined hosts of what are called *fluke-worms*, from their resemblance to flounders and other flat fish, and whose history is yet involved in obscurity. Whether with the rank grasses of marshy lands, which the sheep under the circumstances are compelled to eat, the ova of the future parasite gets admission into the frame, is a point which remains to be investigated. The cause, however, being recognised, the disease may generally be avoided, and when it exhibits itself, the remedy is alike plain and simple,—to remove from the noxious feeding, to relieve the bowels, and supply plenty of wholesome nourishment.

Spleen.

The diseases which have been principally signalized in the SPLEEN, are *enlargement*, usually chronic, often united with *tubercles*, sometimes with *softening* and *rupture*, and of course speedy death. These diseases are not very common, and are certainly obscure, being apt to be confounded with the anomalous tumors already noticed. They may be marked by rigors, loss of flesh and appetite, but the symptoms are rarely conspicuous. After sudden death from rupture, occurring in a poney at work the day before, we found this organ to weigh not less than seventy-two pounds.

Staking.

Before leaving the abdomen, we must mention, that in taking leaps, horses are sometimes wounded in the belly, or STAKED. The wound may, or may not penetrate the cavity, which is easily ascertained by the finger. In the latter alternative, it is comparatively of little consequence, and the treatment is the same as in other skin wounds. In the former, it is much more serious. A portion of the bowel is almost sure to protrude, and the quantity is augmented by every step that is taken. Examination should instantly be made to ascertain if the bowel itself is wounded. If so, the lips of the wound must be nicely united with catgut ligatures, before the intestine is returned. If this cannot be done at the moment, a bandage and pad will prevent its farther escape, till proper assistance is procured. If the bowels are uninjured, by a little gentle manipulation they may be replaced, the edges of the external wound drawn together, and secured by pins and tow, and a bandage bound round the body, sustaining a compress over the aperture. Our dread, after this, is that enteritis may be produced. Hence the antiphlogistic regimen must be pursued, and in all its vigour. Venesection must be freely, and if there be tenderness, repeatedly used; the diet must be very spare, and of the softest kind, and with great care, a cure may be effected. Another variety of the accident remains to be noted: it is where the muscles, or other parts of the parietes of the abdomen, are torn, while the skin remains entire; a sac being formed, into which some of the abdominal contents may protrude. In this case bandages and pressure must be carefully applied, and laxatives and spare diet prescribed.

In commencing our review of the diseases of the URINARY and GENERATIVE ORGANS, we remark that in the horse considerable advantage is derived from the size of the parts, which allows the ready introduction of the anointed hand into the rectum, so that the viscera, including even the kidneys and ureters, may be carefully examined.

Pelvic viscera.

Nephritis.

NEPHRITIS is not a very common disease. It may be acute or chronic; sometimes it is idiopathic, sometimes caused by the exhibition of particular drugs and food. When acute, the pain is violent, there is symptomatic fever, and a peculiar straining of the body; the animal frequently lies down, and points with his nose, in his attempts to reach the seat of the disease; the urine is high-coloured and scanty, and there are frequent ineffectual efforts to pass some. The treatment consists in the vigorous employment of the antiphlogistic regimen, in the free use of decoctions of linseed, in fermentations and mustard poultices, blisters and turpentine being carefully avoided. In the cow, pus is often passed with the urine, which ought, and may easily be distinguished from *Leucorrhœa*.

Hæmaturia.

HÆMATURIA, bloody urine, generally arises from a diseased state of the kidneys, though it is sometimes produced by diseased states and fungus of other parts of the passage, and sometimes by violent strains and internal ruptures.

Diabetes.

Genuine DIABETES, which is a protracted increase of the quantity of urine, with a change in its chemical composition, is not a very rare complaint in horses. Great thirst is usually a prominent symptom, and feverishness. The pathology of the disease is obscure, but seems to be connected with derangement of the digestive organs. Purging, especially with aloes or croton, or with salts, together with astringent medicines, such as carbonate of soda, chalk and lime, also catechu, should be used, and a change in the food, which should be of the best quality. Carrots are regarded serviceable, as also the mixture of a little pipe-clay or pease-meal with the water drunk. We have found iodine a never-failing remedy, very useful in correcting the thirst, and checking the flow of urine.

Renal calculi.

CALCULI are often found in the kidneys of all the domestic animals, including the pig; but they do not readily pass down into the bladder, on account of the horizontal position of the ureter. They occasionally produce immense enlargement of the ureters, and considerable irregularity in the functions of the part.

Diseases of the bladder.

Inflammation.

INFLAMMATION sometimes occurs in the bladder, more especially about the neck: the symptoms are pain in the viscus, and constant micturition, with others as stated under nephritis, and the treatment generally resembles what has been advised for that complaint. The injection of a little warm oil into the bladder, often affords singular relief. CALCULUS is occasionally witnessed in this viscus, and the symptoms are well marked in the constant irritation and the dribbling of urine; manual examination speedily confirms suspicion. It is sometimes seen in valuable young colts and stots, and an attempt must be made to afford relief. This may be effected by cutting merely, or partly by dilatation. LITHOTOMY in the horse is not so perilous, or difficult an operation as in man, the space being much more ample. The following is the mode in which it may most easily be accomplished. A sound is to be passed up the urethra, till it is felt in the perinæum; an incision is then made into the canal, and a director introduced from this point into the bladder; with the probe-pointed bistoury the incision is to be enlarged on the left side of the raphe; the right hand is now introduced

into the rectum, the two fingers of the left into the bladder; the stone may thus be pushed against these fingers, and by them guided to the neck of the bladder, and so forced through the opening in the urethra. A stone weighing four and a half ounces has thus been successfully removed, and the wound healed quickly. Sometimes a soft pulpy mass almost fills up the viscus. FUNGOUS GROWTHS and ulcerations are apt to occur in the mucous coat of the cow's bladder, and corresponding diseases in the horse, and in the glans penis. In the former case, they are not easily remedied; in the latter, the diseased part should be excised.

Castration. CASTRATION is a formidable operation, especially in the full-grown horse, and is best performed by making an incision through the scrotum, allowing the testicle to protrude, tying the arteries, cutting the cord, and removing the gland. These we know are but hints, but our limits prohibit details.

Nicking. Docking. As to NICKING and DOCKING, we believe the time is near at hand when even the Cow-leech will perceive the absurdity of endeavouring to improve upon the fair forms of the most graceful works of nature, and will leave the horse's tail, no less ornamental than useful.

Garget. INFLAMMATION of the UDDER, GARGET, occurs in the mare as well as in cattle, as a consequence of parturition; although it is only in the latter that it is produced from the barbarous practice of *hefting*, delaying milking, that the quantity may appear the greater. In bad cases, when the milk cannot be elicited in the common way, a fine hollow tube (made for the purpose) may be introduced into the teat; through this the milk flows, and the udder resumes its healthy tone. In severe cases the inflammation runs so high, that mortification is the consequence, and the udder drops off. When this threatens, blood should be drawn freely from the milk veins, purgatives should be administered, the weight of the part supported, and poultices applied. Suppuration will thus frequently be induced, and a puncture being made, will relieve. Inflammation of the udder, more general or partial, and sometimes confined to the teat, is frequently so severe in the ewe, that she refuses all sustenance to her lambs, so that they actually die of starvation. The treatment for the dam, is in principle, the same as that just mentioned. In the bitch the disease often becomes chronic, and excision is necessary.

Diseases of the respiratory system. The RESPIRATORY SYSTEM includes the cavity of the nose, the pharynx, larynx, trachea, lungs, and chest, with their several component structures. Each distinct part is liable to assume morbid action, whilst, at the same time, several of the tissues are continuous, and common to two or more of the above named parts, so that any disease attacking one, is apt to spread to others.

Of the nose. As it regards the NOSE, the phenomena produced by its cavities being infected with the *Bot*, have already been mentioned. Fungous excrescences not unfrequently proceed from the turbinated bones and septum, and appear as

Polypus. *polypus*, so interrupting the respiration. In their more aggravated form they secrete pus, and produce a considerable discharge, so that the animal may be supposed to labour under *glanders*. The remedy here is to remove the polypus with the forceps, subsequently washing the

Nasal gleet. parts with a styptic lotion. NASAL GLEET from inflammation of the schneiderian membrane, has sometimes been described as an independent local complaint. Any observations which we have to make upon it, will find a place, while considering those disorders of which it frequently constitutes a conspicuous part.

Trachea. Choking. When treating of the gullet, we had occasion to mention one cause of CHOKING, connected with foreign bodies lodging in the narrowest part of the tube. We have now to add, that draught horses, during a dead pull up hill, sometimes choke from the pressure of the collar on the windpipe. They may stagger a little before falling, or fall without warning. The wheels should, under the circumstances, be set across the road, and the collar thrown off the windpipe. The accident is most apt to occur when the animal is put to draw with a bite in his mouth, as often happens on canal banks. When the morsel goes down the gullet, it is intercepted by the collar, and the two pressing on the windpipe, compress it; and so many horses have been lost. A knowledge of the fact should lead to the necessary precaution.

Laryngitis. INFLAMMATION OF THE LARYNX frequently takes place, the disease at the same time spreading from the delicate lining membrane to the nearest parts. In this way lymph is effused, and the play of the parts impeded. Sometimes the smaller cartilages themselves are altered, being thickened and contorted, and small tumors are apt to be produced, both within the tube and without it. The marked symptoms are local pain, difficulty in breathing and swallowing, and general fever: the treatment required is venesection, and the other parts of the antiphlogistic regimen. Tumors occurring in this locality in cattle, constitute the disease called CLYERS, which, though it may not for a time interfere with fattening, yet speedily injures health.

Clyers.

Disorders of breathing. Connected with the larynx and trachea chiefly, but sometimes also with the lungs, are various distressing affections of the breathing, which, from the character of the respiration, have procured for the animals labouring under them such names as these, *Piper*, *Trumpeter*, wheezer, whistler, blower, grunter, roarer, to the causes of which infirmities we shall now allude. The rima glottidis and larynx are supposed to be peculiarly affected, when there is that sharp and hasty sound which is expressed by the first two of these terms. The *Whistler* utters a somewhat shrill sound, when in somewhat continued exercise, and this is supposed referable to some cause producing contraction in the trachea. The sound of the *Wheezer* is somewhat like that of an asthmatic person, and is supposed to proceed from an over-copious secretion in the bronchiæ; it is heard even when the horse is at rest. *Roaring* is confined to the increased sonorousness of breathing, on any considerable exertion. A *Highblower* is an animal which puffs and blows loudly, dilating his nostrils, while the flanks are comparatively quiet; and in the *Grunter* it is supposed there is some altered structure in the lungs, which interferes with all considerable exertion. A horse labouring under this infirmity, when suddenly touched with the whip or spur, will at all times utter this grunting sound. In further illustration of these material infirmities, we shall dilate a little on ROARING and BROKEN-WIND. Mr White mentions, that he had once and again examined animals which were perfectly useless from ROARING, and had found every part healthy except the larynx, which was ulcerous. Many roarers, however, have subsequently been examined, in which the larynx was quite sound, while the lining membrane of the trachea was thickened. Tight reining has been ascertained to be a cause, the windpipe being found flattened, and bent from the bearing of the bridle. Obstruction of the nose, hepatization of the lungs, and even enlargement of the liver have been suspected. In several instances, we have noticed tumors in the passage, and a wasting of the muscles on one side of the larynx. THICK-WIND is distinguished from BROKEN-WIND. In the former the breathing is rapid and laborious, but the inspiration and expiration are equally so. In broken-wind again, the inspiration is performed at one effort, and the expiration requires a kind of double effort. The cause of broken-wind seems to be the rupture of some of the air-cells of the lungs, whereby air-vesicles are produced on the surface, and the expulsion of the air is rendered less direct and easy. It is usually produced by animals being urged to over-exertion when in bad condition, though a horse may become broken-winded in a straw-yard. Although the cure of this affection is not to be expected, yet it can often be very much

Roaring.

Broken-wind.

mitigated, and that mainly by attending to the diet, condensing nutriment into the smallest compass, keeping the bowels open, and giving little water before work. Calomel, opium, camphor and digitalis, however, give wonderful relief.

Tracheotomy. TRACHEOTOMY is the operation by which the trachea is opened, the name *Bronchotomy* being often inaccurately applied to it. It is performed chiefly in cases of sudden obstruction, which cannot be removed on the instant, but which it is anticipated will soon be overcome. It is frequently practised on the horse. The operation is simple, the incision being made in the mesial line, separating the muscles, and then slitting through a couple of rings, the canula being left in. While the opening was left, we have known the roaring horse to be free from his complaint for many months.

Strangles. The account usually given of STRANGLES is not so simple as it might be. It is a disease of the horse, and few escape it. It attacks them when young, colts not excepted. Generally, however, it exhibits itself at the age of four or five years, during the prevalence of pulmonary complaints. It may be defined a catarrhal affection, accompanied by a specific phlegmonous affection of the cellular membrane of the throat, tending to abscess, with slight fever. The whole cellular membrane, between the branches of the lower jaw, becomes distended with serous and lymphy effusion, acquiring a firm and solid feel, and is tender and hot; it advances to suppuration, and terminates in abscess generally of the throat, but sometimes also in other parts of the body. This alone is Strangles, all other symptoms being only concomitant or accidental. Such are the soreness of the throat, the redness and discharge from the nose, the cough, and tumefaction of the salivary glands. Inflammation of the trachea and lungs, and some say glanders, may supervene upon this complaint. The only treatment required in an ordinary case, is the application of a blister, to urge nature to terminate the process. The abscess should be opened as soon as ripe, and suppuration promoted by slight digestives. Hundreds of cases have been witnessed without one fatal termination.

Catarrh. COMMON COLD is familiarly known in the lower animals; and three stages are observable. At first, there is a discharge, chiefly watery, from the nose, with irritation of the nasal and neighbouring membranes; secondly, in two or three days there is a copious discharge of thick yellow mucus, and the membranes become slightly inflamed; there is irritation of the larynx and trachea, with fulness and a tendency to swelling, feverishness, and sonorous cough. Soreness of the throat is often present, and the lungs frequently become involved. In the third stage, usually most marked where the treatment has been neglected, the animal apparently regains health and spirits, but the cough, though milder, continues; an evil which should anxiously be guarded against. The nasal discharge also continues, and sometimes terminates in *glanders*. The complaint, as it regards the horse, requires nothing more than a few days' confinement in a stable of mean temperature, from 50° to 60° Fahr., warm clothing, bran-mashes, instead of corn, with a little laxative and diuretic medicine. If the parts about the throat are much involved, an epispastic should be applied. If the constitutional symptoms run high, venesection should be employed, and the sooner the better. In combating the third stage, a rowel or seton may be made under the jaw; the bowels should be kept free, exercise steady, and by and by tonics, as sulphate of iron.

Influenza. EPIDEMIC CATARRH, INFLUENZA, THE DISTEMPER of *Horses* and *Dogs*. This very prevalent disorder is, we conceive, not infectious, but epidemic; and different epidemics exhibit characters as diverse as it is possible to conceive. Consisting essentially of the train of symptoms so well known as catarrh, with the addition of fever, more like the product of an atmospheric poison than any thing else, the symptoms are sometimes those of high inflammatory diathesis, sometimes those of the most complete depression and exhaustion. Hence, the most accurate description of one epidemic is quite inapplicable to another, and even the individual cases differ, though partaking of the general type. This being true of the symptoms, there is a corresponding variety in the treatment and probable result. We shall now make a few remarks on cases at the opposite limits of the scale, and the reader will readily understand the intervening varieties. Influenza, with inflammatory diathesis, comes on like a severe attack of common catarrh, the lining membrane of the nose being highly irritable, with a distillation of watery fluid: the irritation rapidly spreads to the frontal sinuses, the eye and throat, with oppression, and failure of appetite. A thick discharge of the watery fluid soon takes place, the parts about the throat and windpipe become highly irritable, swallowing difficult, and the food is quidded, and even water swallowed with difficulty; the cough is very troublesome; the pulse rapid, and the fever high. These symptoms would run rapidly to a fatal termination, and blood-letting is clearly the best remedy. The blood is very sizy, the venesection may require to be repeated, and the other parts of the antiphlogistic regimen must be employed. But at other times the attending fever is of the very opposite character, amounting almost to putrid fever, when the visitation goes under the name of *malignant* epidemic. Debility, and tendency to sinking, here form the type of the attack. From the very commencement, the poor animal staggers in his gait, and can scarcely stand; he refuses food, and is deprived of all energy; the pulse is rapid, small, and weak, while the catarrhal symptoms are still conspicuous. Even at the commencement, there is scarcely room for venesection, and yet the tendency to inflammation is manifest, and not only in the respiratory organs, but also in other parts. Here the practice must be the reverse of that above alluded to: refrigerants, anodynes, tonics, saltpetre, sweet spirits of nitre, camphor, laudanum, and wine must be had recourse to, with hand-rubbing, wisping, judicious ventilation, clothing, and placing in a loose box. These are descriptions of extreme cases, and the vast majority met with in practice lie between them. Sometimes an early and moderate bleeding is all that is required. The tendency to sinking appears to be thus diminished; and sometimes no venesection is required. The complaint is apt to be tedious, and also to relapse; so that the considerations which would recommend care after common catarrh, are doubly cogent in reference to influenza. We have stated that this is the distemper of the horse: it is also the DISTEMPER of Dogs, in which it is apt to be severe, accompanied with a staggering gait, and delirium from affection of the brain. In milder cases, it forms the SNIFTERS of various animals.

Inflammation of the lungs. Under the general term INFLAMMATION OF THE LUNGS, several very distinct affections are included. The bronchiæ are lined with mucous membrane to the minutest cells; the entire organs—all the lobes—are included in the lining membrane, the pleura, which also covers the whole internal cavity of the chest; and there is finally the parenchymatous substance. Hence bronchitis, pleurisy, and pneumonia, though all in a general way, inflammation of the lungs, and having many things common, yet differ widely in symptoms, history, and treatment. They are all in the highest degree dangerous, are marked by symptoms of high inflammatory fever, and require prompt observance of the antiphlogistic regimen. A tendency to BRONCHITIS, and often more than a tendency, is witnessed in *catarrh*, and still more in influenza, and it also shows itself as an original idiopathic affection. The irritation and soreness are considerable, the natural secretion is apt to be greatly augmented in quantity and vitiated in quality, becoming viscid and grumous, and suffocation and death may be the consequence of the

Veterinary Science.

Bronchitis.

Veterinary Science.

effusion into the air-cells. PLEURISY, again, is apt to attack the serous membrane, from sudden chills and other causes; the inflammation speedily proving a great check to the breathing. Serous effusion is usually the consequence, whereby the play of the lung is impeded, and may be arrested, and lymph effused, whereby dangerous adhesions are produced. PNEUMONIA, again, with somewhat of the same local symptoms, extends to the disorganization of the proper substance of the lungs, loading them with effusion, and hepatizing them. These diseases, though distinct in origin and nature, are apt to be combined in progress, and hence the hazard is augmented, as in the prevailing epizootic in cattle. Bleeding in large quantities at first, refrigerants, laxatives, sedatives, blistering, and setons, are the appropriate remedies; but these remedies are seldom applicable to cattle, as the disease has almost always advanced too far before being noticed, and tonics are required instead. As bronchitis advances, care must be taken not to allow the strength to sink too much. CHRONIC COUGH is a sequel of the foregoing inflammatory diseases, and of others of the lungs and windpipe, as has been mentioned. The animals suffering under it should be watched, and the bowels kept easy. Boiled turnips, carrots, barley, and bran mashes form useful feeding.

Pleurisy.

Pneumonia.

Chronic cough.

Phthisis.

CONSUMPTION affects cattle, sheep, and swine, more frequently than horses, and the young rather than the old. It arises from neglect, cold, and exposure in damp unprotected situations, and is very insidious in its attack and progress. The animal becomes thin, the coat staring, the skin appearing as if glued to the ribs; obstinate cough supervenes; discharge is frequent from the nose, and granular swelling appears about the neck. On dissection the lungs are studded with tubercles. Ulcers in the lungs, *vomicæ*, may be numerous, and the mesenteric glands are frequently implicated and enlarged. The mesenteric artery, too, is often enlarged, especially in the ass; and within it are found a number of worms, the STRONGYLUS and FILARIA. It is in the early stage alone of the complaint, that any thing can be done.

Glanders. Farcy.

GLANDERS and FARCY are usually regarded as the most important diseases to which the horse is subject; (the mule and ass are also liable;) but every account with which we are acquainted is nevertheless unsatisfactory, and more calculated to puzzle and perplex, than to enlighten and satisfy. One author mentions that no fewer than sixty causes of the complaint have been enumerated; whence it may safely be concluded that the true one was yet to be found. The full elucidation of the subject would require more space than we can here allow. Professor Dupuy, in his celebrated work on the subject,[1] rendered good service when he so ably and irrefragably established that in this disease (for all are agreed that the two named above are only modifications) there occurs the development of innumerable tubercles;—whether in one particular tissue, as the mucous, or in several, has not hitherto been determined. To these minute tubercles we should ascribe the origin of the nasal affection, as well as of the farcy-buds; the absorbents in the former, as well as in the latter affection, being speedily implicated. At first they are very small. Under certain circumstances they may lie dormant: or, on the contrary, they may proceed rapidly to loathsome maturation, when various parts of the frame become crowded and contaminated with them, to the destruction of life. It is a domestic disease, unknown among the hordes of wild horses; of a scrofulous character, unheard of in climes where struma is unknown; and of starvation and filth, because it seldom or never originates in a well-ordered stable, but is ever found rife where the horses are over-worked, ill-fed, and neglected, and, worse than all, kept in an Augean pest-house. That such combination of circumstances may induce tuberculous complaints, the history of many familiar diseases too clearly demonstrates. The matured matter of these tubercles is decidedly contagious, and thus may the disorder be inoculated and propagated in a thousand ways; and it may also, as held by high authorities, have still more frequently a spontaneous origin. There is nothing inconceivable in the idea that this, like other tuberculous complaints, may, in its early stage, and under favouring circumstances, lie, or be kept latent and innocuous; whilst if advanced to a certain point, it becomes irresistible, and defies all the powers of art. Hence the distinction into *chronic* and *acute* glanders.

Veterinary Science.

The disease usually attracts attention only when the tubercles are advancing to maturity. *Farcy-buds*, small tumors, are now seen in various situations, as on the legs, or inside of the thigh, under the collar bone, in the head, neck, or in the axilla, produced apparently from over-exertion or exposure. They are touched with the cautery, tonics are prescribed, (sulphate of copper, zinc, or iron); every thing in the stable obnoxious to health, is removed; the animal gets full diet, plenty of air and exercise; the disease is arrested, and a cure may be effected. When the disorder commences, as commonly, in the nasal cavity, the discharge is successively watery, gluey, pustular. When inspected, the surface being studded with small ulcerating tubercles, has a marked and peculiar aspect, not uniform and continuous, but irregular and angry, from the number of minute irritable ulcers, with deep and well-marked margins. Under favouring circumstances, these spread fast; all the nasal cavities are soon involved; the lymphatic glands under the jaw participate; tubercles develope themselves in the lungs, usually the prelude of death; the horse loses flesh; he falls from his meat; cough succeeds; strength fails; the discharge from the nose becomes purulent and most offensive; and the emaciated loathsome animal must at length be relieved from his misery. Whenever the disease appears among a sound stud, the infected animal should instantly be removed, and every part of the stall, stable, and its furniture must undergo a complete purification; but the glandered horse, well fed, lodged, and groomed, will often work for years, and improve upon it. Such animals are sources of danger to other horses, also to their attendants, who may be glandered by them; but isolated, they may be profitable to their owners, and not burdensome to themselves. Simple discharges of matter from the nostrils must not be mistaken for glanders.

Hydrothorax.

WATER OF THE CHEST, as stated above, is an occasional consequence of Pleurisy, which, under the circumstances, requires time and great care ere it can be remedied. Often, in more chronic cases, pain and symptoms of inflammation are not detected. Effusion, however, steals on in the cavity, and the lungs become oppressed. The chest when struck, now returns a dead, dull sound, and not the sonorous tone it emits when the healthy lung is in immediate juxtaposition. Diuretics, laxatives with mercury, tonics, and repeated blistering, are the appropriate remedies. It is for such cases that PARACENTISIS is performed, by which the watery effusion is evacuated, and the lung left free. This operation, however, is often little better than a forlorn hope. The operation is very easily performed. An opening is made between the eighth and ninth ribs, near the anterior edge of the ninth, and not far from the sternal extremity. The trochar and canula are here to be introduced, and the stream flows apace. Caution however must be exercised, in arriving at a correct diagnosis; for we have known the animal expire in the hands of the operator, from air rushing in upon the

Paracentisis.

[1] De l'Affection Tuberculeuse, &c. Paris, 1817.

Veterinary Science.

healthy lung, instead of water flowing out and relieving the oppressed one, so causing instant destruction.

The DISEASES OF THE HEART AND BLOOD-VESSELS have not received that attention in veterinary science which their importance claims. As throwing light upon some of them, and on pathology generally, we shall here introduce

Plethora.

a few remarks on PLETHORA. When the supply of food is greater than the exigencies of the system require, an animal usually becomes fat, but still may be tolerably healthy. When, however, a sudden change is made from poor to rich feeding, not fatness but plethora may be the consequence; more blood is formed than the system can easily dispose of, and it becomes oppressed. This effect is often witnessed in cattle and sheep, which, after indulging for a time in luxuriant pastures, take what is called A SHOT OF BLOOD. All at once they become very ill; some part of the body swells, becomes puffy, as if containing air, and in two or three hours the animal is dead, from the *Quarter-evil*, already described. Upon dissection a large quantity of black and decomposed blood is found in the cellular membrane which during life was distended. The horse seldom suffers in this way; but in him plethora creates a strong disposition to inflammation of the eyes, feet, and lungs, and sometimes to an eruption which is called a *Surfeit*, or the *Nettle-rash*. The hair falls off in patches, and the skin is raw and pimpled. There is also a tendency to *grease*, and to what has been designated a WEED, or *Shot of grease*, in the heavy draught breed. One of the legs, generally a hind one, suddenly swells; the animal becomes lame; there is pain in the inside of the thigh, increased upon pressure; and fever supervenes. The disease bears a close resemblance to the *Phlegmasia dolens* of our species, and the leg often becomes as thick as the thigh. We consider it a disease of the absorbents; these vessels enlarging to the size of a quill, and having their vasa vasorum highly injected. We have seen it occur chiefly during continued rest after hard work and exposure to weather, in animals which were highly fed. The best treatment is large bloodletting, scarifying the limb, fomenting, and applying hay, straw, or flannel bandages, with purgatives and diuretics. The pressure of a bandage will expedite the reduction of the part to its natural dimensions.

Carditis.

Some of the diseases of the sanguiferous system are acute, others chronic. Inflammation may attack the heart, and is always most dangerous; the symptomatic fever runs high, and is generally remarkable for the bounding velocity of the pulse. Venesection must be alike prompt and free, and the other parts of the antiphlogistic regimen in keeping. When pleurisy exists, the pericardium cannot well escape, and the latter membrane may be the origin of the mischief. In either case the PERICARDITIS is apt to terminate in *dropsy* of the membrane, in one case of which we found not less than four pounds of serum. *Enlargement* of one or other of the cavities is by no means uncommon, and the valves are often *ossified*. *Aneurism* of the great arteries occurs, but is very rare. These affections are more frequent in cattle than in the horse; and not unfrequently we have witnessed some foreign body, as a needle, work its way into the heart, and destroy life.

The only other complaints belonging to this section we shall mention, are diseases which arise from *phlebotomy*. The first of these, though it may alarm the inexperienced,

Thrombus.

is very trifling. It is a globular swelling, *Thrombus*, sometimes as large as the fist, arising immediately around the newly-made incision. The filtrating of the blood from the vein into the cellular membrane, which is the cause of the disease, is rarely very copious. Gentle pressure may be used at first, and should be maintained with a well-

Inflammation of jugular.

applied sponge and bandage, kept cool with cold lotion. Occasionally there is *inflammation of the jugular* from bleeding, and more rarely, of the plate and saphena vein. The cause is usually referred to the use of a foul fleam or lancet, or from allowing hairs or other foreign bodies to interfere with the accurate adjustment of the edges of the wound. The first appearance indicative of the disease, is a separation of the cut edges of the integuments, which become red and somewhat inverted. Suppuration soon follows, and the surrounding skin appears tumified, tight, and hard, and the vein itself above the orifice, feels like a hard cord. After this the swelling of the neck increases, accompanied with extreme tenderness; and now there is constitutional irritation, with tendency to inflammatory fever. If, under these circumstances, the animal be not relieved, the head becomes swollen on one side, the sensorium disturbed, and death is sometimes, though seldom, the consequence. The mischief is supposed to arise from the inflammation spreading from the surface to the interior coat of the vein; and the disease in the neck does not proceed towards the heart, as in man, but in the opposite direction. In the first stage we must try to relieve by evaporating lotions, or by fomentations. If these fail, and as soon as the disease begins to spread in the vein, the appropriate remedy is to touch the spot with the actual cautery, simply to sear the lips of the wound, and apply a blister over it, which may be repeated. Purgatives in full doses must be administered, and the neck as much as possible, kept steady and upright.

Veterinary Science.

Strongylus and filaria.

Connected with the circulating system, we should not omit to state, that small parasites, popularly called worms, are sometimes found in the blood-vessels, and other parts. This is true in man, and still more in the lower animals. We allude chiefly to the *strongylus* and *filaria*, which are found chiefly in the aorta and cœliac plexus. Allusion has already been made to them under phthisis; and it is one of the filaria that is found in the aqueous humour of the eye of horses in the East Indies. They are accused of appearing in some of the viscera, and there causing disease; as, for example, in the bronchiæ. In these cases turpentine should be administered by inhalation and the mouth. We once, whilst castrating a colt, met with a strongylus in the spermatic vessels. The subject is too extensive to be prosecuted here.

Diseases of brain and nerves.

The BRAIN and NERVES, as may be well supposed, present an interesting, if not a very numerous group of diseases. We commence with FITS of various kinds; and this the more willingly, as we are not satisfied that their pathology has very satisfactorily been ascertained. SWOONING FITS appear in horses and dogs. The horse staggers, sways from side to side, lies on the pole, stops and falls, or falls running. The fit probably arises from accumulation of blood in the head; it is most common in hot weather, going up hill; and some animals are very liable to it. Whenever the horse shews any tendency to giddiness, he should be pulled up, and so may recover in an instant. Before proceeding, see that the windpipe be free, and the bearing rein slack. Should the horse fall, remove the harness, assist him to rise, and if water be at hand, give him a few mouthfuls. This attack, in popular language, is a *Megrim*, an appellation which should give place to that of VERTIGO, or *Giddiness*. There are other and more aggravated forms of the affection, proceeding to what is regarded EPILEPSY, or the *Falling-sickness*. In these cases the horse rears up and falls suddenly, or he reels about and then falls; the muscles of the eye are affected with spasm, so that this organ is greatly distorted; the breathing is often disturbed, and sometimes there is violent motion of the legs. The duration of the fit varies from a few minutes to several hours. "He," says Mr Youatt, "who values his own safety, or the lives of his family, will cease to use an epileptic horse." The late Dr Gregory had his arm broken from a horse being attacked with this disease. If the horse is plethoric, he

Swooning fits.

Vertigo.

Epilepsy.

should be bled. The bowels should be kept open, and the feeding be moderate. Setons to the neck should also be tried. APOPLEXY is a disease to which the horse is not very subject. Sometimes the stroke is sudden, and the case severe; but more commonly some warning is given. The animal will be seen with his head low, or supported against the manger; he staggers as he stands, and if moved, appears as if he would fall; his sight and hearing are affected. He will continue in this state for several, perhaps twelve hours. He then falls, grinds his teeth, with eyes open, protruded, and fixed, the pupil dilated, and twitchings about the frame; he is unable to swallow, the drink is returned by the nostril or the mouth, and the dung often voided involuntarily; the twitchings increase to convulsions, and death speedily closes the scene. The treatment is the most copious bleeding, with the other parts of the antiphlogistic treatment.

Apoplexy.

Phrenitis.

The frightful disease of MAD STAGGERS is seen in the horse, ox, and sheep. It occurs in plethoric subjects after great exertion, exposure to the meridian sun, and high feeding, though the distension of the stomach has not a primary share in its production. The first stage is that of sluggish circulation and oppressed brain. The animal stands with his head thrust against some hard body, his eye closed, and he yawns, doses, and sleeps till he actually falls down, sometimes backwards, in his stall. This startles him, and he rises hastily, but soon relapses. The pulse is slow, breathing sometimes stertorous, the appetite impaired, and the animal will dose with the morsel in his mouth. These lethargic symptoms may continue several days, and may at last end fatally, or they may be succeeded by wild and furious delirium. The pulse now rises, respiration quickens, the countenance becomes animated, the conjunctiva flushed. Fits of delirium appear, the horse dashes himself furiously about, throws himself down, lies in temporary insensibility, suddenly rises, again becomes convulsed, and again relapses into stupor. Approach to such an animal is highly dangerous; for he will rear, wheel round upon his hind legs, and fall back with a violence which threatens instant destruction. These convulsive agonies may continue for hours, before death closes the scene. On dissection the brain is found turgid with blood, and water occasionally in the ventricles. Cattle and sheep, (in these animals it is the *Louping-ill*), when attacked, tremble, fall down, and subsequently roll and toss about: the ox gores at every thing within its reach. The treatment must be most active. The bleeding should be pushed to faintness, and the more rapid the evacuation the better. The same energy should be employed in the other parts of the antiphlogistic regimen.

Hydrocephalus.

WATER IN THE BRAIN, *Dropsy in the Brain, Sturdy, Straggles, Turn-sick, Gid, Giddiness.* This disease is rare in the horse, not unfrequent in cattle, dogs, and swine, and very common in sheep. The disease is sometimes acute, but more frequently chronic, occasionally congenital, when many ounces of fluid are found in the ventricles. Young sheep and hogs are most liable to Sturdy. At first the animal detaches itself from the rest of the flock, and appears dull and stupid; by and by it goes round about, as if giddy, and at length appears blind, in which state it may long continue, and yet recover. The disease depends upon the effusion of serum, either on the surface of the brain, or into the ventricles, or upon the spontaneous growth of hydatids within the skull. The remedies which have been proposed, are the making of a perforation into some part of the cranium, and amongst others, through the nose and cribriform plate into the cavity; and in those cases where the serum or hydatids are thus reached, no doubt immediate benefit may result. About one case in three has been thus restored. The hydatids may occur in any part, and careful examination on the surface sometimes shews the exact locality, so that the spot may be trepanned.[1] In cases where their effects cannot be detected, it would be folly to proceed farther. Blisters and setons have been proposed, and laxatives should be given; and if these fail, the animal should be killed, as the disease does not injure the mutton. PALSY also occurs in the domestic animals, and is common in the dog. In the horse it is sometimes idiopathic, but occurs more frequently in the hind legs, from severe injury of the spine. If the disease is slight, epispastics, with friction, may in time be useful; if aggravated, the case is hopeless. TUMORS OF THE BRAIN are frequently met with on dissection, and precede and probably produce some of the diseases of the head. Their existence, however, can only be suspected, and art has no control over them.

Palsy.

Tumors.

Our views respecting the highly interesting disease of RABIES, or CANINE MADNESS, are not a little peculiar; but being the result of considerable observation, and leading, as we conceive, to most important and beneficial results, we will neither conceal nor compromise our decided convictions. We hold, then, that rabies is essentially an inflammatory affection, attacking peculiarly the mucous membrane of the nose, and extending thence through the cribriform plate of the ethmoid bones, to the anterior part of the brain, so giving rise to derangement of the nervous system, as a necessary consequence: this train of symptoms, we consider, constitutes mainly, if not wholly, the essence of an occasional epidemic, not unlike some forms of influenza or epizootie; and the bite of a rabid animal is not, to another so bitten, the exciting cause of the disease, but merely an accidental concomitant in the prevailing disorder; and the disease, hydrophobia, produced in man, is not the result of any poison introduced into his system, but merely the melancholy, and often fatal result of panic fear, and of the disordered state of the imagination. Those who are acquainted with the effects of sympathy, and imitation, and panic, in the production of nervous disorders, will readily apprehend our meaning; and if our view be correct, the immense importance of disabusing the public mind on the subject is apparent. This is a task which we hope one day to accomplish. But in the mean while, considering the vast responsibility of promulgating these views, without the utmost certainty as to their truth, we shall not press them; nay, we shall, to any greater extent, withhold them at present, and shall now do all the justice our limits allow, to the elucidation of the prevailing, and what is generally considered, the established pathology and history of the complaint.

Hydrophobia.

It is generally alleged, that the complaint arises spontaneously only in the canine and feline species of animals, including the dog, fox, wolf, and the domestic cat, and that from them it is readily communicated to others, as to horses, cows, sheep, and man. It is frequently stated, that these last have not the power of communicating the complaint to others; but Mr Youatt mentions, "that several farriers have lost their lives from being bitten or scratched in the act of administering medicine to the rabid horse;" and Magendie and Breschet have taken the saliva of a man who was labouring under hydrophobia, and have therewith inoculated healthy dogs, which, they assert, became rabid, and bit other dogs, so spreading the contagion. Though the disease has received its name from the horror of water exhibited by man, yet the symptom seems confined to him; rabid dogs lap freely, and sheep affected with the disease are rather greedy of water. It is a great mistake to suppose that every rabid dog must be wild and furious; on the contrary, his faculties are not particularly disturbed; there is no want of his usual sense, but great irritability; for a time he knows his master's voice, and obeys him. The early symptoms in *Dogs* are usually some peculiarity of manner, and some strange departure from their usual habits. In

[1] A trochar or canula may be introduced, and the hydalic drawn through the canula by a syringe.

many instances the peculiarity consists in a disposition to pick up straws, and other small objects. Others keep licking another dog, or cold iron, or stones; and there is often a strong antipathy to strange dogs. As the disease advances, they bite those dogs with which they are associated, and lastly the persons round them, though this only in a moment of irritation; there is also a peculiar change of the voice. In the *Horse* the symptoms are such as the following. The animal will go to work apparently well; all at once he will stop, tremble, heave, paw, stagger, and fall. Almost immediately he will rise, draw his load a little farther, again stop, look about him, and again fall. The progress of the disease is rapid. The animal kicks and plunges in the most violent manner, often attempts to seize and bite other horses and the attendants, and will level to the ground every thing before him, himself sweating, snorting, and foaming amid the ruins; palsy of the hind legs is apt to supervene, the thirst is excessive, and the act of swallowing apparently difficult. The disease rarely extends beyond the third day. On dissection, there is usually found inflammation at the back part of the mouth and nose, and at the top of the windpipe, the origin of the spinal cord, and frequently in other places. Dogs are much more susceptible of the disease than man; and thus of twelve dogs and four men bitten by the same mad dog, every one of the dogs has died of the disease, while the four men escaped. The interval between the infliction of the wound and the invasion of the symptoms varies considerably; both in man and the horse, the mean average is from three to eight weeks. As to the treatment, we would first of all state frankly, that as to cure after the disease has fairly manifested itself, none is recorded. Hence the importance of prevention, and that mainly by the speedy and complete excision of the wounded parts. At the moment the animal is bitten, no time should be lost in endeavouring to get rid of the poison. Free washing may do something, and after this a firm compress between the wound and the heart, till a veterinarian, or some competent person, be procured, who should excise freely, and apply caustic. Copious venesection has proved the most soothing remedy; and with a hint from the experience of Magendie we must close. This physiologist, knowing the influence of largely substituting water for blood in the circulating system, tried the experiment in a mad dog which was in a furious state, and which instantly became tranquil, and so continued for five hours. Again, he injected one pint of water at 100° Fahr. into the vein of a man's arm; directly the patient, from being highly rabid, became tranquil, and the pulse fell from 150 to 80 in a minute, the convulsive motions ceased, he drank water without difficulty, and continued to improve till the fifth day. In another case, death followed as in this; but at the moment of the experiment, there was a great and sudden change for the better. The patient lived eight days after the injection, and died, possibly from another complaint. In attempting this treatment, the veterinarian requires unusual dexterity, as well as caution.

Tetanus.

TETANUS. *Lock-jaw* is another of the most melancholy diseases which can be witnessed. It is common in the horse, and occurs also in the ox, sheep, and dog. It proceeds from two causes, the most common being the irritation of a punctured wound in some tendinous part, as the foot, (which may give no kind of trouble,) or from *docking* or *nicking*, and also spontaneously, especially in climates warmer than our own. The symptoms of the complaint soon discover themselves. The muscles of the jaw, as expressed in the synonym, are early affected, forming *trismus;* and the other voluntary ones are soon implicated, as those of the neck, spine, and extremities. The animal does not feed as usual, and appears unwell; he drops his food and gulps water. Saliva drops from his mouth, and the jaws are found to be stiff; even his head cannot be turned, the eye squints and is drawn into the socket, and the *haw* protruded, the back and loins become stiff, the tail erect, and the extremities singularly fixed, "like the legs of a stool;" the pulse at the commencement is not affected, but soon gets quick and irregular; the breathing becomes laborious, the countenance wild, and expressive of great agony; the poor animal may die in one or two days, or it may be nine or ten days before he is exhausted. The rule of practice is to look for the wound which has preceded the disease, and if there be irritation, to relieve it. For the constitutional symptoms, large bleeding is the most powerful remedy, and injecting water into the veins, as noticed under rabies, would be well worth a trial. This will promote the operation of physic, which in the estimation of many is the chief remedy. A half drachm of croton seed, and six drachms of aloes, may be administered, and repeated the following day, the bowels being torpid. Blisters and opium have been extensively used, with the appearance of success. In the few cases where life is spared, great care is necessary during the protracted convalescence.

Neurotomy.

NEUROTOMY is the cutting of a nerve which supplies a part labouring under painful disease, for the purpose of easing or removing that pain. High expectations were originally entertained of the value of the operation; and though many have been disappointed, yet it frequently proves highly useful. Mr Sewell, its respected proposer, has operated upon more than five hundred cases, and in eight out of ten, with marked success. The fore-feet are peculiarly liable to accident and disease, and the operation has been very much confined to them. The structure of the parts greatly favours this success, for the muscles which move the feet are situate high up the leg, and their nerves need not be interfered with, as it is cutting the nerve of sensation which affords the benefit. The practice was originally proposed for horses incurably lame, and for cases that would not admit of relief by any other means, and to these alone it should be restricted. It is applicable to any kind of chronic lameness about the feet or coronet, except pumice feet, and succeeds best where there is an alteration in the form and texture of the hoof; and in anchylosis it often yields great benefit. If inflammation or ulceration be present, the operation must at all events be postponed, since it would aggravate these states. The operation is not difficult. The horse being cast and secured, an incision about two inches long is to be made upon the side of the large pastern bone, in the direction of the large pastern nerve; the trunk of the nerve is to be laid bare, avoiding the artery which lies anteriorly, and about one inch of it is to be cut out; the excision is to be made on both sides, and in both legs, if both are diseased; the wound to be healed by the first intention.

Stringhalt.

STRINGHALT is more a blemish than a disease, though it is very unpleasant to the rider. It is a convulsive kind of action in the muscles of the hind-leg, supposed owing to irregularity of nervous influence. Neither its precise seat nor nature is accurately known, and dissection has failed to throw any light upon it. It is most conspicuous when the animal commences exercise, and in a short time it greatly subsides. Any method of cure is yet unknown.

Diseases of the eye.

The DISEASES OF THE EYE are highly important, the slightest blemish interfering with the usefulness and value of the animal; and, though not numerous, they have ever been found most untractable, and regarded as reproaches to the science. Criticising the labours of the many authors who have so ably illustrated our art, is what we would scrupulously avoid; but, on the present occasion, a sense of duty constrains us to warn the student generally against many of the views and statements which have been promulgated; no where have we seen more loose observation, more erroneous pathology. The organ is most delicate, the anatomy most minute; and it is upon an accurate acquaint-

Veterinary Science.

ance with this, both in health and disease, that practice can alone be based. To one ignorant here, all is obscure; his treatment must be undecided, and of course unsatisfactory. The diseases of the organ are, to a remarkable extent, the result of the domesticity to which we have subjected the lower animals, and especially the horse; in our stables they are ever forcing themselves upon our notice, while so long as he is running wild, and breathing the untainted air, they are never seen, and in the other animals, with the exception of the dog, they are but rarely witnessed.

Ophthalmia.

The front of the ball of the eye, and the inner surface of the eyelids, are covered with a membrane, the conjunctiva, most of whose blood-vessels are colourless. This membrane is the seat of common OPHTHALMIA, in common speech, of *inflamed eye*. Whatever irritates, inflames; and hence we see how the application of any foreign body, a few particles of sand, or a hair, may produce ophthalmia. This is the only disease of the eye which has been noted in cattle, and arising solely from the cause now mentioned. Sometimes these bodies are actually impacted into the membrane; a straw or hay seed may be so fixed, that all the efforts of the animal may fail in removing it; the eye becomes red and troublesome, and hence the importance, in all cases, of carefully examining the organ, and satisfying ourselves there is no cause of external irritation present. It is not, however, to be supposed that these foreign bodies are the sole cause of ophthalmia in the horse. From the state of the constitution, exposure to weather, and often the contamination of a filthy stable, idiopathic ophthalmia arises. The conjunctiva and its offshoots, towards the lachrymal gland, and elsewhere, are implicated. It is found universally red and inflamed, the eye is very sensitive to light, it waters much, and there is pain. This may excite general fever, or it may not; and this is always an important element. It may continue a long while, and prove troublesome without the deeper parts of the organ being implicated, or they may be involved; and it may be *acute*, with a tendency to high inflammatory symptoms, or it may be *chronic*, where there is the very opposite, namely, weakness and debility in the parts, and in the frame; this latter state is apt to be quite as tedious, though not so painful as the former. This distinction should never be forgotten in practice. When called to treat a case of this common ophthalmia, after ascertaining there is no irritation from a foreign body, we are first to examine the state of the stable, that the air is not impure, or too hot. If a horse has previously had inflammation of the eye, this attack may be nothing more than a local affection of the vessels, and possibly a wash, or rather an injection, of some simple collyrium,[1] once or twice a-day, is all that is required. These external applications should not be used too strong. Bran mashes should be substituted for corn, and a laxative prescribed; the horse should not be exposed to the inclemency of the weather, and the light in the stable should be moderated. All this may by some be regarded unnecessary and troublesome; but so long as it is a fact that one attack is apt to induce another, and that these in the long-run destroy the sight, it is the greatest folly not to meet, and if possible remove at once, the present ailment, and the future tendency. If the symptoms do not speedily yield to this treatment, we must determine whether there is inflammatory diathesis, or chronic debility; the condition of the animal, of the pulse, of the eye, are all to be considered, and if these show that mischief threatens, the antiphlogistic regimen in all its parts is to be energetically applied, and the eye is to be protected from the stimulus of light; fomentations and injections are carefully to be applied, and setons introduced. These directions are given under the supposition we have to deal with acute ophthalmia. When it is chronic, this treatment would be detrimental, both to the disease and the constitution. In the chronic form, the local treatment generally consists in stimulating collyria and setons, and the constitutional, instead of being lowering, must be strengthening. A peculiar, and not unfrequent cause of irritation we must not omit, which consists in the inversion of the lower eyelid, whereby the eyelashes constantly play upon the eye-ball, and thereby inflame it, constituting the disease called TRICHIASIS. This complaint we have often witnessed in dogs and cattle, but seldom or never in the horse. Pulling out the eye-lashes affords but a temporary relief, as they soon grow again in a wrong position. A part of the loose skin of the eye-lid must itself be removed, by pinching up a portion, and removing it with scissors, and healing with stitches; after this, when the parts heal, the cilia are found restored to their proper position. It is in this connection that NEBULÆ and SPECKS in the cornea are to be considered; the former being more superficial, the latter dipping more deeply into the substance of the part. Directly in the sphere of vision, these of course impede it, and cause obscurity of vision. Even here, we must proceed gently. These blemishes are the pure consequences of inflammation, and this subdued, their tendency is to disappear. Time and nature will do much; and the duty of the practitioner consists in helping forward the salutary process where necessary, by gently stimulating washes, whilst irritating powders should be avoided, especially in dogs. OPEN ULCERS frequently occur in the cornea, and are always to be viewed with alarm, as they may speedily cut deep. They should be delicately touched with a fine point of lunar caustic, by which the morbid action is usually changed.

Veterinary Science.

Trichiasis.

Nebulæ.

Specific ophthalmia.

As the conjunctiva is liable to acute inflammation, so is it with the internal membranes, the choroid, iris, &c. It seldom, however, happens in the lower animals, that an opportunity is afforded of examining these parts under disease separately; and hence, what has been called INFLAMMATION OF THE INTERNAL EYE, SPECIFIC INFLAMMATION, AND MOON BLINDNESS, may be considered as an inflammation of the whole internal parts of the eye. That there is any thing *specific* about this complaint, we do not believe, although high authorities have proceeded so far as to distinguish it as the specific gouty opthalmia. All that we are to learn from this is, that the constitution is often at fault, and must be regulated; that there is an inflammatory diathesis, and that every error in diet or treatment tells upon the weakened part. This inflammation is apt to move from one eye to another; and overcome once, to return again and again, (hence its name moon blindness,) till the sight is entirely lost; all which, we believe, is owing mainly to two causes already hinted at; namely, that due care is not taken of the organ in early attacks, and in endeavouring to restore the constitution to sound general health. These views are to be our guides in the treatment; and if this required to be decided in the opthalmia already dwelt upon, still more is it necessary in that now under consideration. As to the symptoms, this internal inflammation may exist without the external parts participating, but usually they are soo involved. One symptom very pathognomatic we must also add; it is a whitish opaque state of the cornea, which supervenes in a few hours, completely obscuring vision, and interfering with our perception of what is going on within the eye. This is not to be viewed as a distinct disease of the cornea, as is often supposed, but merely the result of the fulness and pressure of the parts behind; and were that once relieved, the cornea would immediately regain its transparency. As to treatment, we have scarcely

[1] COLLYRIA. *Cooling.* Sugar of lead, one drachm; opium wine, one drachm; water, two pounds. *Stimulating.* Sulph zinci, two drachms; opium wine, one drachm; water, two pounds; or nitrat. argenti, one drachm, aquæ distill. one pound.

Veterinary Science.

any thing to add. The sight, and the whole value of the animal is at stake, and what is done, must be done promptly and thoroughly, and the animal should not be removed from the sick list till he is in sound wholesome condition, sound in lith and limb, when he would be as little liable to future attacks as others.

Cataract.

CATARACT is an opacity of the lens or its membrane. It may follow as a consequence of the disease last described, when no remedy can be of any use, as the whole organ is disorganized; or it may occur as a pure idiopathic disorder, when, ere long, it will completely obstruct vision. In this form it usually appears in the dog. This complaint can only be remedied by an operation; and extraction being exceedingly difficult in the horse, all attempts to perform it should be relinquished. Couching would be more easily performed. But still the removal of the lens is so detrimental, that it is scarcely worth a trial.

Amaurosis.

GUTTA SERENA, or *Glass Eye*, when pure, is an affection of the retina, or of the brain, which fails to receive the usual impression from light. Professor Coleman had a horse which fell backwards, on one side of the head, and the opposite eye became amaurotic, probably from injury to the brain. A touch of apoplexy often produces the same effect; or it may be acute inflammation of the retina; or chronic, which may never have attracted observation. Depletion may at first be tried; and then the use of setons, attending to the general health.

Worms in the Eye.

WORMS, the *filaria* already mentioned, (p. 636,) occur in our East Indian possessions, in the aqueous humour of the eye of the horse, a curious locality, their occupancy of which is not readily accounted for. Twenty cases sometimes occur during a twelvemonth in a single cavalry stud. On puncturing the cornea, the prisoners escape.

Diseases of the ear.

The EAR of the dog is liable to several diseases, of which the internal and external canker are the most considerable.

Canker. Internal.

The former consists of irritation and ulceration of the tube, with discharge of matter, sometimes of blood, occasionally closing the ear, and producing deafness; or the ulceration may spread to the internal parts, and produce death. This chiefly occurs in water-dogs. Injections of sugar of lead, white vitriol, or nitrate of silver, are the most powerful local remedies, and the general state of health must be improved.

External.

Canker in the outside of the ear appears most frequently in smooth coated dogs: and the same kind of washes, with the decoction of oak bark and iodine ointment, are the most effective remedies. If it does not yield to these, the ear must be rounded, and the disease extirpated.

Of the skin.

CUTANEOUS AFFECTIONS. The name SURFEIT has been given to a crop of small tumors about the size of hempseed or large peas, which break out suddenly over the bodies of horses, especially in spring, often beginning at the neck, and frequently disappearing as quickly as they come, being attended occasionally with itchiness. Its pathology is obscure. The digestive organs are supposed to be at fault; and poisonous herbs, a draught of cold water when heated, sudden exposure to cold and damp, calcareous balls, and worms, have been suspected. Moderate bleeding and laxatives form the surest remedies. The somewhat continued use of doses of antimony, nitre, and sulphur, have been much commended. The horse should be comfortably clad, and should receive regular exercise.

Mange.

MANGE is a very common and most loathsome disease of the domestic animals, arising from a cause the very reverse of that implied in the name of Surfeit, being the result of under-feeding, starvation, and neglect. It is in a high degree contagious; for not only contact with an infected animal, but even with the sordes from his body wherever they are found, is sufficient to produce it. While we thus state that mange is common in the lower animals, we mean nothing more than that a disease of the same general character may affect them all. It is sometimes supposed that all these are specifically the same, and that the itch in man, and the mange in the dog, are identical with the disease in the horse, the ox, and the sheep. This, however, we apprehend is carrying the matter too far. It is said the mange in cattle has been propagated to the horse, and from the horse to cattle; but it is held there is no decided instance of the mange in the dog being communicated to the horse, and still less of the mange of the quadruped being communicated to man, or the itch of man to the quadruped. We may here however mention, that we have seen a herd of cattle labouring under ring-worm, a modification of the complaint, and the two boys who were keeping them were infected with the same complaint. In the *Horse*, we have noticed two varieties, the one of which is vesicular, and in this we are persuaded animalculæ abound, whilst in the other there is only simple disquamation, with oozing of ichor and falling off of the hair. This variety is much the most common in summer. The face, particularly round the eyes and lips, the sides of the neck, the withers, shoulders, axillæ, and thighs, are the parts most conspicuously manged. The grand cause we have already hinted is under-nourishment, what is technically called *poverty;* but when once induced, if care be not taken, it will spread widely. In stables we consider it a token of want of care, and sufficient dressing. When wishing to rid an animal of the complaint, or to guard against its being infected, the most minute attention must be given to its clothing and furniture, as brushes, combs, pails, manger, &c.: these must be purified and kept uncontaminated; after this the cure with a little trouble is readily effected. As to constitutional treatment, gentle laxatives and alteratives should be prescribed, and the food be nourishing and soft. As to local, sulphur ointment, in any of its well-known formulæ, combined occasionally with some preparation of mercury, or tar with rape-seed oil, is a sovereign remedy. In *Cattle* and *Sheep*, the ichorous matter is apt to collect in the neglected hair and wool, and hence the name SCAB-MANGE, SCAB, and SCURF. In commencing the cure, these sordes must be washed off, and *salving* must be most freely administered. This should be done at the first appearance of the complaint, for when once introduced into a flock it greatly diminishes its value. It seems to spread not so much by direct contact, as from the infected stones, banks, &c. which are the principal resorts of the flock. In *Dogs*, the disease is obstinate, and exhibits several varieties. One of them is called the *Red-mange*, in which there is no particular eruption, but a general redness of the skin, which is hot to the touch. Sulphur, sulphuric acid, chlorine, mercurials, tobacco, and hellebore, are the local remedies, and laxative and alterative medicines, with abundant light feeding, the general.

Erysipelas.

ERYSIPELAS in sheep appears in various slight modifications, which have received different names.

Wildfire.

WILDFIRE it is said, generally shews itself at the beginning of winter, and first attacks the breast and belly. The skin inflames and rises into blisters, containing a reddish fluid, which escapes and forms a dark scab. The animal sometimes fevers. Venesection should be used, the skin should be washed with a solution of sugar of lead or with lime water, and physic given, such as salts and sulphur; afterwards a few doses of nitre. Under a somewhat severer form, it is apt to spread quickly among the flock. It appears generally in autumn, and does not continue above eight days at a time, although the sheep once affected are liable to a relapse. The treatment is the same as in wildfire, but somewhat more vigorous.

Mallenders.

MALLENDERS is the name given to a scurfy and somewhat obstinate eruption on the inside of the hock of the horse in the fore-leg, and SALLENDERS to a similar affection in the hind one. Washing with solution of corrosive sublimate, or with sugar of lead, or anointing with iodine ointment, with an occasional laxative, and diuretic, should effect a cure.

Sallenders.

Saddle-galls.

SADDLE-GALLS are sores

Veterinary Science.

arising from the friction of the saddle, for which a strong solution of salt with tincture of myrrh is a good application, whilst attention should be paid to the padding of the saddle. The tumors which sometimes result from the pressure of the saddle go by the name of WARBLES; to which, when they ulcerate, the name of SITFASTS is applied, from the callous skin which adheres to their centre. Goulard water may be used to disperse the swelling; a digestive ointment will remove the sitfast, and the sore should be healed with a solution of sulphate of zinc.

Warbles.

Sitfasts.

Grease.

The well-known and unsightly disease called GREASE, is a morbid secretion from the cutaneous pores of the heels and neighbouring parts, of a peculiar greasy offensive matter, attended with irritation and increased vascular action. It is most frequently seen in coach and cart horses, but often also in young colts which are badly cared for; it is most common in the hind feet, but occurs in all. Its main cause seems to be sudden changes in the condition of the foot from dry to wet, and from heat to cold, greatly augmented, of course, by evaporation. It is seldom seen in thorough-bred horses, and this probably because they are well groomed. The first appearance of grease is a dry scurfy state of the heel, with heat and itchiness. Swelling succeeds, with a tendency to lameness; the discharge augments in quantity, the hair begins to fall off, and pain and lameness become marked. Deep fissures are apt to become prominent symptoms, and to occur sometimes at the upper portion of the fetlock; in the former case they are designated DRY-CRACKS, in the latter RATTAILS, by farriers. Pustules now arise, which burst, and expose great coarse granulations, which have received the name of GRAPES, and which, with the thickened skin, become tough and hard, almost horny. The diseased foot at this time may be thrice its natural thickness. As to treatment, prevention being better than cure, we re-echo the statement of Professor Coleman regarding cavalry horses, that the soldier deserves punishment whose horse becomes greasy. In the early stage, the parts should be washed twice a day with soap and water, and a solution of sugar of lead and sulphate of zinc applied; this may not be chemically scientific, but we have found it superior to any thing else. Even in old and aggravated cases it is very efficacious. When grapes abound, a little of the powdered zinc should be introduced among them, which application often supersedes the application of the actual and other cauteries, as do also, more decidedly, strong washes with diluted sulphuric and nitric acids. We have also found a solution of corrosive sublimate, and iodine ointment, excellent remedies. If the horse be strong and full of flesh, laxatives should be given, followed by diuretics; if weak, tonics may be added to these last. The feeding too must be varied with the condition;—green meat and carrots should be given, and mashes frequently as a substitute for corn. During convalescence exercise should be given; and bandages and pressure hasten the cure.

Warts.

WARTS or ANGLE-BERRIES are prone to occur in the horse, and in cattle, and to be troublesome, more especially in calves. They appear about the eyelids, ears, nose, neck, groin, sheath, and are apt to spread. They often require removal. Sometimes you must cast the horse, and remove them with the scissors, knife, and cautery, or with a ligature. Escharotics, however, have great efficacy, such as alum, blue-stone, corrosive sublimate, and sometimes arsenic.

Tumors.

ENCYSTED TUMORS also are by no means uncommon, a kind of *Talpæ*, which may generally be removed by simple incision, having no decided root or adhesion.

Vermin.

The domestic animals are apt to be annoyed with vermin, which slight knowledge and attention would readily remove.

Flies.

In particular states of hot weather, FLIES, especially some species of the *Tabanidæ* are great nuisances; they will make a spirited horse unmanageable, will drive cattle from their pasture, to scamper about in a state of extreme agitation; and as to sheep, the Ettrick Shepherd says,—"The flies were at this time settled in the fold in such numbers, that we could with difficulty see each other; the heads of the sheep were swollen and black, and seemed all over a scab, the flies being settled on them like a black cloud. A few were anointed with train oil, and no sooner were they turned among the rest, than in less than a minute, not a fly was to be seen." Spirit of tar, added to the oil, renders it more efficacious; and as the fly will not face these remedies, horses and cattle should be protected.

FLEAS are very troublesome to dogs. Washing and combing are not without efficacy, nor tobacco-water, though it frequently poisons the dog. Mr Blaine says, "the only tolerably certain cure I know is, to make the dogs sleep on fresh yellow deal shavings." Rosin and bran may be usefully applied. Oil, however, we believe, is a specific. We have invariably found it so for LICE, so common in horses, cattle, sheep, and dogs. In horses, the prevalence of this filthy vermin shows want of dressing, although it is often connected with poverty and mange. In the slighter visitations we have invariably found, that a single dressing of olive-oil alone, will cause their disappearance from all the above-named animals, or a solution of corrosive sublimate, although this requires a little more caution. For the TICK in sheep, a mixture of tar and turpentine is a speedy and certain poison; and for the MAGGOT, sometimes a most fatal vermin in this quadruped, the great matter is the shepherd's watchful care; as soon as discovered, the affected part must be shaved, and spirit of turpentine, or of tar with oil, or a solution of corrosive sublimate, applied.

Fleas.

Lice.

The tick.

Maggot.

(W. D.)

WORKS GENERALLY ON THE SCIENCE.—Blaine's *Outlines of the Veterinary Art*, 5th edit. Lond. 1841; Boardman's *Dictionary of the Veterinary Art*, 4to, Lond. 1805; Briddon's *Treatise on Veterinary Art*, 8vo, 1846; Dick's *Manual of Veterinary Art*, Post 8vo, 1842; Dun's *Veterinary Art*; Field's *Records of Veterinary Art*, 8vo. 1843; Gunther's *Homœopathic Medicine of Veterinary Art*, 8vo, 1846; Hind's *Veterinary Art Surgery*, 2d edit. 12mo, 1829; Hurtrel's *Dictionnaire de Méd. et Chir. Vétérin.*, tom. 4, Paris; Huzard's *Esquisse de Nosographie Vétérinaire*; Morton's *Calculus Concretions of Animals*, 8vo, 1844; Do. *Veterinary Pharmacy*; Rydge's *Veterinary Art Surgeon's Manual*, 12mo, 1840; Sainbel's *Lectures on Farriery*, 4to, Lond. 1793; Do. *Veterinary Art Surgery*, 2d edit. 12mo, 1829; Spooner's *Veterinary Art*, post 8vo, 1851; *The Veterinarian Periodical Journal*; *The Quarterly Journal of Agriculture*; Thomson's *Popular Essays on the Diseases of Horses, Cattle, Sheep, Swine, and Dogs*, Perth, 1831; White's *Treatise on Veterinary Medicine*, 4 vols. Lond. 1815; Do. *Dictionary of the Veterinary Art*, 1 vol. 12mo. Lond. 1817; Do. *Compendium of Veterinary Medicine*, 18th edit. 1852.

ON THE HORSE.—Aimer's *Diseases of Horses*, 12mo; Blaine's *Village Farrier*, 12mo; Bower's *Diseases of Horses*, 8vo, 1838; Brown's *Manual of Farriery*, 8vo, 1847; Clarendon's *Treatise on the Foot of the Horse*, 12mo, 1847; Clark's (B.) *Essay on the Bots of Horses, &c.*, 4to, Lond. 1815; Do. *New Pharmacopœia for Horses*, 4to, Lond. 1819; Do. *Description of a New Horse-Shoe, &c.*, 4to, 1820; Do. *History of the Horse*, Lond. 1834; Clark's (J.) *Treatise on Shoeing, &c.*; Do. *On the Prevention of Diseases of Horses*, 8vo, Edin. 1785; Do. *Structure of the Foot of the Horse*, 4to.; Do. *Defence of Hoof of the Horse*, 4to.; Do. *Vertical Section of the Horse*, folio; Do. *Bits of Horses*, 4to; Do. *Gripes of Horses*, 4to; Clater's *Farrier*, 12mo; Coleman's *Observations on Structure and Foot of Horse*, 2 vols. 4to.; Freeman's *Observations on the Horse's Foot*, 4to, Lond. 1796; Ferguson *On Blood-letting from Horses*, 8vo, 1843; Gerard *On Teeth of the Horse*, 12mo; Goodwin's *System of Shoeing Horses, &c.*, Lond. 1820; Jeee's *Handbook of Farriery*, 12mo, 1844; Lawrence's *Inquiry into the Economy of the Horse*, Lond. 8vo.; Do. *Complete Farrier*, 4to.; Do. *History and Delineation of the Horse*, Lond. 1809; Mayhew's *Treatise on Mouth of the Horse*, 8vo, 1849; Miles *on Foot of the Horse*, Imp. 8vo, 7th edit. 1850; Peale's *Observations on Diseases of the Horse*, 1814; Percivall's *Lectures on the Vet. Art*, 3 vols. 8vo, Lond. 1823; Do. *Systematic Treatise on the Diseases and Lameness of the Horse*, 8vo, Lond. 1834; also, his *Anatomy of the Horse*; Do. *Hippopathology*, 3 vols. 8vo; Do. *Twelve Lectures on the Horse*, 8vo, 1850; Do. *Form and Action of the Horse*,

Vevay ‖ Viatka.

8vo; Do. *Lameness in the Horse*, 8vo; Do. *Anatomy of the Horse*, 8vo; Pursglone's *Guide to Farriery*, 8vo; Rosser's *Art of Farriery*, 8vo; Skeavington's *System of Farriery*, 4to, 1850; Solleysell *on Shoeing of Horses*, 8vo, 1842; Spooner's *Foot and Leg of the Horse*, 12mo, 1840; Do. *Influenza of the Horse*, 12mo; Stubb's *Anatomy of the Horse*, Folio; *The Horse*, "Library of Useful Knowledge," 8vo, Lond., 1840; Tindall's *Yorkshire Farriery*, 8vo; Turner *On Foot of the Horse*, royal 8vo; Vines' *Diseases of Horses*, 8vo; Do. *On the Glanders*; White's *Compendium of Farriery*, 8vo; Wilkinson *On Tetanus and Epidemic Catarrh*, Lond. 1818; Wilkinson's *Diseases of Horses*, 8vo; Winter's *Health and Disease of the Horse*, 8vo, 1846; Youatt *On the Horse*, 8vo, 1846.

ON CATTLE.—Clater's *Cattle Doctor*, 10th edit. 12mo, 1848; Dickson *On Cattle*, 12mo, 1851; Earl's *Disorders of Neat Cattle*, 12mo; Knowlson's *Cattle Doctor and Farrier*, 3d edit. 8vo, 1845; Lawrence's *General Treatise on Cattle*, Lond. 1805; *Cattle*, "Library of Useful Knowledge," 8vo, Lond. 1840; Skellett's *Treatise on Cattle*, Lond. 4to; Do. *Parturition of the Cow*, royal 8vo; Stevenson's *Cattle Doctor's Vade Mecum*, 18mo; Webb's *Diseases of Cattle*, 12mo; White's *Compendium of Medicine for Cattle*, 6th edit. 8vo, 1841; Youatt *On Cattle*, 8vo, 1851.

Viatka ‖ Vicenza.

ON SHEEP.—Blacklock *on Sheep*; Hogg's *Shepherd's Guide*, Edin. 1807; *Sheep*, "Library of Useful Knowledge," 8vo, Lond. 1840; Mackenzie's *Diseases and Management, &c. of Sheep*, 8vo, Edin., 1809; Simond's *Small-Pox in Sheep*, 8vo, 1848; Spooner *On Sheep*, 2d edit. 1850; *Transactions of Highland Society*, vol. iii.; Youatt *On Sheep*, 8vo, 1851.

ON THE DOG.—Blaine's *Diseases of Dogs, &c.* 8vo, Lond. 1824; Youatt *On the Dog*, 8vo, 1850.

ON THE PIG.—Youatt *On the Pig*, 8vo, 1847.

VEVAY, a town of Switzerland, in the canton of Vaud, on the Lake of Geneva, 11 miles E.S.E. of Lausanne. It is triangular in shape, and has broad, regular streets, with many handsome houses. One of the two churches contains the tombs of Ludlow and Broughton the regicides, who died here. Woollen cloth, leather, and jewellery are made here, and some trade is carried on in wine. The beauty of the town and vicinity makes Vevay a favourite place of residence for foreigners. Pop. (1850) 5201.

VIADUCT. See RAILWAYS.

VIANA, a fortified seaport of Portugal, province of Minho, at the mouth of the Lima, 40 miles N. of Oporto. Its defences consist of walls and the strong pentagonal fort of Santiago, and the town is for the most part well built. It has three squares, three churches, and two hospitals. The harbour is small, but a considerable fishery and coasting trade is carried on. Pop. 8110.

VIAREGGIO, a seaport of Italy, on the Mediterranean, 13 miles W. of Lucca. It consists of broad, straight streets, lined with substantial and in many cases elegant buildings. It has a fort, two parish churches, a profitable fishery, and some trade in corn, wine, and oil. Pop. 5850.

VIATKA, a government of European Russia, lying between N. Lat. 55. 30. and 60. 5., E. Long. 46. and 54., bounded on the N. by the government of Vologda, E. by that of Perm, S. by those of Orenburg and Kazan, and W. by those of Nigni-Novgorod and Kostroma. Length, from N. to S., 310 miles; breadth, 230; area, 53,126 square miles. The surface is much broken by hills, which are for the most part of no great height, except in the N. and E. of the country, where some of the extreme offshoots of the Ural range enter the government. From these hills the general slope of the land is towards the S., but there is no very decided declivity. The principal river, the Viatka, flows in a very irregular course. Rising in the government, it flows at first W., and then takes a curve and turns to the S. On the S. border of the government it joins the Kama, another river which has its source in Viatka, but which flows for the most part of its course through Perm. The other affluents of the Kama are much inferior in size and importance to the Viatka, which is in all 500 miles long, and navigable for barges up to the town of Viatka. The Kama ultimately falls into the Volga, and carries with it all the drainage of the government. The prevailing geological formation of the country is chalk, and the most valuable minerals are copper and iron, which are worked to a small extent. The soil is in general clayey, and there are few tracts of much fertility. Wide morasses and extensive forests occupy a large proportion of the area. The climate is cold and variable, especially in the north, where it is sometimes very inclement, but towards the south it is much milder, and, on the whole, it is not unhealthy. Most of the inhabitants are engaged in farming, but the mode of cultivation employed is not very skilful. Still good crops of corn, especially rye, barley, and oats, as well as of pulse, hemp, and flax, are raised in this country. The extent of arable land in the government in 1849 was 9,794,923 acres; of meadow land, 3,593,086 acres; and of forests, 18,938,899 acres. From the forests abundance of valuable timber is obtained, especially pine, oak, elm, and lime. The pastures support great numbers of oxen, sheep, swine, and goats, the breeding of which is much attended to. Great numbers of bees are also kept. Deer and other wild animals abound in the woods, and fish in the rivers. Few manufactures are carried on except the building of boats and barges on the rivers, and the making of coarse woollen and linen cloth, leather, and wooden utensils for domestic use. Some trade is carried on, chiefly with Archangel, in corn, timber, flax, honey, leather, fur, iron, and copper. Tea and salt are imported from Asia through Perm. The people of Viatka belong mostly to the Greek Church, with the exception of 69,796 Mohammedans, 9419 Pagans, and a few Roman Catholics, Protestants, and Jews. Education is in a very neglected and backward state here. Pop. (1856) 2,051,914.

VIATKA, the capital of the above government, on the river of the same name, at its confluence with the Chlenopka, 500 miles E.N.E. of Moscow. It is built for the most part of wood, but some of the houses and all the 18 churches are of stone. Among the latter, the most remarkable is a fine cathedral, containing an altar of massive silver. There are also two convents, an industrial museum, and various schools and benevolent institutions. Soap and leather are made here, and a considerable trade in corn and flax is carried on. Pop. 9379.

VIAZMA, a town of European Russia, on the river of the same name, in the government and 100 miles E.N.E. of Smolensk. It is enclosed by walls and built chiefly of wood. The principal buildings are a *kremlin* or fortress, a large number of churches and convents, and various schools. Some trade is carried on in corn, hemp, and linen. The French were defeated here by the Russians, October 22, 1812, when a great part of the town was destroyed by fire. Pop. 12,000.

VICAR, a person appointed as deputy to another, to perform his functions in his absence, and under his authority. *Vicar*, in the canon-law, denotes the priest of a parish, the predial tithes of which are impropriated or appropriated; that is, belong either to a chapter, religious house, &c., or to a layman who receives them, and only allows the vicar the small tithes, or a convenient salary.

VICENZA, a town of Austrian Italy, capital of a delegation of the same name, on both sides of the Bacchiglione, here crossed by several bridges, 39 miles W. of Venice. It is surrounded by somewhat dilapidated walls, about three miles in circumference, and entered by six gates. Though many of the streets are narrow and irregular, the town is remarkable for the number of fine public buildings it possesses, many of them the work of the architect Palladio, who was a native of the town. There is a fine Gothic cathedral, and of the numerous other churches not a few are remarkable for the exquisite paintings they contain.

Vich || Vico.

The principal square contains two massive pillars, erected by the Venetians in imitation of those at Venice; and a very tall and slender Gothic campanile tower. The town-hall, court-house, theatre, and other public buildings, are fine specimens of Palladio's style; and there are also many very beautiful palaces in the town and villas in the environs. Vicenza is the see of a bishop, and contains a lyceum, gymnasium, clerical seminary, public library, and various hospitals. Some remains of antiquity have been preserved here, especially the ruins of a theatre, a palace, and an aqueduct. The most important manufacture carried on is that of silk, which employs a large proportion of the inhabitants. Great numbers of mulberry-trees are grown in the surrounding country. Woollen and linen cloth, leather, earthenware, hats, and articles in gold and silver, are also made here, and a considerable trade is carried on in these articles, as well as in corn and wine. Vicenza was at one time an independent state, but was subdued by the Venetians in 1405. Pop. (1851) 29,728.

VICH, a town of Spain, Catalonia, in the province and 36 miles N. of Barcelona. It is irregularly built on the slope of a hill, and has narrow streets but several public squares. The principal edifices are the old castle, now used as a prison; the town-hall; cathedral, and several other churches; several convents; and a theatre. Vich has various educational and benevolent institutions; manufactures of soap, bricks, tiles, gloves, woollen and cotton cloth, &c.; and it is celebrated for its sausages. Pop. 10,667.

VICO, Giovanni Battista, an Italian jurist, historian, and critic, was born at Naples in 1668. Robust and lively when a child, he met with an accident at the age of seven, from which he recovered, after a three years' illness, with a sickly constitution and a predisposition to melancholy, which he retained through life. He was educated by the Jesuits, under whom he distinguished himself as a pupil, and he afterwards studied law with the purpose of practising at the Neapolitan bar, but his feeble health prevented him from adhering to this resolution. He then accepted of an appointment as tutor in jurisprudence to the nephew of Rocco, bishop of Ischia, and in this situation he spent nine years of his life, devoting his ample leisure in the solitude of a great Italian library, to the study of law and theology, and to the careful perusal of the works of Plato, Bacon, and Descartes.

On his return to Naples, Vico married, and shortly afterwards obtained the chair of rhetoric, with the scanty salary of 100 scudi a year, which, however, he contrived to eke out by giving lessons in Latin. This situation he held for forty years, and it remained his chief source of emolument even when he had attained to the highest distinction as a scholar, and was constantly employed in preparing Latin inscriptions and discourses for the Spanish and Austrian viceroys of Naples.

The whole literary life of Vico was a preparation for one great work, which he had roughly forecast while studying theology, philosophy, and jurisprudence in the library of the Bishop of Ischia. In one of his earliest discourses he pointed out the common bond of the sciences, and alleged that the ancient were superior to the modern thinkers, for this reason, that the former studied all knowledge, human and divine, as a whole, while the latter, splitting it up into theology, philosophy, law, and the natural sciences, have devoted their attention to the exclusive study of one department, without considering that every science is so blended and entangled with all the others, that it is not to be understood as if isolated or disjoined from them. In Vico's time the discussions provoked by the writings of Descartes had not died out. The dogmatic part of the Cartesian philosophy had been abandoned, but the Cartesian method was still the subject of a controversial war. Vico entered the lists to defend the principles enunciated by Descartes, but at the same time to protest against the excessive application of the geometric method to the exclusion of authority or "common sense" as the criterion of truth. His next work was more important than any that had preceded it. It was entitled *De antiquissima Italorum sapientia*. Here he entered on new ground, showing that by the application of his doctrine of method and authority to the history of words, important light might be cast on the opinions of nations at a period antecedent to history. In 1719 the perusal of the great work of Grotius turned the attention of Vico more especially to jurisprudence. The result was a treatise *De uno juris universi principio*, and another, *De constantia jurisprudentis*. In these works the author showed the dependence of law upon political events, and again enforced the essential unity of theology, law, philology, mythology, and philosophical history.

Vico now undertook to recast his ideas, and concentrate them into one great work. Bacon had placed the natural sciences on a firm basis. Vico resolved to rescue history and jurisprudence from the domain of chance. He had discovered the laws which regulate social and political development; and as they had not previously been demonstrated, he gave to them the name of the new science, or *Scienza Nuova*, under which title his book was published. In this work he lays down the principle, that besides the idea of the material world, there existed in the divine intellect, previous to creation, an eternal idea of the history of mankind, and he endeavours to show that this idea is realized in the actual course of events, and that the development of religious creeds, languages, social institutions, and systems of law within certain epochs, affords stronger proof of the moral government of the world than any argument *à priori* can supply. The social world, he says, is the work of the predevelopment of the human faculties; and yet this world has issued from an intelligence which is often contrary, and always superior, to the particular ends which men have proposed to themselves. Divine providence is, in short, discernible through the whole course of history. Vico, in applying his general principles to facts and events, arrived at opinions concerning the history of language, the origin of society and social institutions, the Greek mythology, and the legendary character of the Homeric poems and early Roman history, which coincide in a striking manner with the results of modern criticism and research in comparative philology, mythology, and jurisprudence. Indeed, the sceptical criticism of Germany is anticipated so fully and distinctly by Vico, that Wolf and Niebuhr have been accused of borrowing their ideas from the *Scienza Nuova*. The particular researches of Vico, however, are so much mixed up with visionary and fanciful notions, with errors which, since his time, have been exploded by the results of patient criticism and the progress of comparative philology and the natural sciences, that they now possess no great historical or philosophical value. His great glory lies in the fact that it was he who first showed clearly that in the social and political history of the human race we meet with the strongest evidence of the existence of a Divine providence, and the highest manifestations of order, justice, and progress.

When Vico had published his *Scienza Nuova*, a load was off his mind. The task of his life had been brought to a conclusion. "Since I completed my great work," he says in 1726, "I feel that I have become a new man. I am no longer tempted to declaim against the bad taste of the age, because in denying me the place which I sought, it has given me time to compose my *Scienza Nuova*. Shall I say it? I perhaps deceive myself, although most unwilling to do so; the composition of that work has animated me with a heroic spirit, which places me above the fear of death and the calumnies of my rivals. I feel that

Vico.

Victor. I am seated upon a rock of adamant, when I think of that law of God which does justice to genius by the esteem of the wise."

In 1735 better days seemed in store for Vico with the accession of the Bourbons to the throne of Naples. He was appointed historiographer to the king, while his son took his place as professor of rhetoric. But hard study and domestic care and anxiety had impaired his mental powers, and he ultimately sank into a state of insensibility, in which he knew neither family nor friends, and in this helpless condition he died on the 20th January 1744.

The writings of Vico, after his death, fell into comparative neglect, and they remained almost unknown for nearly half a century. When Goethe visited Italy in 1787, he made the acquaintance of Filanghieri, who had just risen to distinction by his great work on legislation. The brilliant young Neapolitan talked of the subjects on which he had written, of his favourite authors Montesquieu and Beccaria, but above all of Vico, whom he never quoted without a burst of patriotic enthusiasm. Goethe, after a hurried perusal of the *Scienza Nuova*, which was lent to him as a sacred deposit, formed a high estimate of his merits. Preoccupied, however, with other subjects of inquiry, he did not speak of it with sufficient emphasis to bring it prominently under the notice of northern scholars. It was M. Ballanchi who first directed attention in France and Germany to the value of the philosophical notions expounded by Vico. Since this period his reputation has rapidly grown, and we are now accustomed to see him associated with Bacon, Spinoza, and Leibnitz, as one of the greatest and most original thinkers of modern times. In 1822, his works were exactly and literally translated into German by M. Weber, and published at Leipsic. In 1828, M. Michelet, suppressing a few passages, translated his writings into French, under the title of *Principes de la Philosophie de l'Histoire, traduits de la Scienza Nuova de G. B. Vico.* The best editions of the collected works of Vico are those published at Naples in 1818 and 1835 by the Marquis of Villa Rosa, and those published at Milan more recently by G. Ferrari, under the title of *Opere di G. B. Vico ordinate ed illustrate da G. Ferrari*, the second edition of which was published in 1854.

VICTOR, Sextus Aurelius, a Latin historian, lived in the age of Constantius and Julian. From the terms in which he speaks of Africa, describing it as "decus terrarum," it has been conjectured that he was a native of that region. According to his own account, he was born in the country, and was the son of a poor and unlettered father. We learn from Ammianus Marcellinus that the Emperor Constantius having seen Victor the historian at Sirmium, afterwards appointed him prefect of Pannonia Secunda, and honoured him with a brazen statue. At a subsequent period, as we learn from the same authority, the office of prefect of the city was likewise conferred upon him. He is supposed to have been the same individual who in A.D. 369 was consul along with Valentinian. It has been inferred that he was not a Christian.

Aurelius Victor appears to have been the author of a work *De Viris Illustribus Urbis Romæ*, which has repeatedly been printed under the names of Cornelius Nepos, Suetonius, and the younger Pliny. The first of his illustrious men is Procas, king of the Albani, the last Sextus Pompeius. Of this work his tract *De Cæsaribus* is to be regarded as a continuation. It commences with Augustus, and terminates with Julian. This tract first appeared in an edition of the author's works published by Andreas Schottus, Antverp. 1579, 8vo. Here we likewise find the earliest impression of the tract entitled *Origo Gentis Romanæ*, but whether it is a genuine production of the same author has been considered as extremely doubtful. Another work commonly ascribed to him bears the title, *De Vita et Moribus Imperatorum Romanorum; excerpta ex libris Sexti Aurelii Victoris, a Cæsare Augusto usque ad Theodosium Imperatorem.* This title is not applicable to a work composed by Victor, but to one compiled from his writings. The materials appear to be borrowed from Suetonius, Eutropius, Ammianus, and Victor.

Victor ‖ Vida.

Of the entire works ascribed to this author there are several editions, accompanied with the notes of various critics. Among these we may specify that of Leyden, Lugd. Bat. 1671, 8vo. An edition "in usum Delphini" was published by Madame Dacier, Paris, 1681, 4to. For another edition we are indebted to Pitiscus, Traj. ad Rhen. 1696, 8vo. But the best edition of Victor is that of Arnzenius, Amst. 1733, 4to.

Victor, Claude Perrin, duke of Belluno and marshal of France, was born at La Marche in the department of Vosges, on the 7th of December 1764. In 1781, he entered the army as a common soldier, and had just received his discharge at the outbreak of the Revolution in 1789. Fired by the events of that period, he re-entered the army, and rapidly rose to the rank of adjutant-major and chief of a battalion. Having greatly distinguished himself at the siege of Toulon in 1793, where he was twice wounded, he was made adjutant-general, and in the end of that year was transferred to the army of the Eastern Pyrenees, with the rank of general of brigade. In 1796, he joined the army in Italy, where he greatly distinguished himself, and was raised to a general of division. After the peace of Campo Formio he was appointed to the command of the department of La Vendée, and by his wise and conciliatory measures he restored peace to that unsettled country. In 1798 he again entered Italy at the head of a division, and distinguished himself in numerous engagements. At the battle of Marengo, where his division formed part of the advanced guard, his bravery and perseverance were so conspicuous that he was presented with a sabre of honour. On the peace of Amiens he was sent to Denmark as ambassador from France, and he afterwards took part in the battle of Jena, where he was wounded. He fought with great gallantry in several subsequent engagements, and in that of Friedland (14th June 1807) where he commanded the first corps of the grand army, his services were of such importance that Napoleon made him a marshal of the empire on the field. After the peace of Tilsit, he was appointed governor of Berlin with the greater part of Prussia; and for the fifteen months that he held this important office, he seems to have conducted himself with great equity and moderation. In 1808, he was sent into Spain with the command of the first corps of the French army, and gained several brilliant victories, for which he was created duke of Belluno. In 1812, while engaged in the blockade of Cadiz, he was summoned to take a command in the Russian campaign, and distinguished himself particularly at the battle of Beresina. He commanded the second division at the battle of Dresden, and principally contributed to the victory. He maintained his reputation at those of Wachau, Leipsic, and Hanau. In 1814, he bravely seconded the efforts of Napoleon in opposing the advance of the allies. On the restoration of the Bourbon dynasty, he was among the first to tender his allegiance, and received the command of the second military division at Mezières. On the return of Napoleon in 1815, he used his utmost endeavours against his old master, and was one of those that accompanied Louis XVIII. to Ghent. On the second restoration he was made a peer of France, and major-general of the royal guard. In 1821, he was appointed minister-of-war, and in 1823 accompanied the expedition to Spain as second in command. After the Revolution of 1830, he ceased to take any active part in public affairs, and died on the 3d of March 1841.

VICTORIA. See Australia.

VIDA, Marco Girolamo, a very elegant Latin poet, was a native of Cremona, but the time of his birth is uncertain. Different writers have placed it in 1470, 1480, and 1490. His parents were noble, but not wealthy. He prosecuted his studies at Padua and Bologna, and at an early age was admitted into the congregation of the canons re-

Vielle || Vien.

gular of St Mark at Mantua. Here, however, he did not long remain, but removed to Rome, where he became a canon of St John of the Lateran. His poetical talents recommended him to the favour of Leo X., who bestowed upon him the priorship of St Sylvester near Tivoli. Vida published a collection of his poems at Rome in the year 1527. This collection, a quarto of 110 leaves, contains *De Arte Poetica* libri iii., *De Bombyce* libri ii., *De Ludo Scacchiarum, Hymni, Bucolica.* Leo recommended to him the subject of a sacred poem, which was not completed till after the death of that pontiff. Under the title of *Christiados*, it was published at Cremona in 1535. In 1532 Clement VII. had promoted him to the bishopric of Alba. Another pope, Paul III., destined him for the bishopric of Cremona, but died before he could fulfil his intentions. Vida composed several other works in verse, and some in prose. When his episcopal city was attacked by the French and the imperialists in 1542, he displayed his courage by urging the garrison to make a strenuous defence, and he afterwards contributed to the recovery of this conquest out of their hands. He accompanied the papal legates to the Council of Trent; and upon that occasion composed a prose work, entitled *Dialogi de Reipublicæ Dignitate*, and printed at Cremona in 1556. He died at Alba on the 27th of September 1566, and his remains were interred in the cathedral. Vida possessed a very elegant taste, and was a great master of Latin versification. The art of poetry, the operations of the silk-worm, and even the game of chess, he has discussed with singular grace and harmony. The encomium of Pope rendered his name familiar to English ears:

> Immortal Vida, on whose honour'd brow
> The poet's bays and critic's ivy grow.

Of his poems there are several collective editions. A collection exclusive of his sacred poems, was published by Thomas Tristram, A.M., Oxon. 1722–3, 2 part. 8vo. But the best edition, containing all the poems which he acknowledged as his, together with the *Dialogi*, appeared soon afterwards, under the care of J. Ant. et Cajetano Vulpiis. Patav. 1731, 2 tom. 4to. Some of Vida's poems have been translated into various languages. Of the *Poetics*, an English translation was published by Pitt in 1725, and another by Hampson in 1793. Of the poem on *Chess*, an English version is said to have been published by Erskine in 1736. A translation of another work, accompanying the original, appeared under the title of *The Christiad*, a poem in six books: translated from the Latin of Marcus Hieronimus Vida, by J. Cranwell, M.A., Cambridge, 1768, 8vo.

VIELLE (Fr.), a very old stringed instrument, played by means of finger-keys, and the friction of a wheel instead of a bow. It is much used by wandering Savoyards. In Britain it is called a hurdy-gurdy.

VIEN, Joseph Marie, a distinguished French painter, was born at Montpellier on the 18th of June 1716. After spending a very sickly youth, he ultimately emerged from his retirement in 1743 as first prizeman for the French Academy's picture, and as exhibitioner on the government pension to Rome. Next year he departed for Rome, where he remained for six years, and returned to Paris with many excellent pictures. These were succeeded by many others, which in style and technical skill resembled closely the pupils of the Caracci. As Vien's fame extended, it had to contend with the envy of the insipid artists, Vanloo, Boucher, and even Natoire his old master. His "St Denis preaching to the Gauls" justifies the admiration of his cotemporaries, who saw in him the regenerator of the French school. After being decorated with the order of St Michael in 1775, and having been appointed one of the rectors and directors of the French Academy, where he had previously been professor, he was chosen chief painter to the king in 1789. Napoleon on his accession to power, made him a member of the senate, a count of the empire, and a commander of the Legion of Honour. Vien died at Paris on the 27th March 1809 in his ninety-second year. Vincent and David carried out the pictorial reforms which Vien had begun. Vienna.

VIENNA (Wien), the capital of the archduchy of Austria, and of the whole Austrian empire, is situated upon an arm of the Danube, to the south of the main stream, at the mouth of the rivulet Wien, about 500 feet above the level of the sea, and in N. Lat. 48. 12., and E. Long. 16. 22. The city, properly so called, is very small, and occupies only a tenth of the whole space covered by Vienna and its suburbs; but as it is more densely built than the other quarters, its population is more than a seventh of the whole. It is surrounded with a strong and compactly built brick wall, rising from fifty to seventy feet above the outer ditch, and forming a fine terrace, which serves as a public promenade, called the Bastien or Bastions. The Bastions are externally surrounded by the Glacis, an open space, varying in width from about 1000 to 1500 feet, and rising gradually into eminences upon which the thirty-four suburbs are built. These are also surrounded with a wall, the external circumference of which is about 14 miles, but are completely separated from the city by the Glacis, which has been laid out with fine walks, thus affording, in the very midst of the town, every facility for air and exercise to the inhabitants. Within the narrow circuit of the Bastions, which may be walked round in fifty minutes, is contained almost every object of interest or importance; the Imperial palace, the offices of government, the residences of the higher classes, most of the public museums, libraries, and galleries, the best shops, and with one exception, all the good hotels. But like those of most other old towns, the streets of the city are narrow, the *places* small, and the houses lofty, rising to four or five stories, occupied by different families, and, like those of Edinburgh and Paris, approached by a common stair. Their average number of occupants is about forty; but in the very heart of the city, there are large masses of building, containing more inhabitants than many a large village. They are generally built in the form of a square surrounding a small dark court, and are under the superintendence of a *Hausmeister*, a person appointed by the proprietor to watch over the building and its tenants, to preserve the cleanliness of the common passages, and attend to the street door. It is however fashionable to reside in the city; and even a tradesman domiciliated there holds a higher rank than his brethren in the suburbs. The suburbs are not so splendidly built as the city; but their more elevated situation, their wide and regular streets, and the inferior height of the houses, would seem to render them a preferable residence, were it not for the domineering influence of fashion.

Among the numerous public buildings which adorn Vienna, the following may be enumerated as the principal. The Kaiserburg, or imperial palace, is a very large building, of a most irregular form, consisting indeed of a conglomeration of edifices erected at different times, but presenting, nevertheless, many portions remarkable for their magnificence, and the beauty of their architecture. It stands on the south side of the city, encloses several courts, one of which, Joseph's Platz, is adorned with a fine equestrian statue, in bronze, of the Emperor Joseph II., and in another, the Burghof, stands the monument of Francis I., erected by the late emperor in 1846. The part used as the residence of the sovereign is called the Schweitzerhof, and is an extensive building forming two sides of a square, but its appearance is not very striking. It however contains large collections of valuable works of art. The rest of the building is devoted to various purposes, comprising, among others, the Hof-Bibliothek, or imperial library, the chancery of the empire, the imperial riding-school, and the theatre of the palace. The library is a temple worthy of the intellectual treasures which it enshrines. It contains upwards of 425,000 volumes of printed books in every lan-

Vienna. guage, and 17,000 manuscripts, mostly of great value. The palaces and mansions of the nobility are among the most interesting buildings in Vienna, while those devoted to public purposes are seldom worthy of the smallest notice. Among the former may be noticed the palace of the Archduke Charles, and the gorgeous palace of the Prince of Liechtenstein. The ancient palace of Prince Eugene, called the Belvedere, was converted into a museum by Joseph II., to whose munificence and taste Vienna is indebted for one of the best collections of paintings in Europe, one particularly rich in the works of the Flemish and the German schools. The palace consists of two parts, an upper and a lower, separated by a garden. The upper contains the picture gallery; and the lower has a fine collection of ancient armour, and of portraits of the most distinguished persons connected with the house of Hapsburg. The imperial arsenal contains collections of weapons of war ingeniously arranged; and, in the city arsenal, besides sufficient arms for 30,000 men, and a proportional artillery, there is a large collection of Turkish trophies, including the head of the grand vizier, Kara Mustapha, who commanded the Turks at the siege of Vienna in 1683. A new arsenal was completed in 1855, to which these historical collections are to be removed. Vienna is indeed well calculated to afford gratification to the antiquary and the admirer of the fine arts; for, besides the imperial and public collections, many noblemen have their separate galleries and museums, and all are of easy access.

Vienna contains numerous Roman Catholic, one Lutheran, one Calvinist, and three Greek churches, with three Jewish synagogues. The principal of these is the cathedral church of St Stephen, almost in the heart of the city; a beautiful Gothic building, with a steeple remarkable for its symmetry and height. It was begun by the first duke of Austria, before the middle of the twelfth century; in the thirteenth it was twice destroyed by fire, and then rebuilt in its present form. Its greatest length is 345 feet, and its extreme breadth 230; the height of the steeple is 444 feet, and it is ascended by 753 steps. Next in rank to the cathedral the Viennese reckon the church of St Carlo Borromeo, in the suburb Wieden, erected by the emperor Charles VI., between 1715 and 1737. It is a large massy structure, surmounted by an oval dome cased in glittering copper, and having in front a portico of six Corinthian columns. Before the church are placed two Doric columns, each of 13 feet diameter, and having their shafts adorned with a spiral band of bas-relief, representing the life, death, and actions of the saint. The church of the Capuchins is only remarkable for containing the sepulchral vault of the imperial family, where the remains of its members have been deposited, since the emperor Matthias, in 1619. The coffins are of bronze, oblong in form, and very large. But the hearts of the deceased are deposited in one of the chapels of the Augustinians, and their other viscera in St Stephen's. We may also mention St Peter's church, a poor imitation of St Peter's at Rome; the church of the Augustinians, remarkable for its extent, and for the tomb of the archduchess Christina, the work of Canova; and the church of St Rupert, remarkable for its antiquity, having been originally built in A.D. 740, restored in 1436, and again in 1703.

Vienna is most liberally provided with scientific institutions and charitable establishments. The university, founded in 1365, possesses an astronomical observatory, an anatomical theatre, a laboratory, a good library of 350,000 volumes, a museum of natural history, a botanical garden, and in 1858–9 had 85 professors and 2132 students. It is celebrated chiefly as a school of medicine. It was established on its present footing, and the building which it occupies was erected by the empress Maria Theresa, in 1755. Besides the university garden, the emperor Francis II. established, at the Upper Belvedere, another botanical garden, where may be found almost all the plants indigenous to Germany. There are also three gymnasiums equally well appointed, and a commercial academy, in which pupils are instructed, not only in the usual routine of school learning, but also in the science and the history of commerce, the knowledge of merchandise and mercantile law, chemistry as applied to the useful arts, drawing, mechanics, mathematics, &c. The oriental academy is unique of its kind. Here young men are instructed in the oriental languages, and also in the political relations of Austria with the Eastern nations. When their studies are finished, they are employed as secretaries to ambassadors, consuls, or other agents of the government in the East. This excellent institution was founded by the emperor Joseph II., and has produced some of the most distinguished men in the recent history of Austria. The Theresian academy was founded by the empress Maria Theresa, for the education of the sons of the nobility; but her philosophic son, Joseph II., thinking they would be better fitted to perform the duties of good citizens if educated in a school of more mixed character, suppressed it, and distributed the revenues in pensions to meritorious civil and military officers. His nephew, however, the emperor Francis II., re-established it on the original plan. It is under the superintendence of a director, and has twenty-one professors, ten masters of modern languages, and several tutors. Vienna has also an excellent normal school, remarkable as having been established nearly fifty years before any similar institution was attempted in England. The medico-chirurgical academy, founded by Joseph II., is one of the finest buildings in Vienna. It has six professors; and the collection of anatomical figures in wax, by Fontador, is little inferior to that of Florence. The general hospital for the sick, also founded by the same emperor, contains 111 rooms, with 2000 beds, and is computed to receive annually about 10,000 patients. Adjoining to this is the lying-in hospital, another monument of Joseph's benevolence. There is likewise a foundling hospital, and many other charitable institutions, which reflect the highest honour on the founders, and on the liberality of the government which supports them. Besides the scientific establishments already mentioned, there are also at Vienna an academy of military engineers established in 1717, in which seventy-nine pupils are gratuitously educated; a veterinary school; and the imperial polytechnic school, designed for the instruction of tradesmen in their various arts and professions. There are also a considerable number of scientific and literary societies; and the higher classes in Vienna are in general well educated and accomplished. Of all accomplishments, a proficiency in music holds the highest place in the estimation of the Viennese; and, in the practice of this art, they are certainly as much above the other nations of Europe (except the Italians), as they are below them in more solid and useful pursuits.

Besides the Bastions and the Glacis, already mentioned, Vienna possesses several other public walks and gardens of great value and importance to the health and recreation of the citizens. The most celebrated of these is the Prater, said to be the finest public park in Europe. It is situated on the north-east of the city, in a large island, formed by two branches of the Danube. From the entrance, the principal drive extends about half a mile in length, divided by rows of trees into five alleys, of which the two outer are appropriated to pedestrians, the next two to equestrians, and the inner one to carriages. Beyond its termination is the more rural part of the Prater. There the wood becomes thicker, the alleys are no longer straight and formal, but wind irregularly till they are stopped by the banks of the Danube itself. On each side of the drive stretches a verdant lawn, plentifully studded with coffeehouses, and therefore much frequented by the listless pedestrians, who seat

Vienna. themselves under shady awnings, or on the grass beneath clumps of trees, enjoying in idle gaiety their ices, coffee, and cigars. The Prater is frequented daily by the rich and the great, on horseback or in carriages. On Sundays and other festivals the shopkeepers and mechanics likewise resort to it in flocks, to amuse themselves and their children with ninepins, conjurors, see-saws, and roundabouts, and to dine under the trees and the pavilions. To the westward of the Prater, communicating with it by two alleys, and on the same island, is the Augarten, a large enclosure, intersected by regular walks, and containing two large eating-rooms where parties are supplied with dinner, a billiard-room, a dancing-room, and a coffee-room. On the first of May this garden is crowded to excess. The Brigittenau is a large meadow to the west of the Augarten, divided from it by the wall of the suburb, and still on the same island. It contains a church and two public houses, and has its share of company in fine weather. On the first Sunday and Monday after St Bridget's day, a fête is held here; and the number of persons who then come to dance and amuse themselves usually amounts to about 30,000. The island which contains these parks and gardens is connected with the city and the southern suburbs by six bridges. The Volksgarten is a large enclosure, between the Kaiserburg and the south wall of the city; it is in fact the palace garden, but the people are freely admitted, and it forms a favourite promenade. It contains a semicircular building where coffee and other refreshments may be procured; and also a Doric temple, built on the model of that of Theseus at Athens, to contain a group by Canova of Theseus killing the Minotaur. All these promenades are somewhat less frequented than formerly, since railways have increased the facility of getting out to the neighbouring parts of the country. For in-door amusement, there are several theatres. Two of these are in the city, namely, the Burg, or palace theatre, and the Kaernthnerthor (Carinthian gate) theatre. There are others in the suburbs, and one of them, near the Wien, is capacious and handsome. The Kaernthnerthor theatre, where operas are performed, is not remarkable for its architecture or its stage decorations; but its instrumental and vocal performances may, generally speaking, be called the best in Europe.

Notwithstanding the precautions taken by the authorities for the public health, Vienna is decidedly unhealthy, and the climate is generally fatal to delicate constitutions. Colds, catarrhs, and pulmonary complaints are frequent and most malignant. This insalubrity arises from its peculiar situation; for it is exposed to the frequent prevalence of easterly winds, which, blowing over the cold plains of Russia, Poland, and Hungary, the icy tops of the Carpathians, and the waters and marshes of the Danube, increase continually in coldness and dampness till they reach Vienna. To the north wind the city is also equally exposed while from the softer influences of the south and the west it is excluded by a neighbouring chain of mountains, behind which rise the everlasting snows of the Tyrolian and the Carnic Alps. Alternations from heat to cold and from cold to heat are frequent and often violent. The narrow streets preclude any benefit from the sun, even when he shines; and in dry weather the clouds of dust are intolerable.

Vienna is the most important manufacturing town in the empire, and contained, in 1850, 425 manufactories of different kinds. The principal manufactures consist of silk and other stuffs, gold lace, silver lace, ribbons, hardware, and ironmongery goods, needles, philosophical instruments, carriages, and paper. The carriages are prized in most parts of Germany. There are several procelain-works, one of which employs 150 painters, and about 1500 work-people. There are also made steel ornaments, jewels, watches, musical instruments, and chemical productions. There are a cannon-foundry and a manufactory of arms, belonging to government; and tobacco is manufactured under a government monopoly. Vienna is indeed the centre of Austrian commerce, and of the capital and enterprise requisite to maintain it. The produce of its industry gives rise to large exportation, and the trade was greatly increased by the establishment of a national bank in 1818. Besides the Danube, by which Vienna communicates with Hungary and the upper parts of southern Germany, communications have been formed with other provinces by means of railways. One line extends northwards to Prague and Cracow; another eastwards to Pesth and Debreczin; a third southwards to Trieste; and a fourth westwards to Salzburg and Munich. Vienna.

The population of the city and suburbs was found, in 1851, to amount to 431,147 souls, exclusive of the garrison of 15,000 men, and strangers residing there.

The roads immediately beyond the gates of the suburbs are worse than those around any other capital in Europe; and, for several miles, the country is dreary and devoid of interest. But the more distant environs are highly beautiful, and offer numberless interesting excursions to the citizen and the traveller. On the north are the islands of the Danube; on the west the lofty summit of the Kahlenberg; on the south the mountains of Styria, covered with forests and vineyards; and on the east, towards Hungary, extensive plains, along which the eye ranges unobstructed to the distant horizon. A few miles east of the capital is the imperial palace of Schoenbrunn (Pretty Spring,) which was occupied by Napoleon as his head-quarters in 1805 and 1809. It was built by Maria Theresa, who used it as her favourite residence. The building is large and superbly furnished; the gardens are well laid out and very beautiful; and the situation is delightful. Luxenburg is another imperial palace, where the emperor has two residences; the one an ordinary palace, with a theatre and other appendages; the other a sort of model of an ancient baronial castle, with a moat, portcullis, arched gateway, court, hall, chapel, chambers, dungeons, walls, passages, galleries, communications, turrets, and every other proper accompaniment of an ancient fortress. The interior is fitted up in a corresponding style; and at a little distance there is a regular tilting-ground, where occasionally mock tournaments have been held for the emperor's amusement. We may also mention Maria Hitzing, near Schoenbrunn, which possesses a theatre and baths, and has been considered the finest and most picturesque village in Austria; Penzing, noted for its ribbon manufactures; Meidling, for its mineral waters; and Baden, fifteen miles south-east of Vienna, a fine town, with 3000 inhabitants, and frequented annually by 4000 or 5000 strangers, to drink its mineral waters; and near Baden, Weilburg, a magnificent palace erected by the late archduke Charles.

Notwithstanding all its disadvantages of climate and situation, few places possess such ample resources, such general means of enjoyment, both intellectual and physical, as this imperial city. Its magnificent imperial library, scarcely inferior to any in Europe, and its admirable museums and public galleries, are all open to the public, in a manner so perfect as to arrangement and accommodation, as to render them practically and generally useful. The theatres and the opera are all excellent. The streets are crowded with a lively, active, bustling population. Nothing occurs to annoy or molest the passenger; and in no capital of continental Europe does the stranger, whose passports are regular, and conduct orderly, experience or perceive so little of the interference of the police as at Vienna. No beggars are to be seen; no appearance of poverty meets the eye; no one appears badly dressed. The Viennese are indeed a happy and enjoying people; frugal, cheerful, and

Vienne.

contented, they seek no alteration in their condition; they know little of their government but its mild and paternal influence; and they dread changes of any kind as fraught with evil. They see their princes mixing among them with all the simplicity and kindness of private citizens; and they love them with an affection which they believe to be reciprocal. Their general tone of character forms them for tranquil enjoyment in themselves, and promoting it in others; and the lower classes, as well as the higher, are generally found to be mild, kind, and obliging. They are, however, said to be more addicted to sensual than to intellectual pleasures; and the standard of morality is very low among all classes.

Vienna is a place of considerable antiquity, and has been the scene of many historical events. It was originally a small village, encircled by marshes and forests, and peopled by fishermen; and here the Romans established *castra stativa*, or a standing intrenched camp, which gradually became a town, with the name of *Vindobona*. It was here that the emperor Marcus Aurelius died, A.D. 180. On the decline of the Roman empire, it fell successively into the hands of the Goths and Huns; and in 791 was, with the rest of Austria, attached by Charlemagne to his dominions. The origin of the modern town is commonly ascribed to Henry I., duke of Austria, who is said to have founded it in or about the year 1142. In 1241 it was taken by the emperor Frederick II., and again, in 1297, by the emperor Rudolph, who bestowed it, with the duchy of Austria, upon his son Albert, who became the founder of the archducal, now the imperial family. It was in vain besieged by the Hungarians in 1477; but eight years afterwards, it was obliged to surrender to Matthias, king of Hungary and Bohemia. It was besieged by the Turks in 1529, and again in 1683; and was relieved, on the latter occasion, only by the arrival of a Polish army, under their king Sobieski, who beat the Turks with great slaughter before the city. In 1805, it surrendered to the emperor Napoleon; and again in 1809, after a short resistance. Six miles east of the city is the island of Lobau, in the Danube, where the French were encamped for six weeks in 1809; and opposite it, near the north bank of the river, are the villages of Aspern, Essling, and Wagram, where were fought the desperate battles which decided the fate of the Austrian monarchy at that time. In 1814 and 1815, the celebrated congress sat here which settled the political affairs of Europe after the wars of Napoleon. In 1848, the city was for a time in the hands of the revolutionary party; but it was bombarded and compelled to surrender on the 30th October of the same year.

VIENNE, a department of France, bounded on the N. by those of Maine-et-Loire and Indre-et-Loire; E. by those of Indre and Haute Vienne; S. by that of Charente; and W. by that of Deux Sèvres. Length, from N. to S., 80 miles; greatest breadth, 51; area, 2692 square miles. The surface is much diversified with hills, which nowhere rise to the height of mountains. The chain of hills which, under the name of the heights of Gatine, extends from the central mountains of France N.W. to the mouth of the Loire, traverses the S.W. of this department, and sends off a branch to the N.E. in the W. of the department. The central portion, too, is occupied by another series of high grounds, but the extreme E. of the Vienne is low. Nearly the whole country is watered by affluents of the Loire; but a small portion in the extreme S.W. is traversed by the Charente. The river that gives its name to the department is one of the chief tributaries of the Loire. It enters from the S., flows northwards for about 56 miles, and receives most of the other rivers of Vienne. Of these the most important are the Claine, the Dive, and the Vaude, which join it from the left; the Grande-Blourde, the Ozon, and the Creuse from the right; the last of which, however, only flows along the border of the department. The Dive, an affluent of the Thoué, flows for some distance in the west. It and the Vienne are the only navigable rivers. In the N.E. of the country chalky strata prevail, but the geological structure of the remainder consists of secondary rocks; and among the minerals the most important are iron, marble, granite, limestone, millstones, whetstones, and lithographic-stones. The character of the soil is various; in some places it is poor, and in others pretty productive. The climate, though variable, is mild and healthy, except in the west of the country, where there are swamps that render the air insalubrious. By far the largest proportion of the entire area is occupied by arable land, on which wheat, rye, oats, hemp, flax, pease, and potatoes are the principal crops grown. The produce of corn is considerably more than the home consumption. A pretty large extent of ground is occupied by vineyards, but the wine made is not of the best quality. On the extensive natural and artificial pastures large numbers of live stock are raised; and the horses, mules, and sheep are of good breeds. There are many orchards of fruit-trees; and the natural forests afford abundance of chestnuts, which form an article of food to the poor. Besides agriculture and the working of mines and quarries, the inhabitants are largely employed in manufactures. Of these, the most important is that of arms and cutlery at Châtellerault. There are also made in the department coarse woollen cloth, lace, saddlery, and starch; and there are forges, furnaces, bleachfields, &c. The department is traversed by numerous roads, and by the railway from Paris to Bordeaux, from which another line diverges at Poitiers to Rochelle. Vienne has for its capital Poitiers, and is divided into five arrondissements as follows:

Vienne, Haute.

Arrondissements.	Cantons.	Communes.	Pop. (1856).
Poitiers	10	82	113,418
Châtellerault	6	50	60,566
Civray	5	45	49,877
Loudun	4	63	36,000
Montmorrillon	6	60	62,724
Total	31	300	322,585

VIENNE, a town of France, capital of an arrondissement, in the department of Isère, at the confluence of the Rhone with the small river Gere, 49 miles N.N.W. of Grenoble. It is encircled on three sides by hills, and on the west by the Rhone, and is traversed by the Gere. It is an ancient and ill-built town, with narrow, steep, and irregular streets, and a few smart squares. The lower and more modern part of the town is somewhat better, and has a good quay along the bank of the Rhone. The principal edifice is the old Gothic cathedral, considered one of the finest in France. It has two lofty towers, and is richly but not very tastefully ornamented. There are also here an ancient abbey; a handsome college, that formerly belonged to the Jesuits; a public library and museum; corn-exchange; hospital; and barracks. Vienne has numerous manufactories, among which are silkmills, dyeworks, woollen and linen factories, paper-mills, tanneries, glassworks, soapworks, and foundries for copper and lead. An important trade is carried on in wine, cloth, iron, steel, copper, lead, and zinc. The town was called by the Romans Vienna Allobrogum, and some ancient Roman remains still exist in and near it. Pop. (1856) 18,458.

VIENNE *Haute*, a department of France, bounded on the N. by those of Vienne and Indre, E. by that of Creuse, S. by those of Corrèze and Dordogne, and W. by that of Charente. Length, from N. to S., 60 miles; greatest breadth, 50; area, 2130 square miles. The surface is crossed by two chains of hills, nearly parallel to each other. One of these is the heights of Gatine, traversing the S. of the department, and reaching the highest point here in

Vierzon || Viger.

Mont Jargau, 3114 feet high. The other chain of hills is further north, near the centre of the department, separating the valley of the Vienne on the S. from that of its affluent the Gartenipe on the N. It is about the same height as the heights of Gatine; its highest summit, Le Puy le Vieux, being 3196 feet high. The rivers already mentioned are the principal ones in the department. They both flow nearly due west, and neither is navigable. In the extreme south, the Tardoire and Bandiat, affluents of the Charente, and the Dronne, Isle, and Loue, affluents of the Garonne, rise on the slope of the Gatine hills, but after a short course leave the department. The prevailing geological formations in the whole department is the primary and early secondary rocks; and the principal minerals are iron, copper, lead, antimony, coal, granite, limestone, porcelain, clay, and felspar. The soil is on the whole not very fertile, and is ill suited for the cultivation of wheat, but it affords excellent pasturage. The climate is cold, moist, and variable. The arable land forms considerably less than half of the entire area; and the produce of corn is insufficient for the home consumption. Rye and buck-wheat are the principal crops raised; beans and pease are also cultivated. The rearing of live stock is well attended to, and there are extensive meadows and pasture-grounds, as well as unenclosed heaths and commons. The horses are of excellent breed; and they, as well as the mules, sheep, horned cattle, and swine, are very numerous. There are extensive vineyards, but only ordinary red wine is obtained here. Forests occupy a great part of the hills, consisting in the upper parts of pine and birch, and further down of oak, chestnut, and walnut trees. Many of the inhabitants are employed in mining and in working iron, which is the most important production of the country. There are also manufactories of coarse woollen and linen cloth, paper, leather, glass, pottery, and nails. Commerce is facilitated by numerous roads, and by a railway that traverses the department. The capital is Limoges; and there are four arrondissements as follows:—

Arrondissements.	Cantons.	Communes.	Pop. (1856).
Limoges	10	78	142,269
Saint-Yrieix	4	26	43,957
Bellac	8	65	83,078
Rochechouart	5	30	50,483
Total	27	199	319,787

VIERZON, a town of France, department of Cher, on the Yevre near its confluence with the Cher, 20 miles N.W. of Bourges. It is well and regularly built, and has manufactories of woollen cloth, hosiery, leather, porcelain, and earthenware; as well as iron furnaces, forges, and steel refineries. Pop. 6730.

VIETA. See THIRD PRELIMINARY DISSERTATION and ALGEBRA.

VIGAN, a town of France, department of Gard, at the foot of the Cevennes, 40 miles W.N.W. of Nismes. It has a college, a law court, cotton factories, and manufactures of silk and cotton stockings, leather, paper, and glass. A considerable trade is carried on. Pop. 4993.

VIGER, FRANÇOIS, more generally known by his Latinized name of FRANCISCUS VIGERUS, a learned Jesuit, was a native of Rouen, and died there in the year 1647. His treatise entitled *De præcipuis Græcæ Dictionis Idiotismis liber*, is said to have been originally published in 1632. The subsequent editions are very numerous, and some of them are enriched by the emendations and additions of Hoogeveen, Zeunius, and Hermann. An edition, including the annotations of all the three, has been printed in our own country, Glasg. 1823, 8vo. In this improved form the work possesses great value. Viger published an edition of Eusebius, *De Preparatione Evangelica*, accompanied with notes, and a new Latin version, Paris, 1628, fol.

Vigevano || Vigilantius.

VIGEVANO, a town of the Sardinian kingdom, in the division of Novaro, on the Ticino, 58 miles E.N.E. of Turin. It is walled, and for the most part well built; and it contains a handsome cathedral in the principal square; two other churches; an episcopal palace; the ancient castle of the Sforzas, altered into a palace by Bramante, and now used for barracks; an episcopal seminary, college, and other schools; and several hospitals. Silk stuffs, hats, soap, and macaroni are made here. Pop. 15,221.

VIGGIANO, a market-town of Naples, in the province of Basilicata, 21 miles S.S.E. of Potenzo. It has four churches, a convent, hospital, and manufactories of woollen cloth, soap, and wax candles. Pop. 5800.

VIGILANTIUS, the opponent of ecclesiastical corruptions in the fourth century, was born about the year A.D. 306, at Casères, in Spain, a village on the northern side of the Pyrenees. The father of Vigilantius kept the Mansio[1] or station at Calagorris, where travellers were supplied with post-horses and guides to conduct them through the passes; and this brought the young mountaineer under the notice of Sulpicius Severus the historian, who took him into his service, and employed him in the management of his estates and in the sale of the wines which they produced.[2] For his good conduct in this situation he was taken into the confidence of his patron, and lived with him more in the character of a friend than a dependant. There are some beautiful letters still extant, which passed between Sulpicius Severus and Paulinus of Nola, in which Vigilantius is mentioned in the warmest terms of affection;[3] and no doubt he was indebted to his familiar acquaintance with these two eminent persons for his first serious impressions. Sulpicius devoted the whole of his immense property to the exercise of almsgiving and hospitality. Vigilantius observed the melancholy effects produced in the noble mind of his protector by his extra vigilant conduct, and learnt to avoid the lessons which degraded "the Christian Sallust," as Sulpicius was called, to the level of a credulous narrator of false miracles.[4] Vigilantius continued to pass his time in the society of Sulpicius in Aquitaine, or of Paulinus in Campania, until the year 394 or 395 A.D., and with them he had the best opportunities of cultivating sacred learning, and of discussing theological questions. But succeeding to considerable property on the death of his father about that time, he resolved to take a journey to the East for his mental improvement, and carried a letter of introduction from Paulinus to Jerome,[5] who was then dwelling as a recluse in Palestine. This introduction, which took place after he was in priest's orders, was a turning-point in his life. Jerome, who began by speaking of Vigilantius as "the holy presbyter,"[6] and "Christian brother,"[7] soon changed his opinion, and heaped every epithet upon him that was most expressive of contempt and resentment. He punned upon his name, and called him "Dormitantius," and inveighed against him as an ignorant pretender to learning.[8] "Tapster," "madman," "monster," "possessed of a devil," "heretic,"[9] "Samaritan," "worse than a Jew;" these were some of Jerome's terms of reproach applied to Vigilantius; but we search in

[1] Bergier, *Hist. des Grands Chemins de l'Empire*, liv. iv. c. ix. pp. 638, 646, 651.
[2] Vaissette, *Hist. Gen. du Languedoc*, i. 152; Tillemont, *Mémoires*, xii. 193.
[3] See especially *Epist. Paulini ad Sulp. Sev.* No. 1; Paulini *Op.* edit. Antv. 1622.
[4] See the miracles of Martin and of the hermits of Egypt, described by Sulpicius in his *Liber de Vita Martini*, and *Dialogi de Virtutibus Monachorum Orientalium*. [5] *Heir. Op.* iv. pars ii. p. 568. [6] Ibid. [7] Ibid. p. 277. [8] Ibid. pp. 281, 282.
[9] Vigilantius was not named among the heretics enumerated by Epiphanius, Augustin, Theodoret, or Isidorus.

Vignola ‖ Villajoyosa

vain for any fair grounds of accusation in justification of such language, which has been condemned by some of the best writers of the Romish Church. No charges of heterodoxy on the great doctrines of atonement and justification, no imputation of doubtful faith on the doctrine of the Holy Trinity, are advanced against him. The sum and substance of Jerome's indictment amounts to this, that Vigilantius denied the sanctity of relics; that he refused to worship and burn lights at the tombs of the martyrs, and to invocate saints; that he disapproved of vows of celebacy, of pilgrimages, and of nocturnal watchings in cemeteries;[1] that he doubted the presence of departed spirits at the places were their bodies were buried; that he questioned the tales of miracles said to have been wrought at the sepulchres of the martyrs; and that he protested against the imputed efficacy of prayers, either *for* or *to* the dead.[2] Unfortunately we have nothing left but Jerome's account of the controversy; and Vigilantius only speaks for himself in the pages of his adversaries, in some of which he is represented precisely in the same light, and almost in the same words, as the early Christians were by their pagan calumniators. After making some stay in Palestine and Egypt, Vigilantius returned to Gaul in 396;[3] and on his way he visited a Christian community in the Cottian Alps, the ancestors, as we have reason to believe, of the Valdenses, among whom he found persons entertaining the same opinions as his own.

During the eight years that followed, he officiated as priest in the diocese of Toulouse, not far from the Pyrenees; but he does not seem to have been confined to the duties of his parish;[4] for we read of his making excursions into different parts of Gaul to collect books, to copy MSS., and to put himself into communication with bishops and clergy whose sentiments were similar to his own. The influence of the Pyreneean presbyter was exercised in another way; he employed much of his time and his fortune in the transcription and circulation of copies of the Scriptures.[5] The zeal of Vigilantius in his endeavour to check the progress of innovation was unremitting till the time of his death, which took place, it is supposed, at the beginning of the fifth century.

VIGNOLA. (See Barocchio.)

VIGO, a town of Spain, Galicia, in the province and 50 miles S. of Pentevedra, on a hill sloping down to the shore of a wide bay. It is enclosed by a wall and trench, and further defended by two castles on the heights behind. The streets are narrow, steep, and crooked. The town has a Doric parish church, town-hall, custom-house, theatre, college, various schools, hospital, and lazaretto. Vigo has a good harbour, an active fishery, and an extensive export trade in wine, corn, and bacon. Pop. 4167.

VILLAFRANCA, a town of Austrian Italy, in the delegation and 9 miles S.W. of Verona, on the Tartaro. It has an ancient and strong castle, and important manufactures of silk. Villafranca is remarkable for the personal interview which took place here between the emperors of France and Austria, 11th July 1859, and the peace in consequence concluded, by which Lombardy was given to Sardinia. Pop. 7000.

VILLAJOYOSA, a seaport of Spain, on the Mediterranean, in the province, and 20 miles N.E. of Alicant. It has a town-hall, custom-house, two churches, one of which is a substantial building in the Tuscan style, a large prison, and several schools. Manufactures of soap, cordage, woollen and linen cloth, are carried on here; and many of the inhabitants are employed as sailors and fishermen. There are some ship-building docks; but the anchorage is not good. Pop. 8087.

Villalon ‖ Villars.

VILLALON, a town of Spain, in the province and 32 miles N.W. of Valladolid. It has many handsome and well-built houses, three parish churches, several schools, an hospital, and barracks; linseed oil, chocolate, leather, woollen and linen cloth are manufactured, and a highly esteemed kind of cheese is made here. Pop. 4674.

VILLA-REAL, a town of Spain, in the province and 5 miles S.S.W. of Castellon de la Plana, on the Majares, 4 miles above its mouth in the Mediterranean. It formerly had fortifications, but these have all been destroyed except a citadel which still remains. The streets are wide and regular, and there are some good squares. Villa-Real has a large town-hall, several churches, an hospital, convent, and three schools. Woollen cloth, flour, oil, and brandy are the principal articles made here. Pop. 8207.

VILLARS, Louis Hector, Duke of, one of the most illustrious of the French generals, was a son of the Marquis of Villars, and was born at Moulins in 1653. Having finished his early education at the college of Juilly, he became one of the *pages de la grande écurie*, and afterwards entered the army as a volunteer. He served with great distinction in Germany and the Low Countries under Turenne, Condé and the Duke of Luxemburg, and obtained the command of a regiment of horse when he was only twenty-one years of age. After the peace of Nimeguen in 1678, he was for many years chiefly employed in diplomatic services, especially at the courts of Vienna and Munich, and he showed himself not less skilful as a diplomatist than as a soldier. On the breaking out of the war of the Spanish succession in 1701, Villars was recalled from Vienna, where he then was, and attached to the army in Italy. In 1702 he was intrusted with the chief command of an army in Germany to succour the Elector of Bavaria. On the 14th of October he defeated at Friedlingen Prince Louis of Baden, who commanded the Austrian forces, and for this service he received the baton of marechal of France. In 1703 he, by a bold and sudden march, captured Kehl, and afterwards succeeded in effecting a junction with the troops of the elector. An attack was afterwards made by the united forces on the Austrians under General Sterumm near Hochstädt, in which the latter were completed routed. Disgusted, however, with the pusillanimity of the elector, Villars requested to be recalled from his command, to which the king reluctantly gave his consent. He was next intrusted with the difficult office of reducing to submission the reformers of the Cevennes known under the name of Camisards, in which he proceeded less by violence than by moderate and conciliatory measures. In 1705, the French arms having suffered many reverses in Germany, Villars was again sent there with the chief command. He established himself in so strong a position at Fronsberg, that Marlborough, at the head of a large army, was afraid to attack him. He then took Treves and Sarrebourg, passed into Alsatia, and forced the lines of Weissenburg. The following year he took Lauterburg and Hagenau; but these successes were neutralized by the defeat of Ramilies in Flanders, occasioned by Villeroi. In 1707 he forced the lines of Stolhofen, occupied Stuttgart, and passed into Franconia and Swabia. In 1708 he was sent to the army in Dauphiné, with which he penetrated into Piedmont. In 1709 he was sent into Flanders to oppose the progress of Marlborough and the Prince Eugene; and on the 11th September of that year was fought the great battle of Malplaquet, in which the French were defeated, Villars having been severely wounded in the beginning of the action. In the two following years little was done; but in 1712 he defeated the Austrians at Denain, forced Eugene to raise the siege of Laudrecy, and took several fortresses.

[1] See the confession of Jerome, that these nightly assemblies were productive of intemperance and profligacy.
[2] See Epist. 37, and *Adversus Vigilantium*. Hier. *Op.* iv. pars ii. pp. 281–288.
[3] Hier. *Op.* iv. pars ii. p. 279. *Epist. ad Rip.* 37.
[4] Hier. *adv. Vigil.* iv. 2, 282; and *Epist. ad Vigil* 36.
[5] Hier. *Epist. ad Vigil.* 36.

Villena ‖ Villiers.

In 1713 he penetrated into Germany, and took Landau and Frieburg. In 1714 the peace of Rastadt was concluded; and on the death of Louis XIV. in 1715, Villars was made a minister of state and a member of the regency. From that time till 1732, when war with Austria again broke out, Villars was chiefly occupied with political affairs. In 1733 he was sent into Italy with the title of *maréchal-général*, which had never been conferred on any one before him except Turenne. He was then in his eighty-first year, but he still evinced all the ardour, activity, and contempt of danger which had characterised his youth. He died at Turin on the 17th of June 1734.

VILLENA, a town of Spain, in the province and 32 miles N.W. of Alicante. It has narrow, crooked, and unpaved streets, several squares, the ruins of an ancient castle, a large town-hall, two parish churches, a nunnery, hospital, barracks, and several schools. Woollen and linen cloth, soap, and brandy are made here. The town has a large modern suburb. Pop. 5314.

VILLENAGE. (See COPYHOLD.)

VILLERS, CHARLES FRANÇOIS DOMINIQUE DE, an eminent Franco-German, was born at Belchen, a French town of Lorraine, inhabited by Germans, on the 4th of November 1764 or 1765. In 1782 he was appointed lieutenant of artillery at Metz, where he employed his leisure in studying science, history, ancient and modern literature, and classics. In 1791 he published a work, *De la Liberté*, which, from its advocating principles antagonistic to those of the majority of the French people at that time, brought the author and the book into an unenviable notoriety. Villers was pursued by the Jacobins into Germany, where Dr Brandis did much to enlighten him regarding the existing state of German literature, which had the effect of reversing the original judgment of Villers respecting the comparative rank of the literatures of France and Germany, and determined him to spend his life in the high endeavour to hold up the torch for the mutual illumination of the two countries. He translated Heeren's *Essay on the Influence of the Crusades* into French, he wrote for the *Spectateur du Nord*, and published his famous *Essai sur l'Esprit et l'Influence de la Réformation de Luther*, which was crowned by the French Institute, and was subsequently translated twice into English, thrice into German, into Dutch, and into Swedish. Villers was subjected to much persecution by the French in 1806, on the taking of Lübeck; but in 1811 he was appointed professor of philosophy by Jérome Bonaparte in the University of Göttingen. In 1813, after the restoration of the house of Brunswick, he was dismissed from his post, but gained a retiring pension. Consumption was making rapid inroads on the strength of this enlightened and excellent man, and he fell a victim to that incurable malady on the 26th of February 1815. Besides the *Philosophie de Kant*, a *Lettre à George Cuvier*, a *Rapport sur l'Etat de la Littérature Ancienne*, he was engaged at his death on a life of Martin Luther, of which he had formerly published a *Précis Historique*.

VILLIERS, GEORGE, Duke of Buckingham, was the third son of Sir George Villiers. He was born at Brookesby in Leicestershire, August 20, 1582. His handsome person and pleasing manners gained him the favour of James I., who in 1615 created him a knight, with a pension of L.1000 a year. From this time his promotion was rapid, and his influence with King James unbounded; after whose death he continued as great a favourite with his son. But for his transactions, which are matter of history, we refer to the article BRITAIN. He was assassinated at Portsmouth by Lieutenant Felton, August 23, 1628.

VILLIERS, *George*, second Duke of Buckingham of that family, son of the preceding, was born at Westminster, January 30, 1627. During the civil wars, he served in the royal army under Prince Rupert. After the death of Charles I. he attached himself to his son, and at the Restoration was made master of the horse, and was one of those confidential ministers of the king who were designated the Cabal. His public conduct was unprincipled and capricious, and his private life notorious for profligacy and crime. He died April 16, 1688, neglected and despised. (See BRITAIN.)

Villoison ‖ Vilna.

VILLOISON, JEAN BAPTISTE GASPARD D'ANSSE DE, a very eminent Greek scholar, was born at Corbeil sur Seine, on the 5th of March 1750. At the age of fifteen, it is said, he had read nearly all the Greek authors, and at the age of twenty-two he published from a MS. the Lexicon on the *Iliad* and *Odyssey* of Apollonius, together with the fragments of Philemon, 2 vols. Paris, 1773. This work spread the fame of his learning, and he formed extensive literary connections with scholars all over Europe. In 1778 he published an edition of the pastoral poems of Longus; and the same year he was despatched to Venice at the expense of the state, to search the library of St Mark for works which had not yet been printed. The *Anecdota Græca* was the result of this inquiry, but this work was found to have been got up with too great precipitation. Another important discovery was a MS. of Homer's *Iliad* of the tenth century, with notes, usually known as the Scholia Veneta, which was published by Villoison at Venice in 1788. F. A. Wolf based his theory of the Homeric poems almost exclusively on this edition and its Scholia. After a twelve months visit to Weimar, he published his *Epistolæ Vimariensis* at Zürich in 1783. Having gained a complete knowledge of the modern Greek, during a sojourn of three years in the archipelago and the continent of Greece, he was engaged on a great work on that country when a severe illness terminated in his death on the 26th of April 1805. Many of the MSS. of Villoison are in the imperial library of Paris. He was a man of very great attainments; his memory was quite astonishing; but his judgment, as so frequently happens with mere scholars, was feeble, and his reflective power deficient.

VILNA, or WILNA, a government of European Russia, lying between N. Lat. 53. 40. and 56. 20., bounded on the N. by that of Kovno, E. by those of Vitebsk and Minsk, S. by that of Grodno, and W. by that of Augustovo in Poland. Length, 270 miles; breadth, about 110; area, 16,100 square miles. It consists of an extensive plain, broken in a few places with hills, which nowhere rise more than 300 feet above the level of the sea. The lower tracts are largely occupied with bogs and marshes, and a great part of the country is covered with primeval forests still uncleared. The rivers all flow directly or indirectly into the Baltic; and most of them are affluents of the Niemen or Memel, which forms the western boundary of the government. Its principal tributaries here are the Vilia and Dubitza. The Düna flows along the north-east border of the government, and the Dange and Beresina rise within its limits, the former flowing to the west, and the latter to the east. In the east and south-east there are many lakes, but none of great size. The soil is in general sandy, and in some places sterile, but, on the whole, not unfavourable for cultivation. The climate is not the mildest; the winters, though short, are severely cold, the spring and autumn moist and foggy, and even the summer, though warm, is by no means unclouded. It is, however, tolerably healthy, and liable to no peculiar diseases. The chief occupation is agriculture, and from it the inhabitants obtain rather more grain than they consume. The chief grain is rye, the next in quantity are wheat and barley, besides which oats, buck-wheat, and pulse are grown. Hemp and flax succeed well, and hops are cultivated sufficient for the breweries. The implements of agriculture are of the rudest kind. The horses are a small but hardy race, and the horned cattle, the goats, the sheep, and the swine, though numerous, are of inferior

Vilna || Vincent, St.

breeds. The forests supply much timber for commerce, and yield pitch, tar, and charcoal, and the furs of wolves, bears, martens, and other wild animals. There are no mines, or at least there are none worked; but there are valuable quarries, yielding granite, limestone, agates, flints, chalcedony, and some marble. The manufactures are almost exclusively of the domestic kind; but the distilleries are numerous and on a large scale, and some of the spirits which they yield is smuggled over the Prussian frontier. The commerce is merely the export of a small portion of the product of the soil, and the import of a few foreign luxuries. The government is divided into eleven circles. Pop. (1856) 840,379.

VILNA, the capital of the above government, on the Vilia at its confluence with the Vileika, 415 miles S.W. of St Petersburg. It is surrounded with walls, and built after the ancient fashion, with narrow and crooked streets; but it has still some fine palaces of the noble families who formerly resided here. That of the Jagellons, now in ruins, stands on the top of a hill called the Castle Hill. Vilna has thirty-five Roman Catholic churches, the most remarkable of which are the cathedral, the beautiful church of St Kasimir, and the splendid one of St Peter; three Greek churches, a Lutheran and a Calvinistic church, several synagogues, and a mosque. The University of Vilna, founded in 1570, was suppressed in 1832, and its library of 200,000 volumes removed to the capital; but there are still here a medical and surgical academy, and other educational institutions. There are also a town-hall, government palace, library, museum, and several convents and hospitals. A few manufactures are carried on; and there is an important trade, much-frequented fairs being held here annually. Pop. 45,581, about half of whom are Jews, and a considerable proportion Tartars.

VILVOORDEN (Fr. VILVORDE), a town of Belgium, in the province of S. Brabant, 6 miles N.N.E. of Brussels. It has a large old castle, now used as a prison, a fine Gothic church, several schools and almshouses. Calicoes, leather, tobacco, vermicelli, and glue are made here; and there are also breweries and bleachfields. Pop. 5200.

VINAROZ, a town of Spain, province and 46 miles N.E. of Castellon de la Plana, near the mouth of the Ebro, in the Mediterranean. It is an ill built town, enclosed by ruinous walls and towers, but it has some good streets and squares, a handsome parish church, several chapels, a town-hall, theatre, hospital, and several schools. The town has ship-building yards, oil-mills, distilleries, and cooperages; and a considerable coasting trade and productive fishery are carried on. Pop. 10,600.

VINCENNES, a town of France, in the department of Seine, 2 miles E. of Paris. It stands on the northern edge of the park or wood of Vincennes, and is a well built town. The only building of any importance here is the old castle, a large and regular fortress in the form of a parallelogram, with walls, moat, and towers. It has been greatly altered at various periods, and now consists of a mixture of ancient and modern buildings. Many of the French kings resided here, and it was long used as a state prison. Condé, Diderot, Mirabeau, and other distinguished men have been confined here; and the Duc D'Enghein was shot in the moat by order of Napoleon, 21st of March 1804. A monument has been erected to him in the beautiful Gothic chapel of the castle. There are now here a large armoury and depot of artillery. Pop. 8451.

VINCENT, ST, one of the West India islands belonging to Great Britain, in the windward group, between N. Lat. 13. 10., and 13. 25.; W. Long. 61. 10., and 61. 20.; 21 miles S.S.W. of St Lucia, and 108 W. of Barbadoes. Length from N. to S. 17 miles; breadth 10; area 130 square miles. The coast is bold and rocky, and the island is traversed from N. to S. by a range of hills, steep and rugged, but mostly covered with wood, attaining their highest elevation in Souffrière, a volcano near the northern extremity of the range, 3000 feet above the sea. A tremendous eruption of this volcano took place in 1812, and caused much damage. The crater is half a mile in diameter, and 500 feet deep. From the central range of hills, several others diverge on either side to the sea, forming numerous valleys, which are well watered by a number of small rivers flowing down them. The soil in the lower parts of the valleys is rich and loamy, while on the higher ground it is more sandy and not so fertile. There are few marshes, and the natural vegetation is nowhere very luxuriant; so that even the uncultivated parts of the island are free from noxious exhalations; and the climate, though exceedingly moist, is considered to surpass in salubrity that of any of the other West India Islands. The extent of cultivated land in the island, in 1855, was 21,081 acres; and the principal productions are sugar, rum, molasses, arrowroot, cocoa, and cotton. The only important mineral production of the island is *pozzuolana*, a cement formed from volcanic ashes. The value of the exports and imports of St Vincent to and from different countries, in 1856, is exhibited in the following table:—

Vincent, Gulf of St || Vinci.

Countries.	Imports. L.	Exports. L.
Great Britain	42,024	105,715
British Colonies	52,775	16,084
United States	30,065	1,025
Other countries	1,241	598
Total	126,105	123,422

The imports consisted chiefly of wheat flour, dried and salted fish, beef and pork, manures, linen woollen and silk cloth, hardware, machinery, and timber: and the principal exports were, sugar to the value of L.75,134; rum, L.15,956; molasses, L.2529; flour, L.7000; and arrowroot, L.15,598. The total number of vessels that entered in the same year was 344, tonnage, 19,784; and the number of those that cleared 334, tonnage, 18,112. The government of St Vincent is in the hands of a lieutenant-governor, and a council at once legislative and executive, consisting of twelve members appointed by the crown. The public revenue for 1856 was L.21,258; and the public expenditure, L.17,037. There were in 1852 103 places of worship in the colony, of which 14 belonged to the Church of England, and nearly all the rest to the Wesleyan Methodists. The number of schools in 1856 was 22, which were attended by 1960 pupils. St Vincent was discovered by Columbus in 1498, but for a long time no settlement was established here by Europeans. In 1714 the French began to colonize the island, but disputes arose between them and the English, and continued for a long time, until it was ceded to the latter in 1763. The French again captured St Vincent in 1779, but it was restored to Great Britain, at the peace, in 1783. The capital is Kingstown, on the south-west coast, and the island is divided into 6 parishes; one of which comprehends the Grenadenes, a group of 120 islets to the south, and included in the government of St Vincent. Pop. (1852) 30,128.

VINCENT, GULF OF ST, a large inlet in the south coast of New Holland extending eastward about 45 miles, and 60 miles farther in a northern direction. At its mouth it is not more than 9 miles broad, but afterwards widens to more than double the breadth.

VINCENT, *Earl of St.* (See JERVIS.)

VINCI, LIONARDO DA, a man of almost universal genius, and one who stands still unrivalled for the extent of his knowledge in art and in science, was as remarkable for beauty of person as for capacity of mind, and was born at the castle of Vinci near Florence, in 1452. He was a natural son of Pietro da Vinci, a notary to the signory of

Vinci. Florence. From his youth he was quite remarkable both for aptitude and for universality. His drawings astonished his father, and on being shown to the painter Verocchio, they alike surprised him. This artist took Lionardo as a pupil, and his progress was so extraordinary as to be the wonder of all who frequented his studio. It is told that the youthful painter executed an angel in a picture of the "Baptism of Christ," on which his master was engaged, which so far excelled the other figures of the painting, that Verocchio in despair, laid down his brush for ever. The first original painting of Lionardo, was the monster known as the "Rotella del Fico," which he executed to astonish his father. Painting, however, was rather his amusement than his profession. A large portion of his time was taken up with poetry, music, astronomy, mathematics, sculpture, architecture, engineering, mechanics, botany, and anatomy. He was not only a student of those arts and sciences, he was a master in them all.

About 1483, Lionardo entered the service of Ludovico, duke of Milan, with a salary of 500 scudi per annum. He was indefatigable in painting, as he was in everything. Statuary, anatomy, fortification, architecture, nothing came amiss to him. He established a famous art academy at Milan in 1485; he modelled a bronze equestrian statue of Francesco Sforza; he painted portraits of the favourites of Duke Ludovico; he studied anatomy under the celebrated Marc Antonio della Torre; and he wrote a treatise on painting and sculpture, which is unfortunately now lost. In 1497, he commenced his greatest painting of the "Last Supper" on the wall of the refectory of the Dominican convent of the Madonna delle Grazie. Numerous copies and engravings of this celebrated work have appeared, but the painting itself no longer remains. An excellent copy of it by the pupil of Da Vinci, Marco Oggione, was purchased by Sir Thomas Lawrence, and is now in the Royal Academy of London. In 1499, the affairs of the Duke of Milan were in so bad a state, that Lionardo had to be content with a small freehold estate for his last two years' salary. On the flight of the Duke of Milan in 1500, Da Vinci, accompanied by his favourite pupil Andrea Salài (known in England as A. Solario) removed to Florence, where he was well received, and had an annual pension conferred upon him. He painted while here the cartoon of St Anne, and the portrait of the Madonna Lisa, now in the Louvre at Paris. But all his portraits must give way before the one of the artist himself now in the Florentine gallery. It is not surpassed by the finest portraits of Titian. He was employed in 1502 as architect and chief engineer to Pope Alexander VI. by Cesare Borgia, where he only remained till the death of his holiness in the course of the next year. At Florence he was chosen to design the "Battle of the Standard," of which he executed only a part, being jealous it is said of the rival cartoon of young Michael Angelo Buonarotti. He again visited Milan in 1507, where he painted a number of excellent portraits. In 1514 he set out for Rome, where Pope Leo X. at first patronised him, but subsequently slighting him, he set out for Pavia, and entered the service of Francis I. of France, a great patron of the arts, at an annual salary of 700 crowns. Proceeding to France in 1516, he left health and Italy behind him. His working-days were over, and he died (in the arms of Francis I., according to Vasari) at Fontainebleau, on the 2d of May 1519, aged sixty-seven.

Lionardo da Vinci was a man of proud and kingly bearing and disposition. He was remarkably handsome in person, and of very sumptuous habits: one of those regal geniuses, in short, which are sometimes sent into the world to impress men with the unexhausted fertility and formative power of the great mother of us all. No man borrowed less than he did; and, until Michael Angelo arose, he had no rival in design. His genius was too universal to stand pre-eminent in any one department; but taking him all in all, his is without doubt the first name in the fifteenth century, alike for prodigious capacity, and for the singular and varied success which attended his inquiries. "The discoveries," says Hallam (*Introduction to the Literature of Europe*), "which made Galileo, and Kepler, and Maestlin, and Maurolicus, and Castelli, and other names, illustrious, the system of Copernicus, the very theories of recent geologers, are anticipated by Da Vinci, within the compass of a few pages, not perhaps in the most precise language, or on the most conclusive reasoning, but so as to strike us with something like the awe of preternatural knowledge." His best-known treatise is that on *Painting*, which has been twice translated into English and once into French, with engravings from drawings by Nicolas Poussin. The fragments of his writings alluded to above by Hallam, were published in 1797 by Venturi at Paris. (For further notice of Da Vinci as a painter, see ARTS, *Fine*, and PAINTING; also the works of Vasari, Lanzi, and Amoretti.)

Vinculum || Vinet.

VINCULUM, in algebra, a character in form of a line or stroke drawn over a factor, divisor, or dividend, when compounded of several letters or quantities, to connect them, and show that they are to be multiplied or divided, &c. together by the other term. Thus $d \times \overline{a+b-c}$ shows that d is to be multiplied into $a+b-c$, and is equivalent to $d(a+b-c)$.

VINET, ALEXANDER RODOLPHE, was born at Lausanne in the canton of Vaud, on the 17th of June 1797. His father, who held an official appointment in the canton, took charge of his early education, and being a strict disciplinarian, the mind of Vinet, as is frequently the case in such circumstances, developed but tardily. Being intended for the church, his studies were early directed to theology, but literature was with him the favourite subject of study. He had already so distinguished himself in this field, that at the age of twenty he was appointed professor of the French language and literature at the gymnasium of Basle. Two years later, in 1819, he was ordained a minister of the protestant church, at Lausanne, and the same year he married. He continued, however, to discharge his duties at Basle, and laboured with great acceptance, being, it is said, eminently successful in winning the attachment of his pupils, and in stimulating them to exertion. About this time a great religious awakening or "revival" was taking place in French Switzerland, which speedily attracted the attention of Vinet. At first, however, he was against the movement, but he soon became convinced of its reality and truth, and immediately threw himself with ardour into the midst of the struggle. The persecuting measures adopted by the government of his native canton against the evangelical party called forth his pamphlet *Du Respect des Opinions* in 1824, and two years later, appeared his more mature work, *Mémoire en Faveur de la Liberté des Cultes*. In 1829, the persecuting spirit of the government broke out afresh, and such was Vinet's opposition, that he became involved in a public prosecution. From this time he took a leading part in the discussions which followed, ever on the side of religious liberty. In 1835 he was made professor of French literature and eloquence at Basle, and in 1837 he accepted an invitation from his native city to fill the chair of practical theology in the academy. He was chosen one of a committee to draw up a new constitution for the church, and as he could not acquiesce in the decisions of the majority, he considered it his duty to secede from the national church, with which he had hitherto remained connected, in 1840, when the new constitution was about to be introduced, and at the same time he resigned his professorship. In 1844 he again became connected with the academy as professor of French literature. On the secession of a large body of the clergy from the national church in 1845, Vinet was one of the committee appointed to draw up a new constitution, and it was chiefly prepared by him. When sub-

mitted to the synod, however, material alterations were introduced, and this is said to have preyed upon his already enfeebled constitution. He died on the 10th of May 1847. Besides the works already referred to, Vinet was the author of *Chrestomachie Française*, 1829; *Discours sur quelques Sujets religieux*, 1831; *Essais de Philosophie Morale*, 1837; *Nouveaux Discours, &c.*, 1831; *Essai sur la Manifestation des Convictions religieuses, et sur la Séparation de l'Eglise et de l'Etat*, 1842. His posthumous works are, *Théologie Pastorale; Homilétique, ou Théorie de la Prédication; Histoire de la Litterature Française au* xviiie *Siècle*, 2 vols.; *Etudes sur la Litterature Française du* xixe. *Siècle*, 3 vols.; *Etudes sur Blaise Pascal; Etudes évangéliques;* and *Nouvelles Etudes evangéliques.* Almost all his works have been translated into English. He was also for many years one of the chief contributors to the *Semeur*, a literary journal commenced in 1831. (See *Alexandre Vinet—Notice sur sa Vie et ses Ecrits*, par Edmond Scherer, Paris, 1853; and an article on his life and writings in the *North British Review* for August 1854.)

VINNITZA, a town of European Russia, in the government of Podolia, between two arms of the Bug, 80 miles N.E. of Kamenetz. It is enclosed by a moat, and has a citadel, Roman Catholic and Greek churches, a synagogue, a gymnasium formerly a Jesuit college, and some trade. Pop. 8988.

VINTIMIGLIA, or VENTIMIGLIA, a town of Italy, in the territory and 18 miles E.N.E. of Nice, on the Mediterranean. It is an ill built place, defended by modern walls and two forts; and it has a cathedral, another old church, an episcopal seminary, three convents, an hospital, and other charitable institutions. The neighbouring country produces much wine, oil, and fruit. Pop. 5000.

VIOLA, or ALTO-VIOLA, an instrument of the violin kind, larger than an ordinary violin, and furnished with four gut-strings, the third and fourth of these being covered with silver-plated copper-wire. It originated from the *viola di braccio*, one of the ancient set of viols used in concerts. The English call it the tenor-violin, or simply the tenor. Its name of alto-viola is derived from its music being written in the alto-clef on the third line of the stave. It is tuned C, G, D, A, an octave above the violoncello. For its compass and use in orchestra, &c., see MUSIC. (G. F. G.)

VIOLA D'AMORE, an instrument no longer in use, but of which the tone and effect are said to have been very sweet and singular. It was played with a bow, and seems to have varied in the number of its strings and in its tuning. One species of it is described as having five gut-strings, and five metal wires tuned in unison with the strings, but passing under the finger-board and bridge, and thus vibrating only as *open* wires, to arpeggios or harmonics, &c., played upon the open gut-strings. The principle of this instrument seems to have been revived in the construction of some recent musical instruments. (G. F. G.)

VIOLA DI GAMBA, a musical instrument no longer in use, but which was the immediate predecessor of the violoncello. A clever musician, C. F. Abel, in the last century, threw away his fine talents upon this nasal and ungrateful instrument. A good *viola di gamba* affords excellent wood materials for making a fine tenor-violin. (G. F. G.)

VIOLIN, a bow instrument of considerable compass, and great powers of expression and execution. Its origin is obscure. In Hindustan the Indian name for a violin is *sāranggī*, which, being pure Sanscrit, is probably the ancient name for the instrument. The best violins are those of the old Cremona makers, Jerome, Anthony, and Nicholas Amati, and Stradivarius and Guarnerius, and F. and T. and G. B. Ruggiero. Next in quality are those of Jacob Steiner, and of the two Klotz, father and son, Tyrolese makers. The difference between the tone of the Cremona violins and the Tyrolese has been compared to the difference between the tone of a flute and a clarinet. The violin has four strings, tuned G, D, A, E, reckoning upwards. The lower string is covered with fine silvered copper-wire. Some persons have used silver, or even gold wire, which does not corrode like the copper. Gross impositions are often practised by unprincipled dealers in pseudo-Cremona violins. Like *copies* of old pictures, they deceive many purchasers. Many of the finest violins of the old makers have been destroyed by ignorant repairers, or by capricious alterations made at the desire of ignorant amateurs. See MUSIC. (G. F. G.)

VIOLONCELLO, a powerful and expressive bow-instrument of the violin family. It has four strings, the third and fourth of which are covered with silvered copper-wire. It is tuned C, G, D, A, reckoning upwards, and is an octave lower than the viola. Passages of rapid execution do not suit this instrument, especially on the third and fourth strings. The best violoncellos are those of the old Italian and Tyrolese makers. See MUSIC. (G. F. G.)

VIOLONE, CONTRA-BASSO, or DOUBLE-BASSO, the largest instrument of the violin kind. The best are of Italian make. See MUSIC. (G. F. G.)

VIOTTI, GIOVANNI BATTISTA, a great violinist, a charming composer, and the founder of the best modern violin school, was born at Fontanetto in the district of Crescentino, Piedmont, on the 23d May 1753. His father, a farrier, played on the horn, and taught his son the first elements of music. The boy when only eight years old, took great pleasure on playing on a small violin that had been bought for him. When Viotti was about eleven years old, a good musician happening to visit Fontanetto, remained there for a year, and during that time gave instructions in music to the young violinist. In 1766 an event occurred which was of the highest importance to the future career of Viotti. It so happened that the boy was taken, with other musicians, to perform a symphony at the house of Francis Rora, bishop of the small town of Strombino, and afterwards archbishop of Turin. The bishop, who was a judge of art, was so delighted with the musical talent and the animated and expressive countenance of young Viotti, that he offered to send him to Turin in order to study the violin there. This offer being accepted, the bishop wrote to the Marchesa of Voghera, who wanted a companion for her son in his studies. Her son, the Prince of Cisterna, was then eighteen years of age, and the marchesa seeing but a child in Viotti, was about to send him home with a present, when Colognetti, an eminent musician of the royal chapel, happened to come into the room. He desired to hear Viotti play, and put before him difficult music which the boy executed at sight so as to astonish and delight Colognetti, who insisted that he should not be sent away. The Prince of Cisterna himself writes regarding that period: "Charmed with a genius so natural, I determined to do all that was requisite in order that such fine abilities might bear fruit. I assigned to him apartments in my palace, and gave him for a master the celebrated Pugnani. Viotti's education cost me more than 20,000 francs, but Heaven forbid that I should regret my money! The existence of such an artist cannot be too highly paid for." Under Pugnani, Viotti acquired the breadth and grandeur which characterized the style of that famous violinist; adding to these qualities his own native ones of brilliancy, elegance, and inspiration. Viotti thus became the most complete violinist that had till then been heard. Appointed violinist to the royal chapel at Turin, he quitted that post in April 1780 to travel with Pugnani in Germany, Poland, and Russia. Everywhere he was received with enthusiasm. The Empress Catherine made him magnificent presents, and wished, but in vain, to retain him in her service. He and Pugnani then visited London, where Viotti's performances made a deep impression on the

Vire || Virgil.

public. In 1782 Viotti performed at the Concert Spirituel in Paris, delighting the Parisians by the perfection of his playing, and the novelty and beauty of his concertos. The Queen of France had a just appreciation of Viotti's genius, and obtained for him a royal pension of 6000 francs. In the summer of 1783 he visited his birthplace Fontanetto, and purchased a property in the neighbourhood, in which he installed his father, who died in the year following. Returning to Paris in 1784, Viotti resumed his professional occupations, and became director of the Italian Opera, and afterwards joined M. Feydeau in the erection of the Théâtre Feydeau, which last failed in the first troubles of the Revolution in 1792, and absorbed all Viotti's savings. Thus ruined, Viotti went to London, where he was engaged at Salomon's Hanover Square Concerts, and produced a great sensation by his solo and concerto playing. He formed friendships with several families of consideration in London; among these the Chinnerys and Chaplin Hankey, to whom he dedicated some of his best duets. But now his tranquillity was disturbed by an utterly false accusation of being a revolutionary agent, and he was ordered to quit England. He took refuge in a country house near Hamburg, living there till July 1795, and composing some of his finest violin duets. Returning to London freed from all imputation, he entered into a wine-trade partnership which failed, and he thus became ruined a second time by speculation. He revisited Paris in 1802, and played at the Conservatoire, his concertos marked by the letters A, B, C, &c. He went back to London, and made a short visit to Paris in 1814, and a longer one in 1818. In 1819 he was appointed director of the Opera at Paris, but could not retard the decay of that theatre. In 1822 he was deprived of his post as director, but received a pension of 6000 francs. His health now became impaired by age and vexation. He tried to amuse himself by travelling, but it was too late. He died at London on 24th March 1824, aged seventy-one. Viotti was a man of great amiability of temper and disposition, and gained numerous sincere friends. There are several portraits of Viotti. The best likeness is that painted at London by Tossarelli, and engraved by Meyer. His pupils were Cartier, Alday, Labarre, Vacher, Pixis, Libon, Mori, Rode, Robberechts; the latter having communicated to De Beriot the last traditions of Viotti's style of playing. His compositions consist of 29 violin concertos; 2 concertantes for two violins; 21 quartets for violins, alto, and violoncello; 18 trios for two violins and violoncello; 45 duets for two violins, and 6 serenades for do.; 18 solos for violin and bass; 3 notturni for piano and violin; 1 sonata for pianoforte alone, composed for Mad^{e}. Montgeroult. (G. F. G.)

VIRE, a town of France, capital of an arrondissement in the department of Calvados, on the Vire, 34 miles S.W. of Caen. It is an ancient town, with steep narrow streets, and many quaint old houses; and it has a Norman castle, a fine Gothic church, a college, public library, court of law, and hospital. Woollen cloth, paper, needles, and leather are made here; and in the vicinity there are mines and forges for iron. Pop. (1856) 6735.

VIRGIL. Of the personal history of Publius Virgilius Maro, the greatest of Latin poets, little is known with certainty. The principal authority on which his biography rests is a life usually attributed to Tiberius Claudius Donatus, a grammarian who flourished in the fifth century of the Christian era. Its authenticity, however, is very questionable; and it is so much disfigured by interpolations, that it is difficult to extract from it such facts as may be implicitly relied on. To this suspicious document we have to add a few scanty allusions by the poet's contemporaries, and the scattered remarks of ancient scholiasts and grammarians.

By all accounts, the parentage of Virgil (or more properly Vergil), is represented as exceedingly humble. Donatus informs us that, according to some authorities, his father was originally a potter, but according to others, and those the more numerous, he was the hired servant of a travelling merchant, to whom he recommended himself by his faithful services, and who gave him his daughter Maia in marriage. By his father-in-law he was intrusted with the charge of a small farm in the vicinity of Mantua, which he ultimately seems to have inherited, and which probably constituted the poet's patrimony. Whatever may have been the original condition of his father, it is gratifying to find this testimony to his moral worth, and to be assured that he was capable of appreciating, and possessed the means as well as the desire of cultivating the rising genius of his illustrious offspring. In this respect Virgil was equally fortunate with Horace, whose father, although possessed but of moderate fortune, placed him under the ablest masters at Rome, along with the sons of knights and senators. Virgil.

Virgil was born at Andes, now called Pietola, a village about three miles distant from Mantua, in the year of Rome 684, B.C. 70, during the first consulship of Pompey and Crassus. He was thus seven years older than Augustus, and five years older than Horace. He commenced his studies at Cremona, where he remained till he assumed the *toga virilis*. This he did on entering his sixteenth year, on the very day, according to some accounts, on which Lucretius died; thus transmitting, without interruption, and with increasing splendour, the intellectual inheritance of Roman genius.

Virgil now proceeded to Milan, and from thence after a short stay, to Naples. Here he devoted himself to study with intense application, and laid the foundation of that varied learning for which he was no less remarkable than for poetical genius. To the language and literature of Greece he applied himself with peculiar ardour; and, in this department, enjoyed the instructions of Parthenius Nicenus, an author of some reputation. But literature alone, however varied and attractive, could not satisfy the inquisitive and capacious mind of Virgil. He strove also to penetrate the depths of philosophy and science; and medicine and mathematics continued to be favourite subjects of pursuit to him through life. Along with his friend Varius, he studied the system of Epicurus, under Cyro, a distinguished teacher of that sect, and the intimate friend of Cicero. Traces of this early discipline are perceptible in his works; although by some he is represented as an academic, and as preferring the sentiments of Plato to those of all other philosophers. To some traditions of his addiction to science, to the revelations contained in the sixth book of the *Æneid*, and to the magic spells described in the eighth *Eclogue*, Virgil probably owes his reputation as a wizard, the character in which he principally figures during the middle ages.

Donatus carries Virgil from Naples to Rome, and there makes him the subject of several fabulous stories, which it would be idle to repeat. The probability is that he did not visit Rome at this time, but having finished his studies at Naples, returned directly to his paternal abode, where he continued to reside till his fame as a poet had begun to attract public notice.

Much uncertainty prevails respecting the early productions of his muse. That the *Eclogues* were not the first offspring of his genius, we have sufficient testimony; but the genuineness of the minor poems, which usually pass under his name, may well be questioned. The most probable conclusion is, that they are either entirely spurious, or so much disfigured by interpolators as to leave few traces of their original form. Donatus enumerates the following as youthful productions of Virgil:—*Catalecton*, *Moretum*, *Priapeia*, *Epigrammatica*, *Diræ*, *Culex*, and, while he ad-

Virgil. mits that doubts existed respecting its authorship, *Ætna*. He is also said to have undertaken a poetical work on the early wars of Rome, but to have been deterred from the prosecution of his design by the rugged and inharmonious structure of the ancient Italian names. To this attempt the poet probably alludes in the sixth *Eclogue*, where he represents himself as having prematurely undertaken a work beyond his strength. But whatever may have been the early essays of Virgil, there can be no doubt that he continued sedulously to cultivate those talents with which he was so richly endowed; and to peruse with intense admiration and delight those masterpieces of Grecian genius, which it was his great ambition to rival and excel. Nor was he inattentive to the literature of his own country; which, however, presented a comparatively limited field for the poetical student. Yet the works of Ennius, Plautus, Terence, Catullus, and, above all, Lucretius, contained a rich poetical mine, from which much precious ore might be extracted, and to which it is manifest he did not scruple freely to resort. Into the genius, structure, and capabilities of his native tongue, he appears to have penetrated more deeply than any other writer; and his diction became the standard to which succeeding poets yielded an implicit, perhaps a slavish obedience. What Cicero effected for prose, Virgil effected for poetry. Few literary phenomena, perhaps, are more remarkable than the mastery over the Latin language which even his earliest productions display. In the works of preceding writers may be found many detached passages scarcely to be surpassed; but in uniformly sustained beauty and propriety of diction, the Mantuan bard leaves all his predecessors, as well as successors, at an immeasurable distance.

Virgil is usually represented as having undertaken the composition of his *Eclogues* at the suggestion of C. Asinius Pollio, a nobleman who was not more distinguished as a commander than as a cultivator and patron of letters. On the formation of the second triumvirate, A.U. 711, Pollio was intrusted by Antony, whose interests he had espoused, with the command of Gallia Transpadana, in which district the patrimony of Virgil lay. The rising talents of the youthful poet early attracted his notice, and he continued to extend to him his patronage and protection as long as he remained in the command of the province. The services thus generously and seasonably rendered to genius were amply rewarded; and the name of Pollio will for ever continue associated with some of the poet's noblest strains.

The date and order of composition of the *Eclogues* have been matter of dispute among critics. By some they are supposed to have been written in the order in which they now stand in the printed editions, and, it is believed, in all the manuscripts of Virgil's works; by others, the second, third, fifth, and sixth, are thought to have preceded the first. The determination of the question is of little importance, and our present limits forbid discussion. The subject of the first *Eclogue* sufficiently indicates the date of its composition. After the battle of Philippi, A.U. 712, Augustus, in fulfilment of a promise which had been previously given to the army, made a large division of lands among the veteran soldiers. Cremona having espoused the cause of Brutus, was among the first to suffer on the present occasion. Its territory was assigned to the soldiers; but not proving of sufficient extent, the deficiency was supplied from the neighbouring district of Mantua. Virgil was thus involved in the general calamity, and driven with violence from his humble patrimony. About this time, however, he appears to have renewed his acquaintance and friendship with Alphenus Varus, who had been his fellow-student at Naples, and who now discharged some important public functions in the poet's district. Under his protection, it is supposed, Virgil repaired to Rome, and by personal application obtained from Augustus the restoration of his farm. Virgil. To record his gratitude for this signal favour, he composed the first *Eclogue*, which, in the person of Melibœus, presents a vivid picture of the distress and misery by which he was surrounded; while in that of Tityrus, he eulogizes in glowing strains, and honours as a god, the youth to whom he owed his own more fortunate lot. It appears, however, that he experienced no slight difficulty in recovering his farm, notwithstanding the order of Augustus; and that, on one occasion, when pursued by the tribune Arrius, who had taken forcible possession of it, he saved his life by swimming across the Mincius. To these fresh disasters he is supposed to allude in the ninth *Eclogue*. Besides Augustus, the persons chiefly celebrated in the *Eclogues* are Pollio, Varus, and Gallus, who had been the poet's earliest patrons, and who ever after continued his most esteemed and beloved friends.

The *Eclogues*, in the composition of which he is said to have spent three years, were received by his countrymen with unbounded applause. They were universally read and admired, and such was their popularity, that they were publicly recited in the theatre at Rome. Their novelty, for pastoral poetry now appeared for the first time in a Roman dress; the pictures which they presented of rural felicity, and of simple and innocent pleasures, so strongly contrasted with the scenes of violence and bloodshed which had so long deluged Italy; the descriptions of nature so exquisitely blended with human feelings and human sympathies; the allusions to recent and passing events; the polished simplicity, beauty, and harmony of the verse,—all contributed to enhance their merit in the eyes of his contemporaries, and to establish them in popular favour.

But, however great their merit in other respects, the *Eclogues* of Virgil can lay little claim to the praise of originality. They are, for the most part, imitations, and occasionally little more than translations of Theocritus. Roman literature was indeed essentially imitative; and its greatest masters rarely ventured to give unfettered scope to the impulses of their native powers. Seldom venturing to depart from their Grecian models, they were content to follow closely in their footsteps, and deemed it sufficient to clothe in the language of Rome those ideas and descriptions which were furnished by their intellectual masters. Yet Virgil, while retaining the substance of Doric song, succeeded in impressing on his Italian transcript not a little of his own calm and meditative nature, and in awakening the popular sympathies of his countrymen in a manner which at once stamped him as the national poet of Rome. Not the least difficulty which he had to encounter in introducing this new species of composition, was the apparently intractable and inflexible nature of the language which he had to employ, little fitted, apparently, for the description of pastoral and rural scenes. But the powers of the poet triumphed, in a great measure, even over this difficulty; and although unable to rival the matchless melody of the Doric reed, he imparted to his native tongue a delicacy, softness, and variety, of which till then it had been considered unsusceptible. In estimating the immediate reception of the *Eclogues*, we must not altogether overlook the skill and dexterity with which the poet paid court to his early patrons, whose voice was perhaps no less potential in the literary than in the political world. Their publication must, at all events, be considered an important era in the literary history of Rome, as exhibiting the first-fruits of that genius which was destined to stamp its indelible impress on the literature of future ages.

About the thirty-third year of his age, Virgil removed to Rome. Here he experienced the bounty, as well as friendship, of Mæcenas and Augustus, and appears to have been placed by their liberality in circumstances which enabled

Virgil. him ever after to devote his undivided energies to his favourite pursuits. It is pleasing to find the most cordial relation subsisting, even at this early period, between such men as Virgil and Horace. Both candidates for popular favour, in circumstances which too frequently produce rivalry, if not hostility, these illustrious poets appear to have been united in the closest ties of friendship. Virgil is said to have introduced Horace to the notice of Mæcenas; and the deep feeling of respect and admiration with which Horace regarded Virgil is manifested in several parts of his works. The sixth Satire of the first book exhibits a pleasing picture of the intimate terms on which they lived with their common patron Mæcenas, and with some of their poetical contemporaries. During his residence at Rome, Virgil inhabited a house on the Esquiline Hill, near the gardens of Mæcenas. He was treated with universal respect; and on one occasion, when some of his verses were recited in the theatre, the whole audience rose to salute him, with the same respect that they were accustomed to bestow on the emperor. But his modesty shrank from the public gaze; and amid the splendour and homage of Rome, he longed for scenes more in harmony with his poetical and contemplative genius, and, it may be added, better suited to the delicacy of his constitution. After a brief sojourn in the metropolis, he accordingly retired to Naples, at that time the favourite retreat of literary men; and there, or at a delightful residence in the vicinity of Nola, about ten miles distant, he continued chiefly to reside during the remainder of his life.

Having thus chosen a congenial place of abode, Virgil, at the suggestion of Mæcenas, commenced the composition of the *Georgics*. The subject was selected, we are told, with the view of restoring among the Romans a love of those rural pursuits to which they had been peculiarly addicted in early times, but which, amid the desolation and bloodshed of the civil wars, had been entirely abandoned and forgotten. Little is known of the private life of Virgil during the composition of this immortal poem, which occupied the space of seven years. Donatus and others relate, that he was accustomed to dictate a number of verses in the morning, and spend the day in polishing and reducing them to a smaller number. From internal evidence, this appears to be no inaccurate description of his literary habits.

The *Georgics* more than realized the highest expectations that had been formed of Virgil's poetic powers. This work, which is dedicated to Mæcenas, is divided into four books, and treats in succession of husbandry, planting, cattle, and bees. Our limits forbid any attempt at analysis; nor indeed could words convey any adequate notion of the wonderful union which this masterwork presents of didactic precept, varied and splendid description, touching pathos and sensibility, episodes at once appropriate and striking, historic and mythologic allusion, displaying all the resources of the richest poetical treasury. The sweetness and easy flow of versification by which the *Eclogues* are distinguished, gave but faint indication of the matchless power, variety, and magnificence of the *Georgics*. Although the subject of this poem is peculiarly national, yet the same imitative spirit which pervades the whole literature of Rome, exercised its influence here also. As in the *Eclogues* Theocritus, so here Hesiod formed the chief model for the general structure and conduct of the work. But in this poem Virgil perhaps owes less to his prototypes than in his other productions; and he has diffused over the whole a flood of poetical light peculiarly his own. The poet has indeed exhibited the happiest combination of genius and art, and has succeeded in imparting to didactic themes a life, an interest, and a grandeur, of which, from their nature, they seem scarcely susceptible. Here the Romans found scenes and modes of life in which their fathers had delighted, depicted in colours which could not fail to excite the deepest interest, and rekindle in their breasts the love of pursuits, which, though for a time banished by the rude collisions of civil strife, were associated in their minds with the heroes and patriots of old, with the undying achievements and illustrious chacters of ancient times. In estimating the merits of the *Georgics*, we must not pass without special notice the matchless beauty of the versification. In sustained majesty, in melody that ever satisfies but never cloys the ear, in variety of modulation, in stateliness but freedom of march, it stands unapproached by any other Roman poet, and unsurpassed by Virgil himself. Virgil.

Having with such signal success enriched the literature of his country with two species of poetry, of which till then it possessed no example, he resolved to attempt a work of a still higher nature. It is evident that he had long meditated such a work; as we find allusions to it both in the *Eclogues* and *Georgics*. He commenced the *Æneid*, A. U. 724, the year in which he completed the *Georgics*. This great work, undertaken, we are told, at the request of Augustus, occupied him till his death, and even then had not received his finishing touch. As he proceeded with its composition, the greatest interest was excited respecting it, and the highest expectations were entertained of its merits, as may be gathered from the prognostication of Propertius, who thus anticipates its future fame:—

"Cedite Romani scriptores, cedite Graii,
Nescio quid majus nascitur Iliade."

In 729, Augustus expressed a strong desire to be favoured with a perusal of the poem, so far as it had been completed; but Virgil excused himself, on the ground that the work was not yet worthy of such an honour. About a year afterwards, however, he was prevailed on to read the sixth book to Augustus, in the presence of his sister Octavia. When the poet reached the beautiful passage in which he alludes so pathetically to the death of her son Marcellus, the adopted child of Augustus, and the universal favourite of Rome, Octavia is said to have swooned away; and, on reviving, to have ordered the poet to be rewarded with ten *sestertia* for each line. In conformity with the usual practice among Roman poets, Virgil occasionally recited portions of his verses to his literary friends; not, however, for the sake of display, but in order to be favoured with their critical remarks. His recitation is represented as highly effective, and as distinguished by remarkable sweetness and propriety of articulation.

Having completed the *Æneid*, he resolved to travel into Greece, that he might, at leisure, correct and polish his great work, and bring it to the greatest possible perfection before giving it to the world. On this occasion, Horace addressed to him the beautiful ode, beginning, "Sic te diva potens Cypri;" in which he expresses in the most affectionate terms, his anxiety for the safe return of his beloved friend. On arriving at Athens, Virgil proceeded to execute the task which he had imposed upon himself; and, besides, composed the splendid introduction to the third book of the *Georgics*. His original intention, on quitting Italy, was to dedicate three years to the work of revisal, and then, amid the scenes of his native country, to devote the rest of his life to the study of philosophy, in which he had always delighted. Augustus, however, on his return from the East, having reached Athens, Virgil, probably in consequence of the state of his health, resolved to accompany him to Rome. But his days were now numbered. The vessel in which he sailed along with the emperor touched at Megara, where he was seized with extreme debility; and his distemper increased so much during the remainder of the voyage, that he died a few days after reaching Brundusium. This event took place A. U. 735, in the fifty-first year of his age. In compliance with his dying wishes, his bones were conveyed

Virgil. to Naples, where, in literary seclusion, he had spent so many years of his life; and his tomb is still pointed out at a spot about two miles distant from that city. The urn which was supposed to contain his ashes bore the following inscription, which is said, but without sufficient authority, to have proceeded from the lips of the dying poet:—

"Mantua me genuit; Calabri rapuere; tenet nunc
Parthenope: cecini pascua, rura, duces."

The precise locality of Virgil's tomb has been made the subject of controversy; but there seems to be no good reason for rejecting the common tradition of the country on this point. He bequeathed the greater part of his wealth to his brother; the rest, to Augustus and Mæcenas, and his friends L. Varius and Plotius Tucca.

Virgil is represented as tall of stature, of a swarthy complexion, negligent in his dress, and somewhat ungraceful in his deportment. The melancholy with which he was tinged probably arose from the delicacy of his constitution, and the ill health under which he laboured. Of the native warmth of his heart, and the sincerity of his friendships, it is impossible to doubt, since he was universally beloved as well as admired by his contemporaries; who, amid their mutual jealousies and literary rivalry, seem to have united in doing honour to one who ever cheerfully recognised the merits of others, and rejoiced in and to the utmost of his power promoted their success. Of the more private and familiar life of Virgil nothing is known. Unlike Horace, whose works constitute his best biography, Virgil has few allusions to himself, and none that throw light on his domestic habits. He passes before us with much of the indistinctness and shadowy grandeur in which he envelops the shades in Elysium.

When he perceived his end approaching, he is said to have ordered Varius and Plotius Tucca to burn the *Æneid*, on which he had expended so many years' labour, and on which his future fame was expected mainly to rest. The reason of this command has been the subject of much discussion. The common opinion is, that not having received his finishing-hand, he was unwilling to transmit to posterity and peril his fame on a work which he had not brought to that degree of perfection which he had contemplated. Some, again, account for the poet's conduct on the supposition that, on the approach of death, he felt regret at having produced a work which, instead of inspiring sentiments of liberty, was intended to reconcile his countrymen to the chains which had been imposed upon them by a successful but unworthy usurper. Fortunately for the interests of literature, Augustus interposed his authority to save a poem to the completion of which he had looked forward with intense interest, and from which he anticipated so much glory to himself and the Roman state. It was intrusted to Varius and Tucca for revisal and publication, but with express injunctions that they should make no additions to the words of the poet; and we have reason to believe that they executed their honourable task in a spirit of due reverence for departed genius.

The *Æneid*, as already mentioned, excited the highest expectations among the literary contemporaries of the poet during its composition; and on its publication, was hailed with universal approval. Ovid alludes to it more than once in terms expressive of his conviction that it occupied the first place in Roman literature, and that, in common with the other works of the author, it would last while the eternal city should endure. The sentence thus early pronounced, has been confirmed by the consenting voice of succeeding ages; and, whatever difference of opinion may have existed respecting its comparative merits, the *Æneid* has ever been ranked as one of the rare productions of human genius which are destined to immortality. If considered as the rival of the *Iliad*, the *Æneid* will be presented in a false as well as unfavourable point of view; and it is difficult to conceive that it was composed under any such predominating idea. Neither the age which produced it, nor the genius of the poet, was favourable to such an achievement; but having resolved to compose an epic poem, Virgil no doubt took Homer as his model, and endeavoured to transplant into the fabric of his work as many of the beauties of the Grecian poet as suited the nature of his subject. We accordingly find that he drew equally on the *Iliad* and *Odyssey*, the first six books being on the model of the former, and the remaining six on that of the latter. How far his plan was adopted with a view to avail himself of the whole range of Homeric materials, it is difficult to determine; but it was a bold attempt, if it was ever contemplated, to rival or surpass in a single work, the combined excellences of his matchless models.

The chief design of the *Æneid* appears to have been, to deduce the origin of the Romans from the Trojans, and by tracing the family of Augustus to Æneas, to establish his divine title to the sovereignty of Rome. This leading idea pervades the whole texture of the work; and the restraint which was thus necessarily imposed on the poet must have interfered most unfavourably with the freedom of epic movement. The character of *Æneas* is meant to shadow forth that of Augustus; but, while he constantly occupies the foreground, he is invested with few attributes calculated to excite admiration, or awaken a vivid interest in his career. He is represented as the mere passive instrument of fate, and there is consequently little about him of heroic daring. The Romans, however, could not fail readily to recognise the intended resemblance; and the halo thrown around the hero of the *Æneid* was calculated to reconcile them to the destined sway of his descendant, which had been mysteriously announced by oracles.

We cannot enter into the details of the *Æneid*, or point out the manner in which the poet has accomplished his main design. As might be expected, he has availed himself of all the native as well as foreign resources within his reach, while the whole displays that sober and chastened judgment for which he was so remarkable, and which, in his case, was so admirably combined with high poetical genius. The *Æneid* has been generally censured for want of variety in the characters. That this charge is well founded, must to a certain extent be allowed; but the fault is inseparable from the very design and structure of the work. The chief object being the exaltation of Augustus, no formidable competitor could be admitted on the scene. The whole attention is fixed on one central figure, to which all the others are made subordinate. But although the contrasts of character are not glaring, they are frequently not indistinctly marked; and if they are apt to elude the notice of the careless observer, they reveal themselves with sufficient clearness to the more searching and curious eye. But the great merit of the *Æneid* lies, not in its leading design and general conduct, but in the beauty of its details; many of which will bear comparison with the happiest inspirations of the father of epic song. It may not be improper to remark, that Virgil, amid the fulsome homage and adulation, which, in common with the other poets of that age, he bestows on Augustus, frequently displays a truly Roman spirit; and, from the manner in which he represents the agents and events of the olden times, appears to sympathize with and appreciate the sterner and nobler virtues by which Rome was distinguished, while the genius of freedom yet presided over her destinies.

In the composition of his works, Virgil drew unsparingly, not only on the poetic treasures of Greece, but on the more limited resources of his native literature. This however he did in conformity with the universal practice of his countrymen; and it may with truth be affirmed, that he borrowed nothing which he did not adorn. His imputed pla-

Virginia. giarisms have sometimes been pointed out with a malicious industry; but when properly viewed, with reference to the position and mission of the poet, they will be found to prove at once the soundness of his judgment, and the purity and refinement of his taste.

The general character of Virgil as a poet may be considered as fixed by the concurring testimony of critics of all ages. That he was deficient in the highest attribute of genius, in the power of creating and bodying forth original conceptions, must be admitted; but, with this limitation, there are few qualities in which he will be found wanting; In soundness of judgment, and correctness of taste; in depth and tenderness of feeling; in chastened fancy and imagination; in vivid and picturesque description; in the power of appreciating and portraying the beautiful, whether in nature or art; of depicting passion, and touching the chords of human sympathy; in matchless beauty of diction, and in harmony and splendour of versification, he stands alone among the poets of his own country, and will bear a favourable comparison with those of any other. His works have taken their place among the imperishable offspring of genius, and, while literature lasts, will continue to exercise a powerful influence on the poetical taste of successive generations.

The *editio princeps* of Virgil was printed at Rome, by Sweynheym and Pannartz, *sine anno*, most probably 1469. Of the immense number of editions which have succeeded it, we must content ourselves with mentioning the following, as among the most valuable. N. Heinsii, Amst., 1676, 12mo.; Ruæi in usum Delphini, Par., 1675, 4to; often reprinted. Emmenessii, Lugd. Bat., 1680, 3 tom. 8vo; Masvicii, Leovard, 1717, 2 vols., 4to; Burmanni, Amst., 1746, 4 tom. 4to; Heynii, Lips., 1803, 4 tom. 8vo. An edition of Heyne's Virgil appeared, with valuable critical additions by Wagner, Lips., 1830, 5 tom. 8vo. Hunteri, Cupri Fif., 1810, 2 tom. 8vo; remarkable for the accuracy of its text. Forbigeri, Lips., 1836–39, 3 tom. 8vo; second edition, 1845–46.

Of the English translations of Virgil, that of Dryden (1649–50) is the most popular. Ogilby's verse translation of Virgil appeared during the same year; and Martyr's prose translation of the *Georgics* and *Bucolics* in 1741–49. There is likewise a dull blank verse translation by Dr Joseph Trapp. A translation of the *Eclogues* and *Georgics* by Warton, and of the *Æneid* by Pitt, appeared in 1753, 4 vols. 8vo. These are held in high repute. The *Æneid* has also been translated into English verse by Symmons and Ring; and into Scottish verse by Gawin Douglas, bishop of Dunkeld, in 1553. Of this last work, an excellent edition was published by Ruddiman, Edin. 1710, fol.; but a still more valuable edition, in 3 vols. 4to, has been published by the Bannatyne Club, under the superintendence of George Dundas. Of the *Georgics*, Sotheby's translation is incomparably the best. It is accompanied by the versions of De Lille, Soave, Guzman, and J. H. Voss. (W. P—R.)

Boundaries. VIRGINIA, the largest and most central of the eastern states in the North American Union lies between 36. 30. and 40. 38. N. Lat.; 75. 10. and 83. 25. W. Long., having Maryland on the E., Ohio and Kentucky on the W., Maryland and Pennsylvania on the N., and Tennessee and North Carolina on the S. Its general breadth from north to south is 210 miles, its length in the southern part is about 425 miles, but in the north only about 350. Its area is about 61,352 square miles, being considerably more than that of England.

Mountains. With the exception of Pennsylvania, Virginia is the only state that extends quite across the great Appalachian chain, and it is traversed from north to south by several well defined mountain-ranges. The Blue Ridge, although pierced by the Potomac, James, and Staunton rivers, constitutes a well marked and continuous chain of 260 miles in length. In general it forms rounded, swelling masses, about 2000 feet above the level of the sea, or about 1500 feet above the valleys at its eastern base; but the Peaks of Otter shoot up in projecting summits to the height of 4260 feet. The prolongation of the Kittatinny mountain of Pennsylvania, enters the state in Morgan county, under the name of the Great Ridge, or North Mountain, and passes into North Carolina under the name of the Iron mountain. Its height is generally from 2100 to 2500 feet, but the White Top peak reaches the height of 6000 feet. Virginia. The Great valley, which lies between these two ridges, sometimes called the German valley, is a continuation of the Cumberland and Tulpehocken valleys of Pennsylvania. From this valley the New River passes westward, and the James and Potomac eastward. West of it are numerous mountain-masses, which are probably prolongations of those which traverse central Pennsylvania. The state is usually divided into four parts, which form political as well as natural divisions. The first of these is the *Tide Water* district, lying east of the lower falls of the rivers, and consisting for the most part of a flat country, nowhere more than 60 feet above the sea. Further west is the *Piedmont* district, extending as far as the Blue Ridge. This is more elevated and diversified in its surface than the former, as it is traversed by a chain of hills parallel to the Blue Ridge, and about 30 miles distant from it. The *Valley* district extends from the Blue Ridge to the most westerly ridge of the Alleghany range; and it is occupied by the various chains of these mountains, and the fertile valleys that lie among them. The extreme west of the state is occupied by the *Trans-Alleghany* district, which slopes westward, and is broken by various branches and offsets of mountains.

Coasts. The coasts of Virginia, where they border on the Atlantic, are for the most part low and sandy. The chief arm of the sea here is Chesapeake Bay, of which the entrance and both sides of the lower part as far north as the mouth of the Potomac belong to Virginia; but all the rest, more than half of its whole extent, to Maryland. A small portion of Virginia, lying to the east of it, is by this bay entirely separated from the rest. The west shore of Chesapeake Bay is here indented by many bays and inlets; the most considerable of which are the estuaries of rivers.

Rivers. Every portion of Virginia is traversed by fine rivers and streams, useful either as channels of navigation or for manufacturing purposes. The chief of these is the main trunk of the Potomac, which has already been described under the article MARYLAND. Its principal tributaries are from this state. The Rappahannock rises on the eastern side of the Blue Ridge, and is navigable for small vessels to Fredericksburg, 110 miles above its mouth in Chesapeake Bay. James River is by far the largest and most important of the streams which have their whole course in Virginia, and is not inferior to the Potomac and the Kanawha in utility and the varied beauties of its scenery. Rising in the Alleghany mountain, it first bears the name of Jackson's River, and after having received the Cow Pasture River, a considerable stream, it takes the name of King James, passes through the Kittatinny, and several other mountain-chains, enters the Great Valley, and, gathering the waters of that fruitful region, emerges from the Blue Ridge over the Irish Falls. Above Richmond it descends by a fall of seventy feet, in the distance of 8 miles, into the low country. Below Richmond it gradually becomes wider and deeper, and in the lower part of its course expands into a long, spacious bay, with sufficient depth for the largest ships. Vessels of 600 tons ascend to City Point, 75 miles from the bay, although there are some bars and shoals which obstruct the navigation; and vessels drawing 15 feet of water proceed 30 miles higher, to Warwick, which is within 5 miles of Richmond, the capital of the state. The York River, formed by the confluence of the Mattapony and Pamunskey, each about 100 miles long, flows south-east into Chesapeake Bay; and is navigable up to Yorktown, about 40 miles above its mouth. The Blackwater, Nottoway, and Meherrin, unite in North Carolina to form the Chowan, which enters Albemarle sound. They are all navigable for small coasting-vessels. The Ohio, which divides Virginia from the state of that name, receives from the left the Great Kanawha, rising in the valley be-

Virginia.

tween the Blue and the Iron Mountains, and also the Monongohela, Little Kanawha, Guyandot, and Big Sandy rivers.

Minerals.

The geological strata that occupy Virginia lie in the same general direction as the mountain-ranges. In the south-east of the state there is a tract of tertiary formation; which is succeeded by a broad belt of primary rocks, interrupted at two places by old red sandstone, and extending as far as the Blue Mountains. This again is succeeded by a tract occupied by various kinds of limestone and sandstone, occupying the whole of the Valley district; while beyond the mountains lie the great coal-fields of Pennsylvania and Ohio. The mineral wealth of Virginia is almost boundless; gold, copper, lead, iron, coal, salt, limestone, marls, gypsum, slate, porcelain clay, excellent marbles, granites, soapstones, freestones, &c., are among its subterranean treasures. The first coalfield is that of the primary region, the extent of which has not been determined, but coal has been worked along the James and Appomattox rivers in the neighbourhood of Richmond. The thickness of the coal-seams is very variable, ranging from 4 or 5 to 30, 40, and even 60 feet; the coal is bituminous, and of an excellent quality. On the north branch of the Potomac there is a remarkable bituminous coalfield, along with strata of valuable iron ore; and, west of the Alleghany, there are some of the most extensive and valuable deposits of coal in the world. At Wheeling, on the Ohio, and for 14 miles down the river, the bank presents an uninterrupted bed of highly bituminous coal, upwards of 16 feet thick. Salt-springs occur in various places. But the most important works are on the Great and Little Kanawha. Virginia has many thermal and other medicinal springs, which are much resorted to by invalids. Gold is one of the most important of the metallic minerals of Virginia. It occurs throughout a belt on the western side of the primary district, stretching from beyond the Rappahannock to the Appomattox; and it has been profitably worked to a large extent. Iron will probably at some future day prove to be a more precious deposit; but, although the ore of several varieties is found in profusion in different sections of the state, it is at present but little worked. Copper ores are found among the altered rocks east of the Blue Ridge; and numerous openings have been made in Orange, Amherst, Campbell, and Buckingham counties, for procuring the cupreous rock, which at an early period was ground on the spot, and sent to England to be smelted. Lead occurs in the south-western part of the state, in the forms of the sulphuret (galena) and carbonate, both of which are wrought, yielding a large per centage of valuable metal.

Climate, soil, and agriculture.

The climate of Virginia, like the character of the country, is very various in different parts. In the low country along the coast, it is hot and not very healthy in summer, but mild in winter. The central regions enjoy a colder and more salubrious climate; and in the extreme west, both the heat in summer and the cold in winter are more intense. But on the whole the climate is well suited for agriculture, for which also much of the soil is well adapted. On the mountain-valleys and along the great rivers there are rich alluvial tracts, while the loftier regions have pasture-land sufficient for vast numbers of cattle and sheep. Agriculture is the chief branch of industry, but the immense resources of the country have as yet been but partially developed. On both sides of the Blue Ridge, maize, wheat, rye, oats, and buckwheat, are the principal grain crops. Tobacco is the principal staple of most of eastern Virginia, but in the valley it is cultivated only in the southern portion, and not at all beyond the Alleghany. In the eastern and southern counties cotton is planted to a considerable extent. On the shores of the Chesapeake, barley and the castor oil plant are cultivated; and on some of the best lands above tide-water, hemp is raised to advantage. The Trans-Alleghany county, being exceedingly mountainous and remote from market, is chiefly devoted to raising live stock. According to the census of 1850, Virginia contained 10,360,135 acres of cultivated land, and produced 11,232,616 bushels wheat, 458,930 rye, 35,254,319 maize, 521,581 pease and beans, 3,130,604 potatoes, 294,818 buckwheat, 53,155 grass seed, 52,318 flax seed; 56,803,218 lb. tobacco, 2,860,765 wool, 11,089,359 butter, 436,298 cheese, 999,450 flax, 1,227,665 maple sugar, 880,767 honey and wax; and 369,098 tons hay. Of live stock, there were in the same year, 272,403 horses; 21,480 asses and mules; 1,076,369 head of cattle; 1,310,004 sheep; and 1,830,743 swine.

Virginia.

Manufactures and commerce.

Manufactures do not engage so much of the industry of Virginia as agriculture, but they are making rapid progress, and the natural resources of the country are sufficient, if fully developed, to raise it to a high place as a manufacturing country. In 1850, the entire number of establishments producing each L.100 worth of goods annually, was 4433. Among these were 27 cotton factories, employing 1275 men and 7688 women, and producing goods to the value of L.309,660; 121 woollen factories, employing 478 men and 190 women, and producing goods to the value of L.175,209; 122 furnaces, forges, &c., employing 3220 men, and producing castings, pig iron, &c., valued at L.510,692; a large number of breweries and distilleries, employing 123 men, and producing 5500 barrels of beer, ale, &c., and 879,440 gallons of whisky, brandy, &c.; and 341 tanneries, producing leather to the value of L.186,429. The direct foreign trade of Virginia is much less than what it might be from the productions of the country, and the number of rivers and harbours it possesses. And it is also much less than it formerly was; for at one time Virginia was the most commercial of all the United States; and its mercantile navy held the position now occupied by that of New York. There is a very large coasting trade; the productions of the country being generally conveyed to the northern ports for exportation; and the imports from foreign lands brought in in the same way. Tobacco, maize, wheat, flour, timber, coal, and oysters, are the most important articles exported from Virginia. The total value of the exports for the year ending 30th June 1858 was L.1,515,917; and that of the imports, L.224,801. In the same year there entered at the various ports of the state 259 vessels, tonnage 92,332; and there cleared 317, tonnage 88,644. The total number of vessels built in Virginia in the same year was 25, tonnage 2605; and of these 11 were steamers. Much has been done here for facilitating internal intercourse and commerce by means of railways and canals, though Virginia is still, in these improvements, behind some of the other states. The great southern line has about 150 miles of its length in this state, and numerous other railways and branches intersect the country; the whole length of the lines in operation in January 1859 being 1230 miles. There are also several canals in Virginia. Of these, the most important are the James river and Kanawha canal, extending from Richmond westwards across the Blue Mountains, and intended to be continued to open up a communication with the Ohio; and the Dismal Swamp canal, connecting Albemarle Sound with Chesapeake Bay, and lying only partly in this state.

Government and finances.

The government of Virginia is republican. The elective franchise is vested in all male citizens, who have been resident two years in the state, and one in the district or town for which they vote. The executive power is in the hands of a governor, elected by the people directly every four years, assisted by a lieutenant-governor, likewise popularly elected for the same period. The legislative body appoint the secretary, treasurer, two auditors of public accounts, the registrar of the land-office, and the superintendent of the penitentiary, each for two years. There is a senate of 50 members, elected from districts in the propor-

Virginia.

tion of the property and taxation combined, holding office for four years, one-half retiring biennially; and a house of delegates of 152 members, elected biennially from districts in proportion to the white population. The judiciary consists of a supreme court of appeals of five judges; besides district, county, and circuit courts. The judges are all popularly elected; in the supreme court for twelve, and in the subordinate courts for eight years. The total public receipts for the year ending 30th September 1859, were L.901,360; the public expenditure, L.879,692; and the public debt, L.6,063,882.

Religion and education.

In 1850 there were in the state 2336 places of worship, with 834,691 sittings. Of the former, 1002 belonged to the Methodists; 639 to various sects of Baptists; 236 to the Presbyterians; 167 to the Episcopalians; and the rest to minor sects. There is no general system of education in the state, but much is done for its encouragement. A sum of money is allotted from the public finances for the gratuitous education of the poor. The recent returns on this subject are imperfect, but the amount expended in this manner in 125 out of the 140 counties, and in three towns for the year ending 30th September 1857, was L.28,452; and the number of poor children educated in 123 counties and one town was 49,547. Support is also given to the primary schools, and an annual grant is made to the university of Virginia. The literary fund, by the proceeds of which the primary schools are supported, was created in 1809; and amounted, 1st October 1857, to L.349,507. According to the census of 1850, Virginia contained 2654 public schools, and 579 academies. It has, besides, ten universities and colleges. Of these, the most celebrated are:—William and Mary College at Williamsburg, which, having been founded in 1692, is, next to Harvard University, the oldest college in the United States, and has educated a large number of eminent men; Hampden-Sidney College; and the University of Virginia, founded in 1819, under the auspices of Jefferson, on a plan in some respects different from that of the other American colleges. There are also in the state theological seminaries for Episcopalians, Presbyterians, and Baptists; two law, and two medical schools. The benevolent institutions supported by the state are two lunatic asylums at Williamsburg and at Staunton, and a deaf and dumb institution at the latter place. There is also a state penitentiary at Richmond.

Population.

The first white settlers in Virginia were English; and the emigration from England continued to be pretty active during a great part of the seventeenth century, particularly from the time of the civil wars to the Restoration in 1660, and toward the close of the century, both before and after the Revolution. Many victims of the political disturbances of those periods were banished to Virginia or sold into servitude in the colony. In the following century, many German emigrants, chiefly from Maryland and Pennsylvania, occupied the valley in the rear of the Blue Ridge, which thence received the name of the German Valley; and in the more western part of the state, great numbers of Irish settlers fixed themselves. Negroes and mulattoes constitute a large proportion of the population of Virginia, and these are mostly held in slavery. The first negroes were brought into the harbours of the Chesapeake by a Dutch ship in 1620, when twenty were sold to the colonists; but the importation was for a long time so inconsiderable, that at the end of fifty years their number was only 2000. The inhabitants indeed endeavoured to discourage the traffic, and the Assembly made repeated attempts to prevent the further introduction of negroes, but failed in obtaining the requisite sanction of the crown; and up to the time of the revolutionary war, from 5000 to 6000 were annually brought into the province by the English slave-traders. It is one of the grievances recited in the constitution of 1776, and reaffirmed in the new instrument adopted in 1830, that George III. had prompted the rising in arms of "those very negroes whom, by an inhuman use of his negative, he had refused us permission to exclude by law;" and in 1778 the new state prohibited their importation under heavy penalties. The following table gives the population of the State at different period:—

Virgin Islands.

Year.	Whites.	Slaves.	Free Blacks.	Total Blacks.	Total.
1642	...	...	...	...	20,000
1670	38,000	2,000	...	2,000	40,000
1790	442,115	293,427	12,766	306,193	748,308
1810	551,534	392,518	30,570	423,088	974,622
1830	694,300	469,757	47,348	517,105	1,211,405
1840	740,958	448,987	49,852	498,839	1,239,797
1850	895,304	472,528	53,829	526,357	1,421,661
1859	1,087,918	511,154	59,118	570,272	1,658,190

The principal events in the history of Virginia are mentioned in the article UNITED STATES.

VIRGIN ISLANDS, a numerous group of small West Indian islands, extending eastward from Puerto Rico, and lying between N. Lat. 18. 5. and 18. 50., and W. Long. 64. 10. and 65. 40. They are comprised within an area of about 100 miles in length, by about 25 miles in breadth, and have in all about 230 square miles, with about 25,000 inhabitants. They are for the most part rocky, elevated, sandy, and barren. Among their productions are sugar, maize, coffee, cotton, indigo, and tobacco. Guinea grass grows abundantly in certain parts, and affords excellent pasturage for cattle. The forests contain many useful trees, among which are mahogany and fustic. Fish are very plentiful on the coasts. There are two rainy and two dry seasons. The dry seasons are from December to April, and from June to September. The westerly portion of the group belongs to Spain, the central to Denmark, and the easterly to Britain. The chief of the Spanish islands, which adjoin to Puerto Rico, are Culebra or Snake Island, and Bieque or Crab Island. They have together an area of about 75 square miles, and a population of about 1200. The chief of the Danish Virgin Islands are St Thomas and St John, the former having an area of about 30 square miles, with 13,666 inhabitants, and the latter an area of 22, with 2228 inhabitants. The island of Santa Cruz is not properly one of the Virgin Islands, though it is sometimes included among them as belonging to Denmark. The principal of the British Virgin Islands are Tortola, Anegada, Virgin Gorda, Jost Van Dyke, Beef Island, Peter's Island, Guana, Salt, Caymanes. The total area is about 92 square miles, and the population about 7000, of whom more than one half are on Tortola. They are subject to a lieutenant-governor, under the governor-in-chief of the Leeward Islands, and are governed by an administrative council of six elective and three non-elective members, presided over by the governor for the time being, all in terms of an act passed in 1854 for amending the constitution of the Virgin Islands. In 1856 the revenue and expenditure were each L.1559. During that year there arrived 648 vessels, of in all 2320 tons, and left 1201 vessels of 3670 tons,—the total value of imports being L.5714; of exports, L.10,563. The Virgin Islands were discovered by Columbus on his second voyage in 1494, and named Las Virgines, in honour of the eleven thousand virgins in the Romish ritual. In 1666 the English established themselves on Tortola, which has ever since remained in their possession. The Danish islands of St Thomas and St John were taken by the British in 1801, but restored the following year. In 1807 they surrendered to the British, and continued in their hands till 1815, when they were again restored. The Virgin Islands suffered severely from cholera in 1853–54.

Viscount ‖ Vitebsk.

VISCOUNT (*Vice Comes*), was anciently an officer under an earl, to whom, during his attendance at court, he acted as deputy to look after the affairs of the county. But the name was afterwards employed as an arbitrary title of honour, without any shadow of office pertaining to it, by Henry VI.; when, in 1440, in the eighteenth year of his reign, he created John Beaumont a peer by the name of Viscount Beaumont. A viscount is created by patent, and ranks next below an earl. His mantle is two doublings and a half of plain fur, and his coronet has only a row of pearls close to the circle.

VISEU, a city of Portugal, in the province of Beira, 48 miles N.N.E. of Coimbra. It stands about 1300 feet above the level of the sea, and the country around is fertile, abounding in vines and fruit trees of various kinds. The streets are tolerably clean, and the houses are superior to those of most towns in Portugal. The cathedral is an interesting building, and contains some of the best works of Gran Vasco, who is said to have been a native of this place. Viseu has a college preparatory to the University of Coimbra; and a large annual fair is held here. Pop. 7000.

VISHNEI-VOLOTCHOK, or WYSCHNEI-WOLOTSCHOK, a town of European Russia, capital of a circle of the same name in the government of Tver, and 70 miles N.W. of the town of that name. It stands on the Zna, at the head of the canal uniting that river with the Tvertza, an affluent of the Volga, and thus connecting the navigation of the Baltic and Caspian seas. This place is consequently a great entrepot for trade, and three large annual fairs are held here. Pop. (1856) 8340.

VISHNU, one of the three relations of the Supreme Being of the Hindus, of which Brahma is considered the creator; Vishnu, the preserver; and Siva, or Shiva, the destroyer and renovator of material forms.

VISTULA (Germ. *Weichsel*), a large river of Europe, rises at the foot of a branch of the Carpathians, near the borders of Moravia, Galicia, and Hungary, and 20 miles south-east of Teschen, and not far from the source of the Oder. Its course is northwards for about 40 miles, but on reaching the Prussian frontier it turns to the north-east, flows past Cracow, and forms the boundary between the Austrian and Russian empires as far as Sandomir. From that point its direction is north and north-west through Poland, as far as Warsaw; then more to the west, until it enters the Prussian territory, a short distance above Thorn. Some distance below this it turns to the north, and flows in that direction to the Baltic, into which the main stream discharges itself below Dantzig, after sending off two branches, the Nogat and the Old Vistula, into the Frische Haff. The whole length of the Vistula is about 550 miles; it is navigable as far as Cracow, and is connected by a canal with the Oder. Its affluents are very numerous, the most important being on the right, the Save from Galicia and the Bug from Russia; and, on the left, the Pilica from Poland and the Netze from Prussia.

VITEBSK, or WITEPSK, a government of European Russia, bounded on the N. by those of Livonia and Pskov, E. by that of Smolensk, S. by those of Moghilev and Minsk, and W. by those of Vilna and Courland. Length, from N.W. to S.E., 220 miles; breadth, 100; area, 17,212 square miles. It consists of an immense low plain, diversified only by a few heights along the banks of the rivers. All of these flow into the Baltic, and most of them through the Düna, which traverses the government in a semicircular course, entering it from the N.E., and leaving it in the N.W. It receives in this government the Mesha, Casplia, Ula, Polota, Drissa, Goroshanka, Viteba, and other affluents. The Lovat, flowing to the north, is the principal river in the government not connected with the Düna. There are also several lakes of small size, such as Dorowitza, Nevel, Sebesh, and others. Both the rivers and the lakes abound in fish. The most valuable mineral is iron; but freestone, limestone, and marl are also obtained here. There are mineral springs in some places. The soil is on the whole poor, consisting in general of a clayey sand, and a large part of the surface is occupied by morasses. The climate is temperate and moist. Agriculture is the principal occupation of the people, and the grain raised is more than sufficient to supply the home consumption. Rye is the principal crop; but wheat, barley, oats, pease, beans, hops, hemp, and flax are also raised, and gardening is much attended to. The extent of arable land in 1849 was 4,663,355 acres; of meadow land, 405,788 acres; and of wood, 4,668,967 acres. On the pastures, horses of good breed, and large numbers of cattle and sheep, are reared; and the government contained, in the above mentioned year, 192,473 horses, 285,274 horned cattle, 133,304 sheep, 1,065,599 swine, and 25,627 goats. The extensive forests consist of pines and other trees; and are infested by bears, wolves, foxes, stags, and other wild animals. Manufactures have as yet made little progress in Vitebsk, but the trade is very extensive. A great part of the productions of the country are conveyed by the Düna to Riga and Pernau, or on sledges to St Petersburg; while the canals that connect the Düna with the Lovat and the Berezina tend greatly to facilitate trade. The principal articles exported are corn, flour, hemp, flax, fish, honey, wax, timber, horses, oxen, wool, hides, and tallow. The government is divided into twelve circles. Pop. (1856) 748,524.

Vitebsk ‖ Viterbo.

VITEBSK, the capital of the above government, on both sides of the Düna, at its confluence with the Viteba, 95 miles north of Moghilev. It is defended by ancient walls and towers; and is built for the most part of wood, with irregular, narrow, and dirty streets. The chief buildings are an old castle, three Roman Catholic and twelve Greek churches, three synagogues and eight convents, a college, bazaar, and several hospitals. Leather and cloth are made here, and there are highly esteemed breweries of mead. An active trade is also carried on. Pop. (1856) 20,728.

VITERBO, a city of central Italy, capital of a delegation of the same name in the Papal States, is situated at the foot of Monte Cimino, on the high road between Florence and Rome, 40 miles N.N.W. of the latter city. It is enclosed by walls and towers, and is generally well built, having many handsome edifices, and a number of elegant fountains. It is supposed to occupy the site of the ancient *Fanum Voltumnæ*, where the general assembly of the Etruscans was held on solemn occasions. In the thirteenth century it was the residence of several popes, some of whom are buried in its churches; and numerous conclaves of the sacred college have been held here. It is at present the seat of a bishop, and the residence of the delegate or governor of the province. The cathedral, a Gothic edifice, is built on the site of a temple of Hercules, and is adorned with some good paintings, and contains monuments of several of the popes. The episcopal palace is an old building of the thirteenth century, now much decayed, but still retaining many points of interest, among which is the great hall where the conclaves were held. Among the other ecclesiastical edifices worthy of notice are the church of Sta Rosa, where the body of that saint is preserved; the church of St Francesco, containing a painting by Sebastian del Piombo, from designs by Michael Angelo; the Trinita, &c. The town-hall contains some good paintings and collections of Etruscan and other remains connected with the locality. There are few manufactures in the city, the inhabitants being chiefly dependent on agriculture. There are numerous mineral springs in the vicinity, and alum, sulphur, vitriol, and other volcanic products are obtained. Many of the higher classes in Rome have country houses about Viterbo. Pop. 14,000. The delegation, or province of Viterbo, has an area of 1120 square miles, and

a population (1853) of 128,324. The surface is mountainous in the north, in other parts undulating or plain. A considerable portion of it is cultivated, producing corn, wine, olive-oil, &c. Cattle are extensively reared in the province.

VITORIA, a town of Spain, capital of the Basque province of Alava, is situated on a gentle eminence, on the high road from France to Madrid, about 190 miles N.N.E. of that city. It consists of an old and a new town,—the former with narrow, tortuous streets and a curious old plaza; the latter with straight, regular, and well built streets, and a modern plaza lined with arcades. Vitoria is, from its position, an important centre of trade, and is a busy and flourishing town. The chief manufactures are iron and earthenwares, linens, leather, paper, candles, and cabinet furniture. It has a collegiate and four parish churches, hospital, orphan asylum, town-hall, theatre, public library, and museum of antiquities. There are delightful public walks outside the town. Vitoria is celebrated for the decisive victory gained here by the Anglo-Spanish army, under the Duke of Wellington, over the French, on 21st June 1813. Pop. (1857) 15,569.

VITRÉ, a town of France, capital of an arrondissement of the same name, in the department of Ille-et-Vilaine, is picturesquely situated on the right bank of the Vilaine, 22 miles east of Rennes. It is enclosed by walls flanked with towers, and has an old feudal castle. The houses are generally ill built, and the streets narrow and dirty. The most remarkable edifices are the church of Notre-Dame, and the house inhabited by Madame de Sévigné. It has a communal college, and manufactures of hosiery, flannel, leather, &c. It has also some trade in these articles, and in wine, honey, hides, and cantharides. Pop. (1856) 8493.

VITRUVIUS POLLIO, MARCUS, a Roman architect of great name, is sometimes represented as a native of Rome; but, if we may rely on the opinion of Maffei, there are divers reasons for supposing him to have been a native of Verona. Other writers are disposed to transfer the honour of his birthplace to Formiæ, a city of Campania, and now called Mola di Gaeta. His *prænomen* is not less doubtful than his country. In the first edition of his work, he is called Lucius. A. appears in some manuscripts, but M., or Marcus, is most frequently to be found. Of his personal history, any notices which we possess are almost entirely derived from his own work. In the preface to the sixth book, he mentions that he was indebted to his parents for a good education. In the preface to the second, he speaks of himself as being small of stature, advanced in years, and having his strength impaired by disease. From the preface to the first, we learn that he was personally known to Julius Cæsar; that, after his death, he was recommended by Octavia to her brother Augustus; and from this emperor he obtained a permanent provision, which placed him beyond the fear of want. The services which he rendered were those of a military engineer: "Ad apparitionem balistarum, et scorpionum, reliquorumque tormentorum refectionem, fui præsto." His treatise *De Architectura*, divided into ten books, is addressed to Augustus. This is a curious and valuable relique of ancient art and literature. The author was evidently a man of superior talents and learning, nor was his knowledge limited to one department: he appears to have been instructed in general literature, and to have been well acquainted with the Greek writers.

The *editio princeps* of Vitruvius, superintended by Jo. Sulpicius Verulanus, is in folio, without place or date, but is supposed to have been printed at Rome about 1486. It is accompanied by the treatise of Frontinus, *De Aquæductibus*, or, as it is there described, *De Aquis quæ in Urbem influunt*. Both treatises were reprinted, Florent. 1496, fol. They were afterwards reprinted by Junta, Florent. 1513, 8vo. Passing various other editions of Vitruvius, we arrive at that of Guilielmus Philander, Lugd. 1552, 4to. The annotations of Philander, who is reckoned one of the principal commentators on this author, had formerly been published in a separate form, Romæ, 1544, 8vo. This edition was followed by that of Daniel Barbarus, Venet. 1567, fol. After a long interval appeared the edition of Jo. de Laet, Lugd. Bat. 1649, fol. It is splendidly printed, but is less distinguished for accuracy. With the annotations of Philander, Barbarus, and others, it contains some appendages of less importance. One of these is a Latin translation of Sir Henry Wotton's *Elements of Architecture*. A more suitable accompaniment is the *Lexicon Vitruvianum* of Bernardinus Baldus. There is a good edition by A. Rode, Berol. 1800, 2 tom. 4to. It was speedily followed by the edition of J. Glo. Schneider, Lips. 1807–8, 3 tom. 8vo. Another elaborate edition was afterwards undertaken; Utini, 1825, 9 tom. 4to. An English translation of Vitruvius was executed by William Newton, Lond. 1771–91, 2 parts, fol. Wilkins published a translation of "*The Civil Architecture of Vitruvius*, comprising those books of the author which relate to the public and private Edifices of the Ancients; with an introduction, containing an historical view of the rise and progress of architecture amongst the Greeks." Lond. 1812–17, 2 vols. 4to. In 1826 an edition was published by Joseph Gwilt, with a list of the several editions and versions of Vitruvius appended.

VITRY-LE-FRANCAIS, a town of France, capital of an arrondissement of the same name in the department of Marne, stands on the right bank of the river Marne 20 miles S.E. of Chalons. The town is modern, having been founded in 1545 by François I. after the destruction of Vitry-en-Perthois by Charles V. The town is clean and well built, with wide and straight streets, and has a handsome church and numerous public fountains. It occupies an important military position, and is enclosed by earthen ramparts and a deep moat. It has manufactures of hosiery, cotton yarn, hats, leather, and oil; and carries on a trade in corn, wool, wood, charcoal, &c. Pop. (1856) 7151.

VITTORIA, a town in the island of Sicily, province of Noto, and 12 miles W.N.W. of Modica. It stands on an eminence, and is a poor straggling town with few good buildings. The inhabitants, who amount to about 10,000, are chiefly employed in agriculture, and in the rearing of cattle and bees.

VIVERO, a town of Spain, Galicia, province and 45 miles N. of the town of Lugo, near the mouth of the Landrova. It is generally neat and well built, and has several churches, convents, and hospitals; a theatre, and a public seminary. It has manufactures of linens, leather, and earthenware, and carries on some trade. Pop. about 4000.

VIVES, JUAN LUIS, better known perhaps under the Latinized form of his name LUDOVICUS VIVES, was born at Valencia in Spain in March 1492. He studied dialectic at Paris, and afterwards became professor of Latin at Louvain and subsequently at Oxford. Having dedicated an edition of the *De Civitate Dei* of Augustin to Henry VIII. of England, he was invited to London, and was appointed tutor to the Princess Mary. The independence of his character drew upon him much persecution. Vives had the courage to blame the divorce of the king from Catherine of Aragon, which led to his imprisonment. When released, he passed over to Spain, and ultimately took up his residence at Bruges, where he wrote the greater number of his works. Vives formed at an early period of his career the friendship of Erasmus and of G. Budæus. Vives gained considerable distinction by his hostility to the scholastic philosophy, and to the authority of Aristotle. The best of his philosophical publications are *De Causis Corruptarum Artium; De Prima Philosophia; De Explanatione Essentiarum; De Censura Veri; De Instrumento Probitatis et de Disputatione*; *De Initiis Sectis et Laudibus Philosophiae;* and *De Anima et Vita.* A complete edition of his works was published at Basle, 2 vols. 1555, a second at Valencia in 1782.

VIZAGAPATAM, a maritime district of British India, under the presidency of Madras, and lying between 17. 15. and 19. 3 N.Lat.; and 82. 24. and 84. E. Long. It is bounded on the N., N.W., and W., by the territory of Orissa; N.E. by the district of Guntoor; S.E. by the bay of Bengal; and S.W. by the district of Rajamandry Area 4690 square

Vizagapatam ‖ Vladimir.

miles. The coast is bold and rocky, and the surface is mostly mountainous and waste, having here and there, however, fertile valleys which yield rice, maize, millet, sugar-cane, indigo, and cotton. The climate though sultry is generally healthy, except along the coast, where it is rather moist. The manufactures are unimportant, and chiefly confined to coarse cottons. Pop. 1,254,274.

VIZAGAPATAM, the chief town of the above district, is situated on a spit of land formed between the mouth of a small river and the sea, in 17. 41. N. Lat.; and 83. 21. E. long. The fort contains a barracks, arsenal, hospital, and other public buildings; but its defences have been allowed to fall into decay. To the N. and W. of the fort is the native town, which contains many good streets and numerous well built houses, but is very much crowded. The climate is considered unhealthy for Europeans, who have often to remove to places more elevated and at a distance from the coast.

VLADIMIR or WLADIMIR, a government of European Russia, bounded on the N. by those of Jaroslav and Kostroma; E. by that of Nijni Novgorod; S. by those of Tambov and Riazan; and W. by those of Moscow and Tver. Length from E. to W. 212 miles; breadth 140; area 18,317 square miles. The surface consists of an undulating plain, interrupted in some places by low hills or the steep banks of the rivers. It has a general slope towards the N.E., and in this direction the principal rivers flow. These all belong to the basin of the Volga; and the largest are the Oka, which waters the S. and E. of the government and falls into the Volga, and its affluent the Kliazma, which flows through the centre from the government of Moscow. The other rivers, about twenty in number, are of much smaller size; such as the Tesa, Kamanka, Unsha, Koloks-cha, &c. There are also many lakes; the largest of which are that of Pleschtschejev, and one called the Cow Lake, containing a floating island. The most important mineral productions of Vladimir are iron, alabaster, freestone, and potter's clay. The principal iron mines are at Murem; and at Vixa on the Oka in this government are the most extensive iron-works in Russia. The climate is on the whole temperate and healthy, but it is liable to great extremes, the summers being very hot and the winters very cold; while in spring and autumn the weather is variable. The rivers are usually frozen from November till March. In some parts the soil is not unfertile, consisting of a stiff clay or loam; but so large an extent of the surface is occupied by forests, heaths, morasses, and sandy tracts unfit for cultivation, that Vladimir is by no means an agricultural country, and does not produce enough corn for the home consumption. The extent of arable land in the government in 1849, was 4,449,398 acres, of meadows 758,238 acres, and of forests 5,443,408 acres. The principal crops are rye, barley, and oats; but wheat, millet, hemp, flax, and pease are also grown. Little attention is paid to the rearing of cattle, and neither the horses nor the sheep of the country are of good breeds. The number of horses in 1849 was 285,800, of horned cattle 342,314, of sheep 360,861, and of swine 11,530. Game is scarce; but bears, wolves, and lynxes abound; and the rivers are well supplied with fish, especially sturgeon and shad. The manufactures of the government are considerable, and in a flourishing condition. There were, in 1849, 317 manufactories, employing upwards of 78,000 work-people. Cotton goods are made chiefly at Shuja and Ivanova; and next in importance to them come woollen and linen fabrics, glass and crystal, earthenware, leather, &c. The trade consists chiefly of the exportation of manufactured goods, either down the Kliazma and Oka, or overland to Moscow; and of the importation of corn, flax, and cotton twist. The government is divided into 13 circles. Pop. (1856) 1,121,720.

VLADIMIR, the capital of the above government, on the left bank of the Kliazma, 120 miles E.N.E. of Moscow. It is one of the oldest towns of Russia, having been founded in 1154; and it was until 1328 the residence of the grand dukes and the capital of Russia. Few traces remain of its ancient splendour: it is a large but ill built town, entered by six gates, and having six principal streets. It has a fine cathedral, numerous other churches, an episcopal palace, court-house, clerical seminary, gymnasium, and other schools. Linen and leather are manufactured, and a considerable trade in fruit is carried on. Pop. (1856) 12,606.

Vlissingen ‖ Voet.

VLISSINGEN or FLUSHING, a fortified seaport town of Holland, province of Zealand, on the island of Walcheren, at the mouth of the estuary of the Western Scheldt, the passage of which it defends. It is strongly fortified, and is one of the chief naval stations of the kingdom, having a harbour capable of accommodating 80 ships of war. It is also the seat of an admiralty board, and has a naval arsenal, docks, wharves, &c. Two large and deep canals enable merchant vessels of the largest size to enter the town, and load or unload their cargoes at the quays. It carries on an extensive trade with the other seaport towns of Holland, as well as with the E. and W. Indies, &c. The town is well built, but contains no buildings worthy of special notice. Flushing was bombarded and taken by the English under Lord Chatham in 1809, when the fine town-hall, two churches, and about 100 houses were destroyed. Since that time its fortifications have been very much strengthened. It is the birthplace of the Dutch admiral De Ruyter. Pop (1856) 10,963.

VOCATIVE. See GRAMMAR.

VOET, GISBERT, an eminent divine, was born at Heusde on the 3d of March 1593. The earlier part of his education he received at the school of his native place, where he astonished his teachers by his uncommon powers of memory. In 1604 he was sent to the university of Leyden, where he prosecuted his studies for seven years. During his theological course, he gave private lectures on logic, and among his pupils he numbered the celebrated Burgersdyck. Having completed his academical studies in 1611, he became a candidate for the ministry. His professional career was retarded by a long illness; but on his recovery, he was appointed to officiate in the church of Vlymen, and he preached occasionally at Engelen, about a league distant. In 1617 he accepted a call to Heusde, where he continued to officiate for seventeen years. In 1619 he assisted for six months at the famous Synod of Dordrecht, and proved himself a most zealous supporter of the doctrines of Calvin. In 1634 he became one of the ministers of Utrecht; and on the foundation of a university in that city, he was appointed professor of divinity. He now took his doctor's degree at Groningen. During the vacation of 1637 he paid a visit to England, where he inspected the public libraries, and formed a personal acquaintance with many learned men. Besides his private lectures, he gave eight public lectures a week, and likewise taught Hebrew, Syriac, and Arabic. Before he settled at Utrecht, he was accustomed to preach eight times a week. He rendered himself very conspicuous by the zeal and pertinacity with which he opposed the philosophy of Des Cartes. This philosopher, who had fixed his residence at Utrecht, was exposed to a great variety of attacks, literary and juridical, from the professor of divinity, by whom the tendency of some of his speculations was considered as highly pernicious. His public opposition commenced in 1639, and gave rise to much controversy. Voet was seconded by Rivet, Des Marets, and other divines eminent for their learning. Having continued his labours to a very advanced period of life, he died on the 1st of November 1676, in the eighty-eighth year of his age. Among many other works, he published *Selectæ Disputationes Theologicæ*, Ultraj. & Amst. 1648–69, 5 tom. 4to. But his principal work was his *Politeia Ecclesiastica*, Amst. 1663–76, 4 tom. 4to.

Vôet || Volcanoes.

VOET, JOHN, the grandson of Gisbert Voet, was born at Utrecht on the 3d of October 1647. His father, Paul Voet, who was born at Heusde on the 7th of June 1619, became successively professor of logic and metaphysics, of the Greek language, and of the civil law, in the university of Utrecht, and died in that city on the 1st of August 1677. He was likewise the author of various works. His son was appointed professor of law at Herborn, and afterwards at Utrecht, and was finally removed to Leyden, where he died on the 11th of September 1714. His principal publications were *De Jure Militari liber singular.* Ultraj. 1670, 8vo; *De Familia Erciscunda liber singularis*, Ultraj. 1672, 8vo; *Compendium Juris juxta seriem Pandectarum*, Lugd. Bat. 1693, 4to; *Commentarius ad Pandectas*, Lugd. Bat. 1698, Hagæ Com. 1704, 2 tom. fol. The last is an elaborate and able work.

VOGHERA, a town of Sardinia, Piedmont, capital of a province of the same name in the administrative division of Alessandria, is situated on the Staffora, 18 miles E.N.E. of Alessandria. The town is well built, is surrounded by walls, and has an elegant collegiate church, a Jesuit's college, hospital, and barracks. It is the seat of a governor and of a provincial court. There are manufactures of woollen and silk stuffs; and an active trade in corn, wine, and silk is carried on. Pop. (1848) 11,454. The province has an area of 308 square miles, and contains 101,695 inhabitants.

VOITURE, VINCENT, a French writer of great reputation during his day, was born at Amiens, in 1598. He was educated at Paris, at the Colleges of Calvi and of Boncour. While in connection with the former college, he wrote, in 1612, his *Hymnus Virginis seu Astreæ*, which was much admired. Voiture got a sinecure clerkship from the superintendent of Finance, and he received an introduction to the celebrated hotel of Madame de Rambouillet. Here he soon rose to distinction, and his society was courted by the great and the influential of France. He visited England, Spain, Africa, and Italy, in all of which countries his remarkable quickness and fluency, as well as his elegant wit and his polite badinage, gained for him numerous friends, and materially extended his fame. He died mâitre d' hôtel to the king, and a member of the French Academy, in 1648. Voiture published nothing during his lifetime except his college verses. His writings—so full of bel-esprit, according to Voltaire—were collected after his death by his nephew in 1650, and they have since been frequently reprinted. The *Letters* of Voiture have been twice translated into English, once by Davies, in 1657, and the second time by various authors, of whom Dryden was the chief, in 1736.

VOLCANOES. In other parts of this work, some account has been given of the principal volcanoes, either under their own heads, or those of the countries in which they occur. (See articles ÆTNA, ICELAND, JAVA, MADEIRA, POLYNESIA, &c.) The volcanic rocks have also been described in the article MINERALOGY and GEOLOGY; and the general features of volcanoes are treated of under PHYSICAL GEOGRAPHY. It remains now only to recapitulate those points in their structure and history which form the data for reasoning upon their nature and cause.

Number of Volcanoes.—About 400 volcanic mountains are known to exist in various parts of the earth, and more than half of these have given evidence of their igneous activity in modern times. Catalogues have been compiled by Von Buch (*Iles Canaries*, Paris ed. 1836), Scrope (*Considerations on Volcanoes*, 8vo, Lond. 1825), Humboldt, and Keith Johnston. The active volcanic vents are marked on Darwin's map of the *Coral Reefs*; and more recently (1854), a very complete map, on which the extinct volcanoes are also marked, has been published in Keith Johnston's *Physical Atlas*: the number of active volcanoes is there estimated at 270. The following numbers are given by Humboldt in the last volume of *Cosmos* (Bohn's edition, p. 121). Volcanoes.

1. Europe	7	active	4
2. Atlantic Islands	14	„	8
3. Africa	3	„	1
4. Continental Asia	25	„	15
5. Asiatic Islands	189	„	110
6. Indian Ocean	9	„	5
7. South Sea	40	„	26
8. America	120	„	56
Total	407	Total active	225

VOLCANIC REGIONS—*Europe.*—The principal seat of volcanic activity in Europe is the kingdom (formerly of the Two Sicilies) including Ætna, Vesuvius, and the islands of Stromboli and Volcano still in action; with Ischia and the volcanoes of the Phlegræan fields which have been long quiescent.[1] Among the Greek islands there is a smaller tract, where Santorin has manifested some activity in historic times.

Atlantic Islands.—All the remote islands of the Atlantic are volcanic. Iceland and Jan Mayen, Pico in the Azores, and Teneriffe, have had modern eruptions. The rest of the Azores and Canaries, Madeira, Ascension, St Helena, and Tristan D'Acunha, are quiescent, or have long burned out. On the Antarctic continent, Mount Erebus, and in the S. Shetlands, Deception Island, have been seen in action.

Africa.—In continental Africa only one active volcano has been seen, in the Cameroons Mountains, on the west coast. There are others in the Red Sea and in the Comoro Islands.

Continental India has no burning mountains. Barren Island in the Bay of Bengal, Bourbon, and the remote oceanic rock of St Paul, are active volcanoes.

Continental Asia exhibits only the volcano of Demavend on the Caspian, two reputed volcanoes in the Thian-shan, and nine in the peninsula of Kamtschatka.

Asiatic Islands.—A great volcanic belt extends through the islands of southern and eastern Asia; commencing on the coast of Birmah, and passing through the Andaman Islands, Sumatra, Java, and Timor, it turns northward to Amboina, Gilolo, and the Philippines, and then extends by the Loo-choo Islands to Japan, the Kurile Islands, and Kamtschatka. This region includes above 100 active volcanic vents, of which half are in the eastern and half in the southern portion.

South Sea.—With rare exceptions, the whole of the Pacific Islands which exhibit any rock whatever are of volcanic origin; yet in this great region there are fewer smoking volcanoes than on the single island of Java. These active vents occur in the Mariana and Sandwich Islands, north of the equator; and in the New Guinea group, New Hebrides, and New Zealand; and in the Friendly Islands.

America, west coast.—Volcanic rocks, with cones and craters, and other indications of subterranean action, exist in almost uninterrupted series, from the Aleutian Islands and coast of Russian America to the southern extremity of the continent in Tierra del Fuego. This region contains one-fourth of the known active volcanoes, including many of the loftiest mountain-summits in the world. On the north-west coast there are five, including Mount Elias, and Mount Regnier on Puget's Sound, and St Helen's (15,000 feet,) north of the Columbia river.

In Mexico there are four active volcanoes; and eighteen in Central America. There are none in the Isthmus of Panama, which may therefore be considered in a state of stable equilibrium at the present time.

In Quito and New Grenada there are ten active cones of extraordinary dimensions, and situated 50 to 100 miles from the coast. The group of Southern Peru and Bolivia consists of fourteen great volcanic mountains, including Chimborazo, only three of which are active. Chile exhibits the larger proportion of thirteen (out of twenty-six) active volcanoes, extending over as many degrees of latitude, and amongst which are Aconcagua, 23,000 feet; Maypu, 17,662; Antuco, 9242; Osorno, 7443; and Corcovado, 7509. In Fuegia, the loftiest summit (Sarmiento, 6800 feet) is an extinct volcano. The Galapagos and Juan Fernandez, belonging to this coast, and not to the Pacific island-group, have active volcanoes.

On the eastern coast of America there are no volcanoes; but in the West Indies there are three active vents, in the chain of the Lesser Antilles.

Distribution in Latitude.—A large proportion of the volcanoes above mentioned are situated in tropical regions, and very few exist at a distance of more than 30° from the equator. Nevertheless,

[1] *Campi Phlegræi*, by Sir William Hamilton, fol. Naples, 1776.

Volcanoes. they are not dependent on climate, but are seen on the grandest scale in Iceland, or blazing amidst the perpetual winter of the south polar continent. In Deception Island, South Shetland, the layers of scoriæ are interstratified with snow. The following examples occur in high latitudes:—

Jan Mayen (6874 feet)	70° 49′ N.
Hecla, in Iceland (5110)	63° 59′ „
Mount St Elias (17,860)	60° 17′ „
Kamtschatka (15,763)	65° 4′ „
Taranaki, New Zealand (8840)	39° 15′ S.
New South Shetlands	62° 55′ „
Erebus, S. Polar land (12,400)	77° 32′ „

Proximity to the sea.—These statements, or a glance at the map, will show that a vast majority of the volcanoes now in action stand either as islands in the sea or near its shores. The most remote are Sangay, one of the great mountains in the Quito group, 112 miles, and Fragua, 156 miles from the sea; and the two volcanoes of Thian-shan in Central Asia, which are 1500 miles from either the Arctic or Indian seas.

Linear arrangement.—The position of volcanic vents at intervals along lines of coast and chains of islands is a remarkable circumstance, and was recognised by Plato in the myth of Phlegethon. It seems to indicate a frequently common origin upon longitudinal fissures,—an inference which is strengthened by some instances of their simultaneous eruption at great distances. On the night of the 19th January 1835, an eruption of Osorno was seen by Mr Darwin, who learned afterwards that Aconcagua in Chile, 480 miles northwards, was in action on the same night. A great eruption of Coseguina, 2700 miles to the north, occurred within six hours, accompanied by an earthquake felt over 1000 miles; but it is difficult even to conjecture whether this coincidence was accidental, or showed some subterranean connection. In the case of Juan Fernandez, situated 330 miles from the coast of Chile, there was undoubtedly a connection between the volcanic forces acting under the island and under the continent, as was shown during the earthquake of 1835.[1]

Form and Structure of Volcanoes—*Cones of Eruption.*—The characteristic form of fire-emitting mountains is a cone, truncated at the summit by a funnel-shaped cavity or *crater*. They are built up of ashes and *scoriæ*, erupted from the crater and deposited in layers, which are thickest near the rim, and consequently become steeper as the cone grows in height.[2] The angle of the slope is pictorially represented at 45°, as in Humboldt's *View of Chimborazo*, but is probably never quite so much. In the Peak of Teneriffe the inclination at the summit averages 33°, and in the volcanoes of Java it varies from 20° to 35°.[3] Humboldt says that of all the volcanic cones he has seen, that of Cotopaxi is the most beautifully regular. The loftiest eruptive cones are the Sahama, in Bolivia, 22,350 feet; and Aconcagua, in Chile, 23,004 feet.

The outer surface of the cone consists usually of loose materials. The lofty peaks of the Andes present the appearance of mere heaps of trachytic fragments; but the interior must be rendered more solid by pressure and the percolation of rain-water, which it is known will convert light tuffs and loose volcanic sand into a heavy and compact rock. The interstices of the scoriæ are sometimes filled with ashes, or with pumice, as at Teneriffe.

Craters.—The crater of Vesuvius exhibits a series of apparently horizontal strata—the sections of lava-currents and beds of scoriæ, which dip outwards at an angle of 30° to 40°. Liquid lava is seldom ejected from cones of eruption; but when it does overflow at the summit, the crater is usually broken down on one side by its escape. Obsidian, which has a lower specific gravity than other forms of liquid lava, is frequently ejected from summits; while the heavy basaltic lavas have issued from fissures at low levels, and have often been spread out beneath the sea. The fragments of melted lava ejected from craters harden instantly on the surface, while the interior becomes vesicular from the expansion of the vapours they contain. The same is the case with the surfaces of lava streams, which cool rapidly and contract, breaking up like the sunburnt earth, and becoming rugged and uneven. Some scoriæ, like pumice, will float in water for a time, and have been met with far at sea, covering the surface, in masses of sufficient depth to impede the progress of a ship.

Craters are frequently filled up, either by the rising of lava from within, or by the falling in of the summit of the cone. In the intervals between great eruptions, the interior of the crater presents the appearance of a hollow plain, with sometimes one or more small cones of eruption in the centre. Such was repeatedly the case with the crater of Vesuvius. Before the eruption of 1822 it was 4200 feet high; but more than 800 feet of the summit was carried away by explosions, and a crater excavated, which was three quarters of a mile in its longest diameter, and nearly 1000 feet in depth. In 1834, this great cavity had been filled up nearly to the top with lava, which had consolidated, and formed a level and unbroken plain, except that a small cone, thrown up by the ejection of scoriæ, rose in the midst of it like an island in a lake.[4] Volcanoes.

Cones without Craters.—It is stated by Humboldt, that amongst the extinct, or at least quiescent volcanoes, "unopened domes" and "bell-shaped elevations without craters" are very numerous; and he cites as examples the Chimborazo, Ararat, and the Puy de Dome. It is, however, more than probable that these mountains have had craters which are now obliterated. The original eruptive orifices of the extinct volcanic island St Helena appear to have been filled up by enormous columns of phonolite, which now stand out as pinnacles (called Lot's Wife, Little Stony-top, &c.), more or less denuded of their former matrix.

Dikes.—The steepness of volcanic cones is liable to be further increased by the pressure of the incandescent lava previous to eruptions. Great vertical fissures are formed, radiating from the volcanic focus, and extending to the surface, or even to the summit of the mountain. Through these fissures the principal lava-streams escape, and they ultimately become filled with sheets of compact lava, cooled slowly under great pressure, and are called *dikes*. The crater of Vesuvius exhibits seven or more great vertical dikes, some of them at least 400 or 500 feet in height, and thinning out before they reach the uppermost part of the cone. In the Val del Bové, or lateral valley of Etna, the mass of this intrusive matter sometimes appears to equal in volume the rock it penetrates. Mr Darwin describes one dike in St Helena as being 1260 feet high, and only decreasing from 9 feet wide at the bottom to 8 feet 8 inches at the top. In some of the valleys of this island, they are numerous to a degree unequalled anywhere else: they extend in less regular lines, covering the ground with a network like a spider's web, and with some parts of the surface even appearing to consist wholly of dikes, interlaced by other dikes. The total amount of upheaval produced at successive eruptions, and rendered permanent by this injection of the fissures, must have been very considerable.

Laminated structure.—In the lava bordering the Ætnean dikes, Mr Darwin has observed a laminated structure, generally vertical, and extending in the direction in which the mass has flowed. "The most probable explanation of this structure in the felspathic rocks, appears to be that they have been stretched whilst flowing onwards in a parting condition." It is mentioned here because of its resemblance to the "ribbon-structure" of glacier ice produced by lateral pressure.

Craters without Cones.—It has been observed that the great mass of the lava streams produced in eruptions are not discharged from the summit of cones, but from fissures on their flanks and base, and these sometimes take the form of craters. The Chajorra, on the side of the Peak of Teneriffe, is 3000 feet lower than the terminal crater, which it far surpasses in size and in the magnitude of its lava-streams. The most striking example of a volcanic vent unaccompanied by a cinder-cone, is the great cauldron-like crater of Kilauea on the flank of Mauna Loa in the island of Hawaii. This orifice is 4000 feet above the sea-level, while the summit is 13,760 feet. It is 3 or 4 miles in diameter, and 1000 feet deep when in its ordinary state, and resembles a huge quarry surrounded by vertical walls. Scattered over its bottom are lakes and pools of lava always in a state of ebullition, but instead of overflowing the rim of the cauldron, it finds a passage by subterranean fissures for 10 or 20 miles before it breaks ground, and flows over the surface towards the sea. The subsidence of the liquid plain of lava in the cauldron after eruptions has given origin to a ledge of consolidated lava 342 feet above the lake which it encircles. The usual slope of the lava sheets of Mauna Loa is between 5° and 10°. (*Dana.*)[5] Sandwich Islands.

Old Crater Walls.—A very common feature in the configuration of volcanic mountains consists in the ruins of an older and larger crater surrounding the active cone of eruption. It is frequently broken down on one side, and in some very ancient volcanoes the erosive power of running water, or (in certain cases) of the sea, have greatly modified the form of the circumvallation, and enlarged the breach in its wall. One of the most perfect examples of this kind is the Peak of Teneriffe, which "stands like a tower surrounded by its fosse and bastion." The bastion, or old crater-wall, extends nearly all round, but is broken down on the W. and N.E.; the highest, southern side, is 9000 feet above the sea. Its outer slope is less than 12°, but on the inner side it presents to the mountain a precipice of 1000 to 1800 feet. The cavity which it surrounds is 8 miles in diameter, and 7000 feet above the sea. The Peak, or cone of eruption, is more than 5000 feet in height, and the summit (or Peak of Teneriffe.

[1] Darwin *On Volcanic Islands*, p. 128. [2] *Teneriffe* by Piazzi Smyth, 8vo, Lond. 1858. [3] Junghuhn's *Java*, German tr. Leipz. 1852.
[4] Lyell's *Principles of Geology*, 8vo, Lond. 1853. [5] *Geology of American Exploring Expedition*, 4to, Philad. 1849.

Volcanoes. *piton*) 500 or 600 feet more. The crater is 300 feet across, and 70 feet deep, but much broken down and easy of access. The sulphureous exhalations are chiefly noticeable on first reaching the brink, and do not prevent multitudes of insects and some small birds from taking shelter in it. The highest point is 12,198 feet above the sea.[1]

Ætna. The high platform of Ætna exceeds 9000 feet, but the cone of eruption is only 1100 feet. There is evidence of a great encircling crater 2 miles in diameter, having once surrounded the base of the cone, but scarcely any portion of its wall remains. The most remarkable feature of Ætna is the great chasm called the Val del Bové, which excavates the eastern flank of the mountain. It is described as a vast amphitheatre, 3 miles across and 6 in length, surrounded by steep precipices which rise to nearly 2000 feet in height at the upper end, and exhibit sections of innumerable lava-streams and beds of volcanic scoriæ, traversed by highly inclined dikes.[2] This valley is not itself a crater, although there is evidence of an old axis of eruption near its upper end, but is comparable with the "Valley of Jacob in Mount Ararat," and the ravines which break the circumvallation of Teneriffe and the Caldera of Palma. It was probably formed, at least in part, by aqueous erosion; for though Ætna ordinarily feeds only a few small rivulets, yet, sometimes, as in the flood of 1755, the body of water discharged from it has been so great, that it was thought that if all the snow on the summit was melted in an instant, it would not have supplied such a volume of water. The Val del Bové was the scene of the last eruption, which commenced on the 20th of August 1852.[3] In many

Java. of the loftiest volcanoes of Java, the active cone and crater are of small size, and surrounded by a plain of ashes and sand, and encircled by an "old crater wall," which is often 1000 feet and more in vertical height. Many of these are no less than 4 miles in diameter, and they are attributed by Junghuhn to the truncation by explosion and subsidence of ancient cones of eruption.

Vesuvius. The present cone of Vesuvius is supposed to have been formed by the great eruption of 79, in which the elder Pliny lost his life, and the cities of Herculaneum and Pompeii were destroyed. The semicircular ridge of Somma, which girdles the northern flank of the present mountain, is believed to be a remnant of the ancient Vesuvius. It was described as a truncated cone with a level outline as seen from a distance; and the crater, which must have been 3 miles in diameter, was surrounded by precipitous walls, except on one side, where there was a single narrow breach. These walls must have been since destroyed on the side towards the sea.

Origin of Encircling Craters.—In many of the old and extinct volcanoes which have been wasted by atmospheric influences or the action of the sea, little or no trace is left of a cone of eruption within the broken rampart of the old crater-wall. This is the case

Palma. in the island of Palma, the type of Von Buch's *craters of elevation*, which resembles a vast cauldron 3 or 4 miles across, with walls rising to the height of 7000 or 8000 feet above the sea. The interior hollow or *caldera*, is only 2000 feet in elevation, and above its sloping sides rise precipices of 1500 to 2500 feet, traversed by countless dikes. There is only one great breach in this barrier, prolonged downwards in a ravine (*barranco*), by which torrents escape to the sea. From the centre of the cauldron rises a small conical eminence of a few hundred feet, consisting of lavas resembling the more modern of those on the rim of the great crater.

It was supposed by Von Buch that this *caldera*, like the dome-shaped bases of Ætna and Teneriffe, had been formed of lava-streams poured out, probably beneath the sea, on a much lower slope than they now exhibit; and that their present position and form were due to sudden and violent explosions. This hypothesis has lost much of its popularity since it has been ascertained by Scrope and others (especially Sir C. Lyell), that lava streams of small extent are actually consolidated on greater inclines than was formerly supposed.

Nevertheless there is difficulty in believing that such great lines of circumvallation as that of Teneriffe have ever formed the base of proportionately gigantic cones of eruption. In cones of eruption the sides are *concave*, but the swelling dome-like form of the bases of volcanoes with encircling craters points to the influence of expansion and upheaval rendered permanent by successive injections. They are true *craters of slow elevation*, and not of eruption or explosion. Mr Darwin admits this explanation in the case of the great broken craters of St Jago, Mauritius, and St Helena, which he thinks may have been elevated slowly *en masse*, while their central portion became separated from the exterior by curved faults. The inclination of their beds may have been slowly acquired by that mode of elevation of which, as Elie Beaumont says, the dikes are the evidence and the measure.[4]

Rapid formation of new Cones.—The ordinary growth of volcanic mountains may be slow, or fitful, and subject to frequent interruptions; but instances are not wanting of rapid or even sudden formation. Such is the Monte Nuovo in the Phlegræan fields, formed M. Nuovo. in September 1538 on the site of the old Lucrine lake, once famous for its oysters. The eruption lasted two nights and two days without intermission, and on the third day people went up to the top of the new hill, 440 feet in height, and looked down into the crater (now 421 feet deep), and saw stones boiling up, as a cauldron of water boils on the fire. It has remained quiescent ever since.

Scarcely less remarkable is the Monte Rossi, at the foot of Ætna, a double cone of 450 feet high, and 2 miles in circumference at the base, which was entirely formed of ejected sand and scoriæ in the course of three or four months, in the year 1669.

The volcano of Izalco, in Central America (now 1600 feet high), also rose up suddenly on the 23d February 1770, and has since remained uninterruptedly active, often serving as a beacon for mariners in the Bay of Acajutla. But the most famous modern volcano is Jorullo in Mexico, formed in the latter half of the year 1759, which Jorullo. attained at once an elevation of 1600 feet, and has never resumed its activity. Six smaller cones, the least of them 300 feet in height were thrown up along the line of the same fissure, and so enormous was the quantity of ejected lava and scoriæ, that the whole plain, for the space of four square miles around, seemed to swell up like a blister, till it attained the elevation of 550 feet at the base of the mountains. Those who reason habitually from the slow progress of ordinary events, are apt to omit from their calculations the influence of convulsions like these, by which (as in social revolutions) the usual work of centuries is accomplished (or destroyed) in an hour.

Magnitude of Lava-streams.—It will be sufficient to mention two illustrations of the mass of liquid stone poured out in the course of single eruptions. In 1783 a lava-torrent burst from the Skapta-Jokul in Iceland, and continued flowing for two years. It filled up Iceland. the rocky beds of rivers, in many places 400 to 600 feet deep, and near 200 wide, flowing up their channels as well as down, filling deep lakes and an abyss of 600 feet below a waterfall, and spreading out over wide alluvial plains, in broad, burning lakes from 12 to 15 miles wide and 100 feet in depth. The two principal streams were respectively 40 and 50 miles in length, and 7 and 12 to 15 miles wide, forming a mass which surpasses Mount Blanc in magnitude.[5]

In the island of Hawaii, in 1840, a burning deluge of lava broke out 10 miles below the crater of Kilauea. It spread from 1 to 4 miles wide, and reached the sea, at a distance of 30 miles, in three days, and for fourteen days plunged, in a vast fiery cataract a mile wide, over a precipice of 50 feet. In 1843 a similar stream flowed from the summit of Mauna Loa; and, in August 1855, the lava broke out at a spot 2000 feet below the summit, on the opposite side to Kilauea, and continued for ten months overflowing an area of 200,000 acres. The main stream was 65 miles long, from 1 to 10 miles wide, and from 10 to 300 feet in depth.[6]

Frequency of Eruptions.—The activity of volcanic mountains is very unequal, and their fire often becomes extinct for long periods. The little mountain Stromboli (2318 feet) has been incessantly active since the Homeric age. In the time of Strabo and Pliny it was remarkable, as at the present day, for the number of its incandescent chasms, resembling the pit of a blast-furnace, in which fluid lava ascends hourly and overflows.

Izalco, near San Salvador, exhibits four fiery eruptions in an hour, with variable violence, but astonishing regularity of occurrence; and the volcano of Rancagua in Chile (34. 15. S. Lat.) is said to be always throwing out ashes and vapours like Stromboli.

The great mountain Sangay (17,000 feet), S.E. of Quito, has been in eruption ever since 1728, and is the most active of all known volcanoes, "exhibiting every quarter of an hour the greatest quantity of fiery, widely luminous eruptions of scoriæ;" 267 explosions have been counted in an hour, causing a continuous roar, which has been heard at places distant 252 and 348 geographical miles. Humboldt states that, during his residence near Quito, he could distinguish, by their *voices*, the eruptions of four great volcanoes on the same night.

Other mountains have burst forth into paroxysmal activity, and then relapsed into repose for many years. The eruptions of Copiapo have occurred twice after intervals of twenty-three years; and Coseguina has shown renewed activity after pauses of a hundred and of twenty-six years. In Ischia there intervened between two successive eruptions a pause of seventeen centuries; and Vesuvius has repeatedly slumbered for a century, or two at a time.

---

[1] *Admiralty Report, on the Teneriffe Experiment*, 4to, 1859.
[2] Sartorius von Waltershausen, *Atlas of Ætna*.
[3] Lyell in *Phil. Trans.* 1859.
[4] Hopkins, *Report Brit. Assoc. for* 1847, p. 33.
[5] Henderson's *Journal*, and Hooker's *Tour in Iceland*. See also Sartorius von Waltershausen's *Atlas of Hecla*.
[6] Coan *Journ. Geol. Soc.*, 1856, p. 170.

Volcanoes.

An attempt has been made to connect the periodicity of small earthquake shocks with the moon's action on the supposed fluid interior of the earth;[1] and if there were any foundation for the report, it might be expected to influence other volcanic phenomena. But no such connection has been traced. Stromboli and Ætna, however, are said to be most active in November and the winter months.

Antiquity of Volcanic Vents.—The extreme age of many active volcanoes is shown by the fact, that in volcanic archipelagos seldom more than one island is active at a time, and the greater eruptions usually occur only after long intervals; also by the amount of degradation, by slow action of the sea, which their coasts have suffered, wearing back their sloping borders into lofty precipices. This is still more forcibly conveyed by the study of extinct volcanic islands, like Kerguelen's Land[2] and St Helena, whose internal structure is more completely exposed to view.

But most of the active volcanoes are of recent geological date, and some are quite modern. Vesuvius and Ætna rest upon marine strata of newer Pliocene age, and Hecla is newer than the Miocene tertiary. The Cordilleras have been the seat of volcanic activity since the earlier cretaceous period; but half their foci have been long extinct, and the rest are of many different ages. In islands where no marine strata co-exist with volcanic rocks, no limit can be assigned to their antiquity.

Extinct Volcanoes.—The largest and most perfect assemblage of extinct craters is that of Clermont in central France, a map of which resembles a portion of the lunar surface.[3] Like the volcanoes of Madeira and the Azores, they are of post-miocene date.[4] The Peak of Teneriffe itself (probably the Atlas of the ancients) has never erupted from its highest cone since the time of its first discovery, and appears to have been cooling down for ages. According to Sir C. Lyell, the volcanic district of Olot, in Catalonia, belongs to the older Pliocene period. The Eifel, in Prussia, also exhibits volcanic phenomena in several very interesting forms, and belongs to the middle tertiary age. The Ghauts of India are a prodigious mass of tertiary basalt, and the columnar basaltic rocks which overlie the chalk of Austria, and are repeated in Staffa and Mull, are probably of miocene age. In this country there are no ancient volcanic craters: the old trappean hills, which present the greatest resemblance to volcanic peaks, are, perhaps, the Rivals in Caernarvon, and the Titterstone in Shropshire—especially as seen from the grounds of Downton Castle.

Ancient Volcanic Rocks.—Scarcely any part of the globe is without signs of the former action of volcanic fires, and although the loosely constructed cones of eruption have been swept away, and the solid crater-foundations broken and wasted, enough remains to attest their existence and activity in every age of the earth's history. It has been previously pointed out (in the article MINERALOGY), that only an arbitrary distinction can be made between ancient "trappean" and modern volcanic rocks. Counterparts of the older rocks may be found in the interior of modern volcanoes, both as regards composition, hardness, and specific gravity. Columnar basalt appears to have been formed in the interior of lava-streams poured out at low levels and beneath the sea. Greenstone is represented by the *diorite* of the Ætnean dikes. Some of the trachytic lavas are full of minute quartz crystals; others contain hornblende and mica, forming sometimes a complete passage to the structure of the granitic rocks. Generally the old trap rocks consist of orthoclase and hornblende, while the newer lavas contain augite, and oligoclase, and glassy felspar, and are more easily fusible. The *dolerites* of Iceland, Ætna, and Stromboli, consist of augite and Labradorite.

Cause of the distribution of Volcanoes along Coast-lines.—It is admitted by all who have speculated on the causes of volcanic action, that proximity to the sea is one of the necessary conditions for its manifestation. That the sea-water finds access to the foci of volcanoes is rendered at least probable by the enormous quantities of vapour always discharged, and the extraordinary torrents which sometimes accompany eruptions.

Ancient Volcanoes remote from the Sea.—The map of volcanoes and geological map of the world, in K. Johnston's *Atlas*, exhibits remains of ancient volcanoes deep in the interior of continents and far removed from present seashores. Such are Fisher's Peak, in Arkansas, and Ararat in the old world; the Ural, Altai, and Himalaya are accompanied by volcanic ranges, and there are many scattered centres of igneous action in Australia. Wherever their forms are distinct, they seem to beacon the old sea margins of the former world at various stages of its history; and the signs observed in the Thian-schan may, perhaps, be the last sparks (maintained by salt-lakes of the Tartarian steppes) of volcanic fires which once lighted up the shores of a great inland sea. Volcanoes.

Extinction of Volcanic Foci.—The final extinction of volcanic fires does not seem to depend on the exhaustion of materials, but on the excessive amount of subterranean movement with which they have been associated,—in one class of instances removing them far inland, and, in the other, drowning them beneath the sea. "On several encircling islands of the Pacific there are old craters and streams of lava, which show the effect of past and ancient eruptions. In these cases it would appear as if the volcanoes had come into action, or become extinguished on the same spots, according as the elevating or subsiding movement prevailed." (Darwin.)

Source of Volcanic heat.—It was suggested by Sir Humphry Davy, that if the interior of the earth contained large quantities of the unoxidated metalloids, all the phenomena of volcanoes might be occasioned by the penetration of sea-water through deep fissures; and although abandoned by its distinguished author, this hypothesis (with some modifications) has been entertained by Dr Daubeny[5] and other chemists. There is no question that water plays a most important part in volcanic processes, or that elastic vapours supply the principal motive force of upheavals and eruptions also.

Geological Theory.—The most popular opinion has always referred the phenomena of volcanoes (and earthquakes) to "the reaction of the interior of our planet upon its uppermost strata." "A volcano, properly so called, exists only when a permanent connection is established between the interior of the earth and the atmosphere" (Humboldt). From observations made in mines, it is believed that the interior temperature of the earth increases at the rate of 1° for every 50 or 100 feet, and that a heat capable of melting granite must prevail at the depth of 25 miles,—a distance which agrees with M. Beaumont's estimate of the thickness of the solid crust. According to Mr Hunt's observations, the increase of temperature below 200 fathoms is only at the rate of 1° for every 85 feet. But then it has been shown that pressure facilitates the fusion of substances which contract in melting, so that at the depth of 50,000 feet (or 9½ miles) a dull red heat of 680° Fahr. would be sufficient to melt granite, or at least to retain it in a state of fusion. Now, as the Peak of Teneriffe is 12,000 feet high, and rises from a depth of 12,000 feet in the sea, it is probable that its focus is at least 24,000 feet below the summit, and possibly twice as distant. And it has been already mentioned, that the substances ejected from the highest orifices are those of least specific gravity and greatest fusibility. The trachyte of Ponza would probably not be solidified at a temperature less than 680°, even at the depth of 2500 feet. Granite, according to Mr Sorby,[6] is unerupted lava, out of which the lighter and more fusible elements have been melted,—a view which agrees with some remarks of Mr Darwin, for it seems impossible that many distinct rocks should exist separately in the depths of the earth, if all are alike fluid from the intense heat.

Mr Darwin's Theory.—The geologist who, next to Humboldt, has seen most of volcanic phenomena in all parts of the world, has advanced a step further in the theory of volcanoes, by endeavouring to connect their distribution with the nature of the subterranean movements formerly or still in progress. Having marked the sites of all the active volcanoes on his map of coral-reefs,—in which he has distinguished (by structure of the reefs) the areas of subsidence from others regarded as areas of elevation,—he goes on to say, "It may be considered as almost established that volcanoes are often (not necessarily always) present in those areas where the subterranean motive power has lately forced or is now forcing outwards the crust of the earth, but that they are invariably absent in those where the surface has lately subsided, or is still subsiding."[7] Sir C. Lyell had previously argued, that "aqueous and igneous agents may be regarded as antagonist forces,—the aqueous labouring incessantly to reduce the inequalities of the surface to a level, while the igneous are equally active in renewing its unevenness." Sir Charles, therefore, appears to regard volcanoes as active agents in raising the surface of the earth, while Mr Darwin considers them only as the index of terrestrial movements. Sir Charles Lyell's theory.

Statements like these, coming from the highest geological authorities, are not likely to be questioned by geologists; but to naturalists, who study the distribution and origin of the existing "nations" of plants and animals, they will appear opposed to the fact, that while active volcanoes abound in those regions which he is accustomed to look upon as *the most ancient dry land on the face of the globe*, they are still more absolutely and entirely wanting in

[1] Ansted's *Geological Gossip*, 12mo, Lond. 1860.
[2] Described in Hooker's *Antarctic Botany*, part ii. 4to, Lond. 1847.
[3] Scrope *On the Geology of Central France*, 4to, Lond. 1827.
[4] White's *Handbook for Madeira*, ed. J. Y. Johnson, 8vo, Edin. 1857.
[5] Daubeny *on Volcanoes*, ed. 2, 1848. See Smyth's *Teneriffe*, p. 376.
[6] *Journal of the Geol. Soc.* 1858, vol. xiv. p. 453.
[7] *Structure and Distribution of Coral Reefs*, 8vo, Lond. 1842 (reprinted 1851, p. 142).

Volcanoes.

the provinces which he supposes to have been last rescued from the sea, judging by the character of their living population.[1]

It is quite certain that the faunas of Bourbon, Java, New Zealand, &c., are not only very ancient, but that they have once been more widely distributed, and possessed a higher importance, and are now on the decline. They are not new faunas, recently produced, or lately imported, but the remains of ancient populations, having a peculiar and marked physiognomy (*facies*) which we cannot find on the continents, unless dimly represented in the remains of the former world; and it is equally certain that (with local and temporary exceptions) these areas are diminishing in extent. Mr Darwin himself remarks, that the region of the Asiatic islands is "the most broken land on the globe, and that the rising parts are surrounded and penetrated by areas of subsidence."

No naturalist will doubt that the volcanic islands of the Atlantic are the summits of submerged regions. The Faroe islands and Iceland are fragments of a once continuous barrier in the North Atlantic; Madeira and P. Santo, the Azores and Canaries, are all more or less intimately connected with the Lusitanian province.[2] Even the remote oceanic specks—Tristan d'Acunha and Kerguelen's Land—are regarded by Dr Hooker as particles of a great southern continent, once extending as far as the Falklands and Fuegia, and clothed with a uniform vegetation![3] Sicily must have been a promontory of Northern Africa since the establishment of the present fauna; although the temporary appearance of Graham's Island (in 1831) *ought* to indicate an upward tendency in the bed of the Mediterranean, near the Skirki.

Non-volcanic coast lines.

Non-volcanic Coast-lines.—On the other hand (as we can see by a glance at the maps) the non-volcanic coast-lines include all the northern arctic regions which are believed to be rising (with the exception of Greenland, which is volcanic and subsiding); all the low, shelving eastern coast of America, bounding tertiary plains, which have risen above the sea in the last age; the rising borders of the Baltic, and, in short, all the shelving coasts and low islands of shallow seas. These great surfaces, in Northern Asia and America, prairies and pampas, Baltic plains, and plain of Lombardy, *have been upheaved in mass*, without the aid or countenance of volcanic eruptions. Or, if it should be asserted that the supposed upward movement of volcanic regions is a mere transitory operation, liable to be reversed before it has united island to island, or produced any influence on the zoological and botanical provinces, it may be replied that such minor oscillations of level are common to every coast in the world, and not peculiar to volcanic regions. The eastern shores of England exhibit churches perched on the brink of cliffs, or buried in dunes of sand, alternating with new villages, rising up beneath the old cliffs on land gained from the sea; while, on the western coast, frequent raised beaches are associated with submarine forests, and other evidence of an opposite kind, speaking as plainly of small changes of level as do the columns of Serapis at Pozzuoli. It appears, therefore, that active volcanoes do not indicate regions undergoing continental elevation; and that they only prove the existence of conditions favourable to "the penetration of the interior of the earth by external influences," as Humboldt has stated it, "because the elevation of the coast, produced by internal elastic forces, is accompanied by a neighbouring depression in the basin of the sea, so that an area of elevation borders on an area of depression, and at this bordering-line large and deeply penetrating fissures and rents are produced."[4]

Humboldt's theory.

Organic remains in Volcanic rocks.—It is usually said that organic remains are wanting in all igneous rocks, and such is necessarily the case with lavas poured out in a molten condition; but volcanic deposits are often *aqueous*, and these do contain fossils. The eruption that destroyed Pompeii consisted of showers of ashes and streams of mud, which sealed up and preserved every enduring relic. Many of the volcanic eruptions in the Andes of Quito have been accompanied by streams of liquid tufa and mud, containing the small Siluroid fishes (*Pimelodus cyclopum*) which inhabit the subterranean waters of the mountains. Fragments of unaltered limestone, with fossils, as well as pieces of granite and other primary rocks, have sometimes been ejected from volcanoes. The silicious shields of microscopic *Diatomaceæ* (miscalled "Infusoria") are of common occurrence in volcanic mud, whether of marine or fresh water origin; these minute plants flourish in thermal waters, and form a large proportion of the substance termed *meteoric paper*. Submarine lava-streams, at a moderate depth, become overgrown with sponges and corals, and tenanted by marine animals, to which their uneven surfaces afford abundant shelter; here they may become entombed with volcanic mud, or calcareous tufa, to form deposits like those of Baixo, and S. Vincente, Madeira. With regard to the silicified sponges ("moss agates") and wood obtained from volcanic rocks, Dr Hooker has observed that both recent and fossil (*i.e.*, already silicified) wood are found entangled in the lavas of Kerguelen. It is known that silicious deposits are of constant occurrence in the vesicular cavities of decomposing trachytic lavas, whose further disintegration sets them free like the agates of Oberstein, found in beds of gravel.[5] The same process may take place in deposits formed by the consolidation of volcanic mud, with cavities caused by the partial decomposition of wood, coral, and sponges. Extensive deposits of lignite are often associated with volcanic formations, as at the Drachenfels and in Iceland; they are sometimes interstratified with lavas and tuffs, telling of long intervals of repose, and the development of a luxuriant vegetation over the ashes of former fires. (S. P. W.)

Volga ‖ Volhynia.

Surturbrand.

VOLGA. See RUSSIA.

VOLHYNIA, or WOLHYNIA, a government of European Russia, bounded on the N. by those of Grodno and Minsk; E. by that of Kiev; S. by that of Podolia and by Galicia; and W. by Poland. Length from E. to W. 230 miles; greatest breadth 152; area 27,540 square miles. The surface is partly level and partly undulating. The northern portion consists of a plain, interrupted here and there by a few wooded hills, while the southern part is traversed by several offsets of the Carpathian Mountains, which, however, nowhere exceed 300 feet in height. In the extreme south of the government there is an elevated table-land, forming part of the watershed between the rivers Dnieper and Dniester. The former of these receives nearly all the drainage of Volhynia, most of the rivers flowing northwards and joining its affluent the Pripet. The largest are the Turija, Stür, Gorün, and Slutsch. The Bug, an affluent of the Vistula, forms the western boundary of the government, and receives a few small streams from it; and the southern Bug takes its rise on the frontier between Volhynia and Podolia. The only lakes in the country are of very small size; but there are extensive morasses, especially towards the north. The climate is mild, equable, and healthy; somewhat resembling, but with rather more severity, that of Southern Germany. Fearful ravages are often caused by swarms of locusts, which from time to time visit the country. The soil is on the whole fertile, and well suited for agriculture, which is the principal branch of industry here. Indeed Volhynia is one of the principal corn-producing governments of Russia; although the methods of farming are very unskilful, and the implements rude. All kinds of grain are raised, especially wheat of very fine quality; and there is a considerable surplus for exportation. Rye, barley, oats, millet, pulse, hops, tobacco, flax, and hemp are also among the productions of the country. In 1849, the extent of arable land in Volhynia was 5,691,629 acres; of meadow land 2,063,120 acres; and of wood 7,255,189 acres. The forests, which are thus extensive, consist in some places almost entirely of pines, but in others oaks, beeches, and limes are numerous. They afford abundance both of timber and fuel. Bears, lynxes, wild boars, wolves, foxes, and many kinds of game, are among the wild animals of the country; and the rivers are well supplied with fish. The pastures are very rich, especially towards the north; and on them large numbers of live stock are reared. The oxen are highly esteemed; and the horses, which are of the Polish breed, are much used for the cavalry. In 1849 the government contained 246,789 horses, 621,306 horned cattle, 995,391 sheep, a large proportion of which were of superior breed, 337,458 swine, and 22,793 goats. The most important of the mineral productions of the country is iron, for which there are a number of furnaces. Saltpetre, flint, limestone, and potter's clay are also found; and there are mineral springs in some places. Manufactures have made considerable progress since the

[1] Forbes in *Jour. of Royal Institution*, Lecture on the Question of Modern Creations.
[2] Forbes in *Memoirs of the Geol. Survey.*
[3] *Botany of Antarctic Voyage*, i. part ii. 1847.
[4] *Cosmos*, vol. v. p. 436, Bohn's ed.
[5] See Bowerbank, *Journ. Geol. Soc.* v. 319.

Volney ‖ Vologda.

beginning of the present century; and now leather, glass, earthenware, potash, tar, and charcoal are made to a considerable extent. The trade is chiefly in the hands of the Jews, of whom there are upwards of 180,000 in the government. The principal exports are corn, cattle, and hides. Volhynia is divided into twelve circles, and has for its capital Jitomir. Pop. (1856) 1,498,387.

VOLNEY, CONSTANTIN FRANÇOIS CHASSEBOEUF, COMTE DE, was born of good family at Craon in Anjou on the 3d of February 1757. Passing from the colleges of Ancenis and Anger, he went to Paris, where he studied law for a time, but ultimately took to medicine. Being possessed of a competency, he set out for the east in 1783, and spent some years in traversing Lower Egypt and Syria. He published on his return to France in 1787, his *Voyage en Syrie et en Egypte*, which for sagacity, learning, acuteness, and spirit, was pronounced the first work on the subject extant. In September 1791, he published his celebrated *Ruines*, in which he first gave to the world those peculiar views regarding the symbolical character of all forms of religion, which have brought his name into such popular notoriety. It is full of ingenious though very extravagant views. Two years afterwards he published his well known brochure on the *Principes Physiques de la Morale*, being an attempt to construct an ethical system on a material basis. Volney was thrown into prison by Robespierre as a royalist, where he lay for ten months. On his release he was appointed professor of history at the new Ecole Normale, where he delighted crowded audiences by his brilliant lectures. In 1795 appeared the first of his philosophical writings, being the *Simplification des Langues Orientales*, which, it is to be feared, effected more in name than in fact. On the suppression of the Normal school during the same year, Volney proceeded to America, where he remained till the spring of 1798, when he returned to France. Bonaparte, whom Volney had known in Corsica in 1793, was now the leading man in France, and there sprung up a friendship between them as warm as it was short-lived. Volney was made a comte by Bonaparte during their intimacy, and he was made commandant of the Legion of Honour. He voted for the deposition of Napoleon on the 2d of April 1814, and he was made a peer on the 4th of June by Louis XVIII. In 1814 he published *Recherches Nouvelles sur l'Histoire Ancienne*, of which a considerable part had already appeared under different forms. The later years of Volney were much occupied with his philological studies, of which he published a considerable number of papers. He died on the 23d of April 1820. See the *Œuvres Complètes de Volney*, with a notice of his life by A. Bossange, 8 vols. Paris, 1826. Volney made a vaunt of his irreligion, and in all his works, particularly in his *Histoire de Samuel inventeur de sacre des rois*, he took occasion to hold up the contents of the sacred Scriptures to the mockery and derision of mankind.

VOLOGDA, or WOLOGDA, a government of European Russia, bounded on the N. by those of Archangel and Olonetz; W. by that of Novgorod; S. by those of Jaroslav, Kostroma, Viatka, and Perm; and E. by Siberia. It is, next to Archangel, the largest in the European part of the empire, being in length from N.E. to S.W. 760 miles; in breadth 380; and having an area of 148,048 square miles. It consists of an immense undulating plain, interrupted only by a few hills here and there, and extending eastwards as far as the Ural Mountains, which separate this government from Siberia. A branch of this range stretches in a N.W. direction across the N.E. of Vologda, and divides the basin of the Petschora on the E. from that of the Dwina on the W. These rivers both flow northwards into the Arctic Ocean, and carry in that direction the whole drainage of the country, except a few streams in the extreme S. which flow into the Volga. The Dwina is formed by the confluence of the Jug and the Suchona; the former of which flows from the S., and the latter from Lake Kubenskoe in the W., receiving in its course the Vologda and the Griasorka. The largest affluents of the Dwina are the Vichegda from the right, and the Vaga from the left; the former augmented by the Jula and Sussola, and the latter by the Vel and Ustie. The Petschora, which has its source in Perm, receives the Ilicha from the right and the Izma from the left. Besides these rivers there is the Mezen, which does not properly belong to Vologda, but has a small portion of its course within its limits. It falls into the Arctic Ocean. The government has also several lakes and some very extensive morasses. The most important minerals found here are iron, copper, marble, granite, limestone, quartz, and salt; of which last there are important springs sufficient to supply nearly the whole home consumption. The climate of so extensive a country naturally varies considerably in different parts. On the whole it is severe but healthy; colder in the N.E. than in the S.W. The winters are long, and the rivers are usually frozen from November till May. The soil is in some places fertile; but in general it requires much care and the use of manure to fit it for cultivation. Rye and barley are the principal crops; but they are not raised in sufficient abundance to supply the home comsumption. Pease, beans, flax, hemp, and hops are also grown. The extent of arable land in 1849 was 1,931,208 acres; of meadow land 1,021,233 acres; and of wood 88,881,454 acres. This immense extent of forests, of which by far the most part belongs to the government, constitutes the chief wealth of the country. Bears, wolves, foxes, elks, reindeer, ermines, martens, squirrels, and hares are among the wild animals of Vologda; and there are many kinds of birds and waterfowl. The extensive pastures of the government are favourable to the rearing of live stock, and both the horses and cattle are of good breeds. Vologda contained in 1849, 187,372 horses, 422,766 horned cattle, 366,658 sheep, and 50,635 swine. Manufactures are carried on to some extent here; especially those of woollen and linen cloth, paper, leather, soap, candles, and glass; and there are also iron and salt works, distilleries, &c. The government has an extensive commerce, being the centre of the transit trade between Siberia and Archangel, which is carried on in summer by the rivers and in winter by means of sledges. The North Catherine canal, completed in 1817, connects the Vichegda with the Kama, an affluent of the Volga, and so greatly increases the facilities for trade, by opening a water communication from the Arctic Ocean to the Caspian Sea. The chief articles exported from Vologda are timber, pitch, tallow, and furs. The inhabitants are for the most part Russians, but there is also an intermixture of Finns, and Samoyede tribes. Pop. (1856) 929,589.

Vologda ‖ Volta.

VOLOGDA, the capital of the above government, on the river of the same name, 110 miles N. of Jaroslav. It is divided into two parts by the river, and is a very ancient town, built for the most part of wood, except some of the more modern houses, which are of stone. It has two cathedrals and many other churches, a monastery, nunnery, several hospitals, a gymnasium, and other schools. Vologda is the seat of the civil governor, and of various public offices, and has manufactories of candles, soap, potash, bells, leather, cloth, ropes, and cordage. An active overland trade with Siberia is carried on; and large fairs are held here annually. Pop. (1856) 14,159.

VOLSCI. See ROMAN HISTORY.

VOLTA, ALESSANDRO. See SIXTH DISSERTATION, § 740.

VOLTAIC ELECTRICITY.

Voltaic Electricity.

VOLTAIC ELECTRICITY properly designates that branch of electricity to which the name of *Galvanism* is generally applied. The term *voltaic* has been given to it in consequence of the science having been founded by M. Volta, professor of natural philosophy at Pavia, although the experiments of Galvani were prior to those of his countryman. At present we propose to comprehend under this general title, the sciences of *galvanism*, *electro-magnetism*, *magneto-electricity*, and *thermo-electricity*; and we have adopted this arrangement in order that we might avail ourselves of the various discoveries which might be made up to the close of the work.[1]

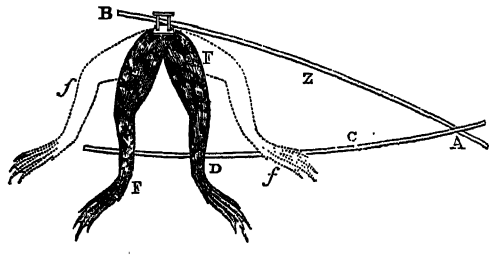
PART I.—GALVANISM.

Galvanism, A. D. 1789.

The science of *galvanism* derives its name from some interesting experiments performed in 1789 by M. Galvani, professor of anatomy at Bologna. When one of his pupils was using an electrical machine, a number of frogs were lying skinned on an adjoining table for the purposes of cookery. The machine being in action, the young man happened to touch with a scalpel the nerve of the leg of one of the frogs, when, to his great surprise, the leg was thrown into violent convulsions. Madame Galvani, having observed the fact, communicated it to her husband, who speedily repeated and extended the experiment. He found that the convulsions took place when a spark was drawn from the prime conductor; and when the blade of the knife, or any other good conductor, was brought into contact with the nerve. When a frog formed part of an electric circuit, a very small quantity of electricity, whether common or atmospheric, produced convulsions in the muscles. Having hung a number of frogs by metallic hoops on an iron railing, he observed that the limbs were frequently convulsed when no electricity was indicated in the atmosphere. In studying this experiment, he was led to the conclusion that the convulsions were not produced by extraneous electricity, but that they always took place when the muscle and nerve of a frog were each placed in contact with metallic bodies, themselves connected by a metal. A still more powerful effect was produced when two metals, such as *zinc* and *silver*, were employed, the nerve being *armed* or coated with one of these metals, the muscle brought into contact with the other, and the two metals joined by an electrical conductor.

This experiment is shewn in fig. 1, where Z is the rod

Fig. 1.



of *zinc* and C the rod of *copper*. The extremity B, of the zinc is brought into contact with the *armed* muscle of the suspended limb FD, while the extremity of the copper is brought into contact with the nerve at D. When the two metals are made to touch at A, the limbs are convulsed, and take the dotted position *ff*. Galvani explained this phenomenon by saying, that the muscle of the frog was a sort of Leyden phial, the nerves representing the interior, and the muscles the exterior coating of the phial, and the discharge or shock taking place by the metal or metals, which form a communication between the two electrified coatings. The fluid which thus passed along the nerves and muscles was called the *Galvanic fluid*.

Voltaic Electricity.

Discoveries of Volta, A.D 1800.

The publication of Galvani's discoveries excited great interest. The subject was prosecuted by Valli, Fowler, Robison, Volta, Wells, Humboldt, Fabbrici, and others; but the labours of Volta were the most successful, and, by his discovery of the *Voltaic pile*, he may be considered as the great founder of the science. In his earliest inquiries, Volta saw the true cause of the phenomena described by Galvani. He maintained that the exciting fluid was ordinary electricity, produced by the contact of the two metals, and that the convulsions of the frog arose from the electricity thus developed passing along its nerves and muscles. Volta afterwards proved that the force, which gave rise to these phenomena, was generated by the contact of heterogeneous bodies, that it decomposed their natural electricity at the point of junction, continually separating the two fluids, and making the *positive* electricity pass along the one and the *negative* along the other.

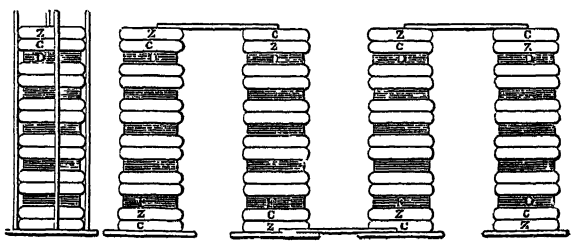
Galvanic circles.

According to this view of the subject, every two heterogeneous bodies form a *galvanic circle* or *arc*, as it is sometimes called, in which electricity is generated; and hence Volta was led, in 1800, to invent the *Voltaic pile*, or *compound galvanic circle*.

Voltaic pile.

This apparatus, shewn in figs. 2, 3, consists of a number

Fig. 2. Fig. 3.



of *single galvanic circles*, ZC, ZC, &c., each of which is composed of a disc of *zinc* and another of *copper*. These single galvanic circles are separated by a disc D, of paper, card, or cloth soaked in *water* or any other *fluid*. When thirty or forty *pair* or *couple* of zinc and copper discs, four inches square, are combined, as in fig. 2, the electricity developed will be sufficient to make the gilt leaves of an electroscope diverge, the *upper* or *zinc* end with *positive*, and the *lower* or *copper* end with *negative* electricity; and if we touch the upper end with the wetted fingers of one hand, and the lower end with the wetted fingers of the other, a distinct electrical shock will be experienced.

Electrical shock.

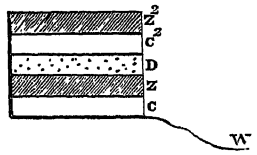
The *zinc extremity* of the pile is therefore called the *positive extremity* or *pole*, and the *copper extremity* the *negative extremity* or *pole*. The *wet* card, or disc, which separates each pair of metallic discs is called the *conductor*.

[1] The names *Electro-magnetism* and *Galvanism* occur so early in the alphabet, that the arrangement referred to could not with propriety be avoided.

Voltaic Electricity.

In order to understand how the electricity of each galvanic pair is accumulated in the pile, let C, fig. 4, be a plate of *copper*, or a *negative* element, communicating with the ground by a wire or chain, W. When a plate of *zinc* Z, or a *positive* element, of the same size, is placed above it, a decomposition of electricity will take place at the instant of contact; the *negative* electricity will pass into the copper and through the wire W into the ground; while the *positive* electricity will enter the *zinc*, and accumulate, till its tension, or the thickness of the electrical stratum, is a maximum which we shall call 1. If we were to make the zinc plate Z communicate with the ground by another wire, the positive electricity with which it is charged will be carried off like the negative electricity from the copper disc, and the electricity, set free by the contact of the two metals, would be carried off as soon as it is generated. By uniting the extremities of the two wires the electricities would be recomposed, and a continual circulation of electricity would take place. The disc of *copper* C, communicating with the ground as in the figure, and the *zinc* disc Z, having an electrical intensity equal to 1, let us place upon Z a wet disc D of card. The positive electricity will pass from Z to D till the tension of the electricity in D is equal to 1, a fresh supply arriving from the contact of the two metals. The same electrical state will continue when a second plate of copper, C^2, is placed above the disc D. But if we place a second plate of zinc, Z^2, it will acquire from the copper beneath it and the wet disc an electrical intensity equal to 1, and from its own action on the copper it will acquire another portion of electricity equal to 1, so that its electrical intensity will be 2. While this is going on, the negative electricity developed in the copper will be neutralised by the positive electricity which it possesses, and in the first pair, CZ, there will be a new development, by which the first zinc disc Z will be brought back to an intensity 1, as well as the disc D and the second copper C^2. Hence the second zinc disc, Z^2, can be in equilibrium only when it has an intensity double of that possessed by the first. In like manner the third zinc disc will have an intensity 3, the fourth 4, and so on, the fortieth having an intensity 40.

Fig. 4.



Mode of action of the pile.

In the voltaic pile which we have now described, the *negative*, or copper pile, communicates with the earth, and the intensity of the *positive* electricity increases, at every pair, from 1 to 40. If we take another pile of similar dimensions, in which the zinc or positive pile communicates with the earth, then the intensity of the negative electricity will increase from 1 to 40. Let us now place these two poles together, so that the two poles in communication with the ground are supported by a wet disc of card, we shall have a pile of eighty pair of plates, in the middle of which the electricity is in its natural state, its intensity being there 0, while at one end there will be a *positive* pile whose intensity is 40, and at the other end a *negative* pile whose intensity is also 40.

In a voltaic pile thus insulated we have electricity of opposite kinds accumulated at its two poles, and of any intensity we choose. If we now place a wire in contact with one pole, and another wire in contact with the other, and bring their extremities together, we shall observe an *electric spark*. By separating them and again bringing them together, another spark will be seen, so that there is a continual current of fire passing from the one extremity or pole of the wire to the other.

Electric spark.

If we now unite the two extremities of the two wires, so as to close the circuit, every thing will appear to be at rest, but, notwithstanding this state of apparent repose, the electrical actions are still going on; the electrical fluid is decomposed in each pair of plates, and again recomposed in the conducting wires. In order to prove this, we have only to interpose a piece of slender wire between the extremities or poles of the conducting wires, when it will either become hot, or red hot, or white hot, or be fused, according as it is longer or shorter, or of a greater or a less diameter. In like manner, water, acids, and other compound substances are all decomposed when placed between the poles and the wires, so as to form part of the galvanic circuit.

Voltaic Electricity.

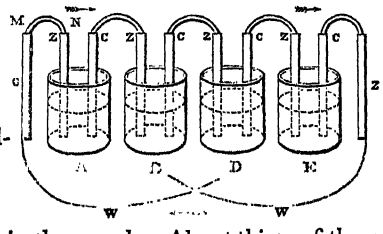
CHAP. I.—DESCRIPTION OF GALVANIC APPARATUS.

Galvanic apparatus.

In performing these experiments, and drawing from this powerful agent all the electrical energy which it is calculated to yield, a great variety of apparatus has been employed. When a voltaic pile consists of many couples, their superincumbent weight presses all the water or other fluid from the discs of card or cloth, and thus injures the action of the pile. In order to avoid this, Volta introduced the "*couronne des tasses*," which is represented in fig. 5, where A, B, D, &c., are three or more glass vessels containing acidulated water or diluted sulphuric acid; the plates Z and C of zinc and copper, about two inches square, are soldered to the ends of a bent metallic wire, M, N, &c., and are immersed in the water in the vessels. About thirty of these cups are sufficient to give a shock. When the circuit is closed, by joining the ends of the wires W, W, gas is actively evolved at all the surfaces of the plates, but when the circuit is broken the evolution of gas ceases in the copper plate, and becomes less copious in the zinc.

Couronne des tasses.

Fig. 5.

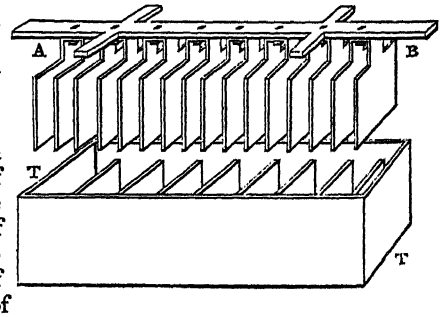


A valuable modification of the "*couronne des tasses*," called the *trough battery*, was suggested by Dr Wilkinson and Dr Babington. Plates of zinc and copper, about four inches square, are joined together in pairs, by being soldered at one point. The pairs of plates are then attached to a strip of well dried and varnished wood, A B, fig. 6, so that the whole can be placed in a trough, T T, made of earthenware or wood, with as many partitions as there are pairs of plates. When the trough is of earthenware the partitions are of the same substance, but if they are made of wood the partitions are made of glass. When diluted sulphuric acid is poured into the cells of the trough T T, the battery A B, is immersed in it, so that each pair shall be separated from the adjoining one by a partition of the trough. This apparatus has the great advantage of allowing us to clean or repair the plates, without pouring out the fluid, which can also be changed with great facility. The powerful voltaic battery, constructed for the Royal Institution b Mr Eastwick, under the direction of Sir H. Davy and M Children, is upon this plan. It consists of 2000 double plates, and its acting surface is 128,000 square inches. When a battery consists of a number of these troughs unit-

Modification of it.

Trough battery.

Fig. 6.



Voltaic Electricity.

ed together, the terminal plates of the adjacent troughs are joined by slips of copper, which unite the zinc end of one trough with the copper end of the other.

Cruikshanks' galvanic trough.

The *galvanic trough*, as it is called, is shown in fig. 7,

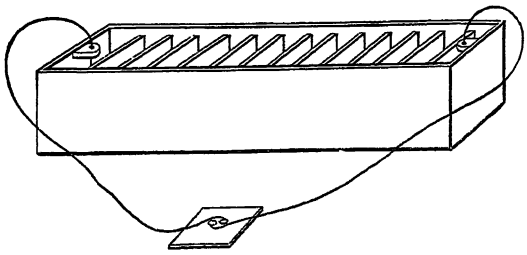


Fig. 7.

as constructed by Mr Cruikshanks of Woolwich. Plates of zinc and copper C Z, C Z, &c., fig. 8, soldered together, are made to constitute the partitions of a trough, T T, of baked wood, by fixing them into grooves formed in its side, all the zinc surfaces being on one side and all the copper ones on the other. The spaces or cells between them are then filled with a solution of salt and water, or with diluted muriatic or sulphuric acid. Troughs of this description are very apt to get out of order from the warping of the wood by the action of the acid solution, from the cracking of the cement, and other causes which affect the condition of the cells. This trough was still farther improved by keeping the plates of zinc and copper separate as at Z, C, but united at their summits S, with a small ribbon of copper. Each of these double plates was then placed upon the earthenware or glass partitions of a trough like that in fig. 6.

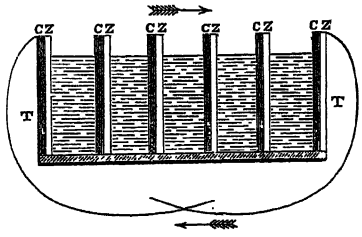
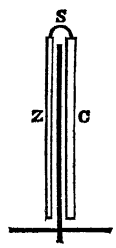


Fig. 8.



Wollaston's elementary galvanic battery.

Dr Wollaston found that the power of a galvanic battery was greatly increased, when each surface of the zinc plate was opposed to a surface of copper, and in 1815 he constructed on this principle what he calls an *elementary galvanic battery*. From a series of experiments, made for the purpose of ascertaining the most compendious form of apparatus, by which visible ignition might be shown, he found that a single plate of zinc, *one inch* square, when rightly mounted, was more than sufficient to ignite a wire of platina $\frac{1}{800}$th of an inch in diameter, even when the acid is very diluted (fifty parts of water to one of sulphuric acid). "But for this purpose," he adds, "each surface of the zinc must have its counterpart of copper, or other metal, opposed to it; for when copper is opposed only to one face, the action on the posterior surface of the zinc is wasted to little or no purpose. The smallest battery that I formed of this construction consisted of a thimble without its top, flattened till its opposite sides were about $\frac{2}{10}$ths of an inch asunder. The bottom part was then nearly 1 inch wide, and the top about $\frac{8}{10}$ths, and as its length did not exceed $\frac{9}{10}$ths of an inch, the plate of zinc to be inserted was less than $\frac{3}{4}$ths of an inch square."[1]

Mr Children's battery.

The plan thus suggested by Dr Wollaston was employed by Mr Children in the construction of a magnificent battery, in which each plate presented a surface of 32 square feet; the plates being 6 feet long, and 2 feet 8 inches broad. The plates are attached to a strong wooden frame, suspended by ropes and pulleys, which, being counterpoised, is easily lowered and elevated, so as to immerse the plates in, or raise them out of, the acid. The cells of the battery were twenty-one in number, and their united capacities 945 gallons.[2]

Voltaic Electricity.

Berzelius found that the power of this battery was greatly increased by making the copper which envelops the zinc a cell or vessel for containing the liquid.

Mr Hart's battery.

Having seen a new battery of Dr Wollaston's, constructed on a large scale by Newman, Mr Hart[3] of Glasgow conceived the idea of adding sides and bottoms to the double copper plates, so as to make them form cells of themselves, for holding the acidulous liquid. In this way, each galvanic pair became a *triad*, consisting of *two* plates of copper inclosing one of zinc. The following is the method of constructing such a battery as given by Mr Hart:—

"The cells are formed by cutting the copper in the form represented by fig. 9; they are then folded up as seen in fig. 10, and the seams grooved. A drop of tin is run into

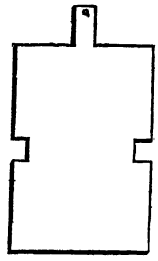


Fig. 9.

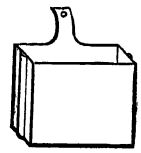


Fig. 10.

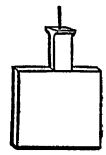


Fig. 11.

each lower corner, to render the cells perfectly tight, and at the same time to increase the positive state of the copper. Fig. 11 represents the zinc plate cast in the usual manner, and having a piece of screwed brass wire cast into the top of it, in order to suspend it by.

"Fig. 12 is a section of the battery, showing how the copper tail of the first cell is connected with the zinc plate of the second, and so on. This connection is rendered perfect by joining them with a drop of solder. The zinc plates are kept firm in their place in the cells by three small pieces of wood, in the same manner as in Dr Wollaston's battery; the whole are then fixed (by means of screw nuts fitted on the brass wires) to a bar of baked wood, previously well varnished. Fig. 13 represents the battery in its complete state.

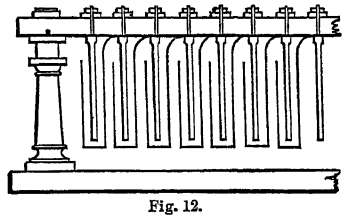


Fig. 12.

"When the battery is small, two may be suspended on

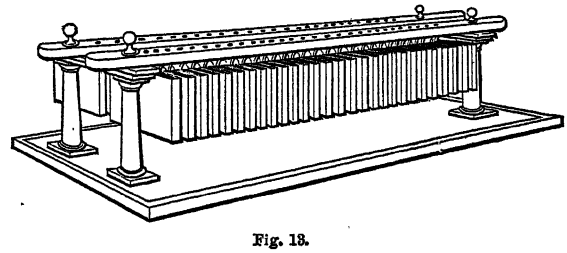


Fig. 13.

one frame. When used for shocks, they may be arranged with the positive or negative poles together, and joined with wire to complete the circuit; but when employed for

[1] *Annals of Philosophy*, vol. vi. p. 210.
[2] *Phil. Trans.* 1815, p. 363.
[3] *Edin. Journal of Science*, No. vii. p. 19, Jan. 1826.

Voltaic Electricity.

deflagration, the batteries ought to be placed alongside of each other, with all the positive poles at one end, and the negative at the other, and the poles of the same name joined. This arrangement will increase the surface, while the number is the same.

Mr Hart's battery.

"When the battery is to be used, it is to be lifted off the frame, and dipped into a wooden trough lined with lead, into which the acid has been poured, or it may be placed in the leaden trough, and the liquid poured into it till the cells are full. It is then to be placed on the frame, and the rest charged in succession."

Dr Hare's improved battery, or galvanic deflagrator.

Very great improvements have been made on the galvanic battery by Dr Robert Hare of Philadelphia, whose *galvanic deflagrator*, as he calls it, is represented in fig. 14,

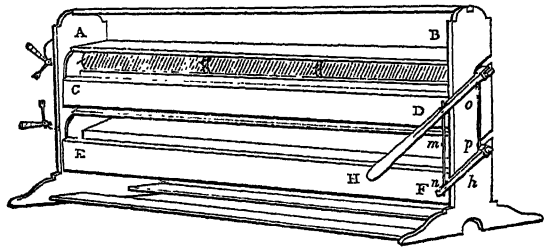


Fig. 14.

which represents an apparatus consisting of two troughs, each of which is 10 feet long. Each trough contains 150 galvanic pairs. The galvanic series, AB, in the upper trough, is shown as it appears when the acid is off the plates, CD being the part of the trough containing the acid when it is off the plates. In the lower trough EF, the galvanic series is omitted, in order that the interior may be better understood. The series belonging to this trough is shown in fig. 15. The pairs are contained in three boxes, each having fifty pairs. In placing these *three* boxes in the trough, a little space is left between them and that side of the trough in which the acid enters, so that instead of flowing over them, it may run down outside, and rise up within them.



Fig. 15.

The pairs of the series consist of copper cases, about 7 inches long, 3 wide, and half an inch thick, each containing a zinc plate equally distant from its sides, and prevented from touching it by grooved stripes of wood. Each zinc plate is soldered to one side of the adjacent case of copper, as shown in fig. 16, the copper cases being open only at

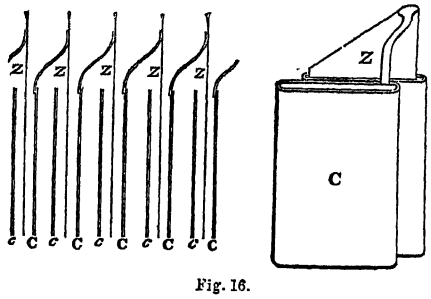


Fig. 16.

the top and bottom. The copper cases are separated from each other by very thin veneers of wood.

The two troughs, AB, EF, fig. 14, are joined lengthwise, egde to edge, so that when the sides of the one are *vertical*, those of the other must be *horizontal*. Hence, by turning the handle H a quarter of a revolution, the two troughs thus united upon pivots which support them at the ends, will be so raised that any fluid in the one trough must flow into the other, and by reversing the action must flow back again. In this way, the galvanic series being placed in one of the troughs, and the acid in the other, the plates may, by means of the handle H, be all simultaneously subjected to the action of the acid, or relieved from it. The pivots are made of iron, coated with brass or copper, and a metallic communication is made between the coating of the pivots and the galvanic series. The lower trough, EF, is connected with the upper one, AB, by metallic rods, *mn*, *op*, joining the two handles, H, *h*.[1]

Voltaic Electricity.

Hare's galvanic deflagrator.

In the course of his experimental researches in electricity, Dr Faraday was led to the construction of a voltaic trough, in which the coppers, passing round both surfaces of the zincs, should not be separated from each other, except by an intervening thickness of paper, or in some other way, so as to prevent metallic contact, and should thus constitute a compact, powerful, and economical instrument. He found, however, that Dr Hare had in the trough, which we have above described, anticipated him in his contrivance. The arrangement of Dr Hare, who separated the copper plates by thin veneers of wood, and poured the acid on and off the plates, by a quarter revolution of an axis, which carries both the troughs with the plates and another trough to collect and hold the liquid, was applied by Mr Faraday as the most convenient. His zinc plates were cut from rolled metal, and, when soldered to the copper ones, had the form shown in fig. 17. They were then bent over

Faraday's voltaic trough.

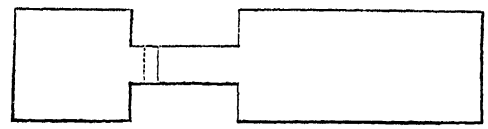


Fig. 17.

a gauge into the shape fig. 18, and when packed in the wooden trough, were disposed as in fig. 19, small plugs of cork being used to prevent the zinc from touching the copper plates, and a single or double thickness of cartridge paper being interposed between the contiguous surfaces of copper to prevent their contact. A trough of 40 pairs of plates could thus be unpacked in five minutes, and repacked again in half an hour; and the whole series occupied only 15 inches in length. A trough of this kind, with 40 pairs of plates *three* inches square, was compared with one of 40 pairs of 4-inch plates, having double coppers, and used in porcelain troughs, with insulating cells, and having the same strength of acid; and the former was found equal to the latter in the ignition of platina wire, in the discharge between points of charcoal, and in the strength of the shock. The following are the advantages of this form of trough enumerated by Dr Faraday:—1. It is so compact that 100 pair of plates may go into a trough 3 feet long. 2. The copper bearings, on which the pivots rest, afford fixed terminations, which Dr Faraday connects with two cups of mercury fastened in front of stand of the instrument. These fixed terminations give the great advantage of arranging an apparatus to be used in connection with the battery, before the latter is put in action. 3. The trough is ready for use in a few seconds, a single jug of diluted acid being sufficient to charge one hundred plates. 4. When the trough has performed a quarter of a revolution, it becomes active, and the experiment has the advantage of the *first contact* of the zinc and acid, which is *twice*, and sometimes *thrice*, that which the battery can produce a minute or two after. 5. When the experiment is finished, the liquid can be instantly poured

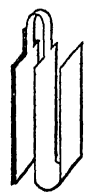


Fig. 18.

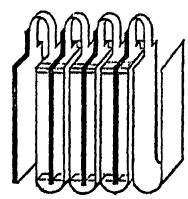


Fig. 19.

[1] Silliman's *Journal*, vol. vii. p. 347, and vol. v. p. 94.

Voltaic Electricity.

Faraday's voltaic trough.

from between the plates, and hence the latter is never needlessly wasted, the acid unnecessarily exhausted, or the zinc uselessly consumed. The charge, too, is mixed and made uniform, and the advantage of a *first contact* is obtained in the next experiment. 6. The saving of zinc is so very great, that Dr Faraday estimates the zinc to be *thrice* as effective as that in the ordinary form of battery. 7. The surfaces of the zinc and copper plates may be brought much nearer to each other when the battery is constructed, and remain so till it is worn out. 8. Thinner plates of zinc will do the duty of thicker ones, and rolled zinc, which is the purest,[1] may be used. 9. The purity of the diluted acid is proportioned to the quantity of zinc dissolved. 10. The acid is more easily exhausted, so that we need not use an old charge a second time. 11. By using a due mixture of nitric and sulphuric acid for the charge, no gas is evolved from the troughs. Among the defects of this form of the battery, Dr Faraday enumerates the precipitation of copper on the zinc plates, arising chiefly from the papers between the coppers retaining acid when the trough is emptied, which acid, acting slowly on the copper, forms a salt, which gradually mingles with the next charge, and is reduced on the zinc plate by the local action, and hence the power of the whole battery is reduced. Dr Faraday proposed to remedy this evil by using slips of glass to separate the coppers at their edges.[2]

Mr Young's improved battery.

Mr James Young of the Andersonian University, Glasgow, proposed a form of battery in which these papers are not required, and in which this effect is produced with *half* the quantity of sheet copper, in consequence of both sides of the copper plates being presented to surfaces of zinc. The following is Mr Young's construction. Supposing the breadth of the required plates to be 2 inches, the sheet copper and zinc are cut into ribbons 2 inches broad and 5 inches long, and a portion cut out as in fig. 20. The ribbon is thus divided into two squares of 2 inches, and united at A, and having a piece projecting at B. Fig. 20,

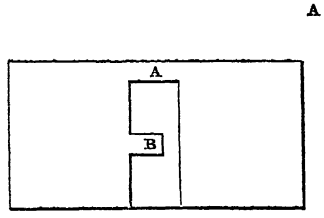


Fig. 20.

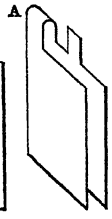


Fig. 21.

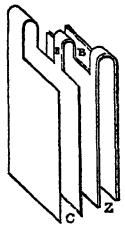


Fig. 22.

representing a single plate, either of zinc or copper, is bent at A, as in fig. 21. A plate of zinc thus bent is then united to a similar one of copper, by soldering together the projecting parts BB, as in fig. 22, and this is the only metallic communication existing between them. Each pair of plates is constructed as in fig. 22. In arranging a number of pairs to form a battery, they are interlaced so that a copper square comes in between each couple of zinc squares, and *vice versa*. This arrangement is not easily described. At the positive end of the battery there is a single copper plate, which is soldered at the top to the last double copper plate, as seen in fig. 23, which represents three pairs properly arranged, and also the way in which they should be fitted up, and kept steadily apart in a wooden frame. This frame is made of two solid pieces of wood, into which are dovetailed two cross bars, *ee*, *e'e'*, in front with two similar ones behind. The grooves in the cross bars for receiving the edges of the plates, are formed by placing the four cross bars together, and sawing a little way into one side of them all every eighth of an inch or so in their length, so as to form a set of parallel grooves.

The frame, fig. 23, with its plates, may be introduced into a porcelain or wooden trough, TT, containing the

Voltaic Electricity.

Mr Young's battery.

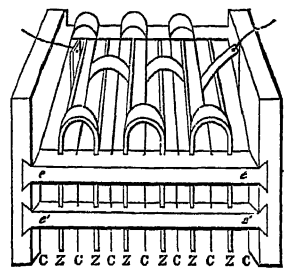


Fig. 23.

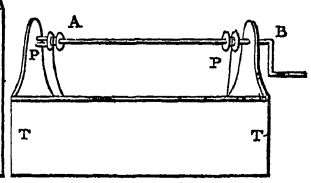


Fig. 24.

diluted acid. Mr Young prefers a single trough to Dr Hare's two connected troughs and by means of an axis of stout wire, AB, carrying two pulleys, PP, the frame and battery can be raised out of the fluid.

De la Rue's battery.

Mr Warren de la Rue made an important step, by using a solution of sulphate of copper as the exciting agent in voltaic batteries. Oxygen is thus supplied to the zinc by the oxide of copper; no gas is evolved; and the action being thus rendered continuous, the effect is fully equal to that momentarily produced by immersion in acids. The battery which Mr de la Rue considers best adapted to the use of sulphate of copper, is shown in fig. 27, 28. The zinc plate is shown in fig. 25. It should be tinned on the top A, previous to the amalgamation of the rest of the plate. The zinc plate is retained in its place by grooves cut out of the two slips of wood BB, to within 3-4ths of an inch of the bottom. The copper plates are formed into cells painted on the outside (as in fig. 26), 5 inches square and 1 inch wide, E, E, being two ears of copper for suspending the cell in its place, and A, a slip of copper to be soldered to the zinc plate in the adjacent cell. As the zinc plates do not descend lower than within 3-4ths of an inch of the bottom of the cells, the space thus left may contain the deposits arising from decomposition of the sulphate of copper. The cells are supported in a long wooden frame, by means of the ears E, E, by hooks driven through them, as shown in fig. 27. In order to receive the charge when the battery is in action, Mr de la Rue employs the contrivance shown in fig. 28. A spout L, a quarter of an inch deep, is placed at the top of each cell, and these spouts overhang a wooden gutter extending along the frame. The solution of the sulphate must then be renewed by means of a funnel with a long neck, the long end being made to descend nearly to the bottom of the cell. When the fresh solution is thus poured in, the spent liquor will run out by the spout into the gutter. When a series of experiments is over, the battery must be emptied, and the plates well cleaned by dashing water between the cells.[3]

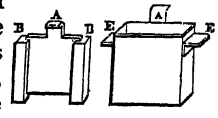


Fig. 25. Fig. 26.

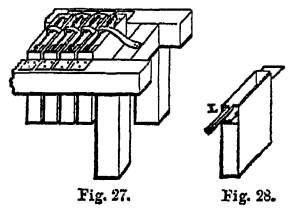


Fig. 27.

Fig. 28.

Professor Daniell's dissected battery.

Professor Daniell has published in the *Philosophical Transactions* for 1836, an account of two new voltaic batteries. The first of these, called the *dissected battery*, consists of ten glass cells, a section of one of which is represented in the accompanying figures.

"*a b c d* (fig. 29), is a foot of solid glass, containing a cavity *e f g h*, the upper part of which is fitted with a stopper, *g h*. Through this stopper the stems of the two plates, *i j k l m n*, pass into the lower part of the cavity, which is

[1] Dr Faraday found rolled Liege or Mosselman's zinc the purest.

[2] *Phil. Trans.* 1835, part ii.

[3] *London and Edinburgh Philosophical Magazine*, April 1837, vol. x. p. 244.

Voltaic Electricity.

Professor Daniell's dissected battery.

divided into two cells by the partition *o p*, and each of which contains mercury, into which the wires respectively dip. The plates may be connected together, or with the plates of other cells, by means of wires, *p*, *q*, passing through the lateral holes *t*, *u*, and dipping also into the cups of mercury. To the glass foot, thus arranged, a glass shade, *v w x z*^{1} *z y*, is fitted by grinding, and constitutes a cell for the reception of the liquid. A graduated glass jar, A, B, may be suspended over either plate by means of a brass clip, proceeding from a rod placed by the side of the cell in the manner represented by fig. 30, which is a perspective drawing of such cells.

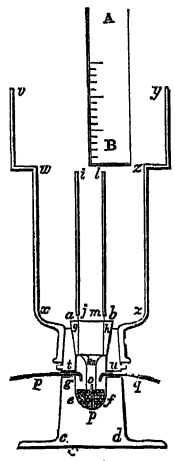
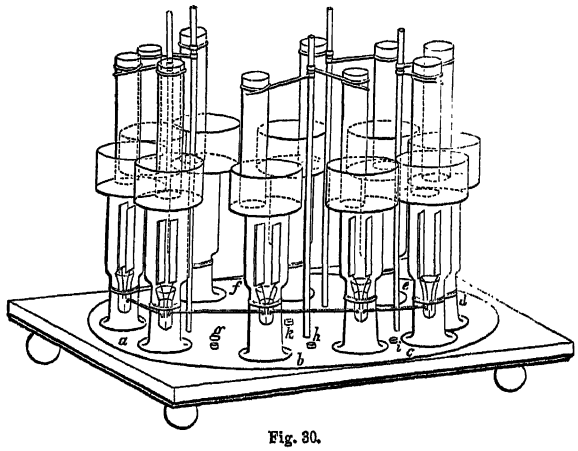
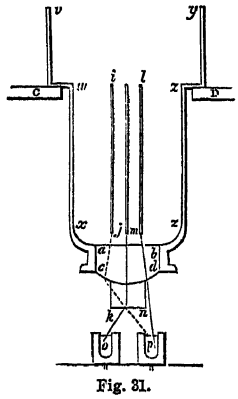


Fig. 29.

"Fig. 31 represents the section of a cell which is adapted to the same purposes, but is less expensive in construction. It is supported in a perforated table C, D, by its projecting rim *v w z y*, and the stems of


Fig. 30.

the plates pass through the glass stopper *a b c d*, into the exterior mercury cups *o*, *p*, by means of which all the necessary connections may be made.


Fig. 31.

"The circular arrangement of the cells of the battery (fig. 30), admits of their being combined together in various ways with the greatest facility, by means of small cups of mercury, *g*, *h*, *i*, placed at proper intervals. My next disposition was to connect all the platinum plates together by wires radiating from them to a central cup *k*, of mercury, and all the zinc plates by wires, dipping into a ring of the same metal, placed in a groove *a b c d e f*, surrounding the whole arrangement. In this state of things no action was of course manifest, for there was no complete circuit; but upon making a connection by means of a wire, between the central cup and the exterior circle of mercury, the current was enabled to circulate, and was manifested by the simultaneous evolution of gas from all the cells."

Variations in the force of batteries

Notwithstanding the numerous improvements in the voltaic battery, no successful attempts had been made to discover the causes of the variations and decline of its force, after the first immersion of the plates in the diluted acid. The principal cause of these variations, according to Professor Daniell, is the evolution of hydrogen gas from the negative metallic surface, which not only consumes a considerable portion of the generated electricity, but reduces at the conducting plates the oxide of zinc, formed by the action of the battery at the generating plates, and here the conducting plates were ultimately so encrusted with metallic zinc, as to diminish and finally annihilate the circulating force. Hence he was led to the construction of what he calls a *constant battery*, for producing an invariable current of force, and he considers it as promising the following advantages:—

Voltaic Electricity.

Professor Daniell's constant battery.

1. The abolition of all local action, by the facility of applying amalgamated zinc.
2. The trifling expense of replacing the zinc rods when worn out, and the total absence of any wear of the copper.
3. The dispensing with the use of nitric acid, and the substitution of the cheaper materials, sulphate of copper and oil of vitriol, and the absence of any annoying fumes; and,
4. The facility and perfection with which all metallic communications may be made, and different combinations of the plates arranged.

Fig. 32 represents a section of one of the cells, ten of which are shown in connection at fig. 33; *a b c d* is a cylinder of copper 6 inches high and 3½ inches wide; it is open at the top *a b*, but closed at the bottom, except a collar *e f*, 1½ inch wide, intended for the reception of a cork into which a glass siphon-tube, *g h i j k*, is fitted. On the top, *a b*, a copper collar, corresponding with the one at the bottom, rests by two horizontal arms. Previously to the fixing of the cork siphon-tube in its place, a membranous tube, formed of a part of the gullet of an ox, is drawn through the lower collar, *e f*, and fastened with twine to the upper, *l m n o*; and when tightly fixed by the cork below, forming an internal cavity to the cell, communicating with the siphon-tube in such a way as that, when filled with any liquid to the level *m o*, any addition causes it to flow out at the aperture *k*. In this state, for any number of drops allowed to fall into the top of the cavity, an equal number are discharged from the bottom. *p q*, is a rod of cast zinc, amalgamated with mercury, 6 inches long and half an inch diameter, supported on the rim of the upper collar by a stick of wood, *r*, *s*, passing through a hole drilled in its upper extremity; *t* is a small cup for the reception of mercury, by which, and the cavity *a*, at the top of the zinc rod, various connections of the copper and zinc, of the different cells, may be made by means of wires proceeding from one to the other.

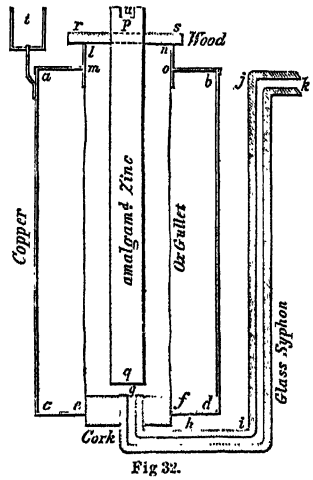


Fig 32.

In fig. 33 the ten cells are represented as connected in single series, the zinc of one with the copper of the next. They stand upon a small table in a circle, with the apertures of the siphon-tubes turned inwards, surrounding a large funnel, communicating with the basin underneath, for the reception of any liquid which may overflow. A smaller funnel is supported over the internal cavity of each cell by a ring sliding upon rods of brass placed between each pair of cells. One of these only is shown in the drawing, to avoid the crowding of the sketch.

In the preceding construction, Mr Daniell had two main objects in view. 1. To remove out of the circuit the oxide of zinc as soon as its solution is formed; and, 2. To absorb the hydrogen evolved upon the copper without precipitating any substance injurious to the latter. The *first* of these objects is completely effected by suspending the rod in the

Voltaic Electricity.

membranous cell, into which fresh acidulated water is allowed to drop slowly from the funnel above, whilst the

Professor Daniell's constant battery.

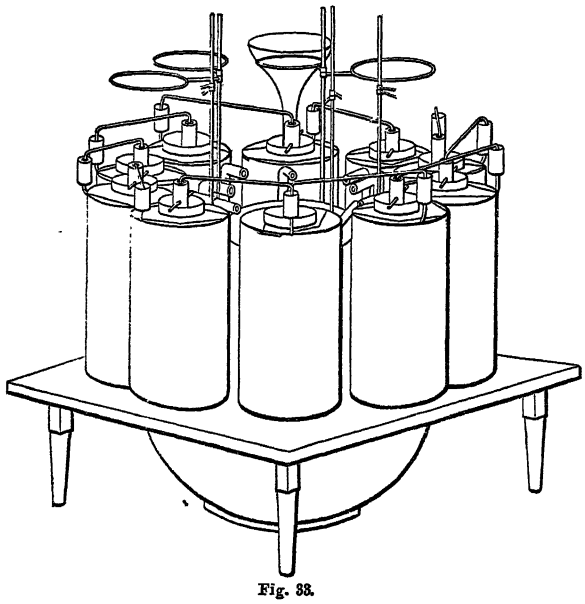


Fig. 33.

heavier solution of the oxide is withdrawn from the bottom at an equal rate by the siphon-tube, *g h i j k*. The *second* object was attained by charging the space round the membrane with a saturated solution of sulphate of copper instead of dilute acid. When the circuit was completed, the current passed freely through this solution, no hydrogen appeared upon the conducting plate, but a beautiful thick coating of pure copper was precipitated upon it, thus perpetually renewing its surface.

Notwithstanding these changes, there was still a gradual, though very slow decline in the force of the battery, which Mr Daniell traced to the weakening of the saline solution by the precipitation of the copper, and consequent decline of its conducting power. In order to remedy this defect, he suspended some solid sulphate of copper in small muslin bags, which just dipped below the surface of the solution in the cylinder, and kept it in a state of saturation by its gradual dissolution. With this improvement the voltaic current became perfectly steady for *six* hours together. An improvement upon this arrangement is shown in fig. 34, where *a c f h*, is a perforated colander of copper, into which, instead of muslin bags, the sulphate of copper is placed. The central collar, *b d e g*, rests by a small ledge upon the rim of the cylinder. The membrane is then drawn through the collar, and, after being turned over its edge, it is fastened with twine.

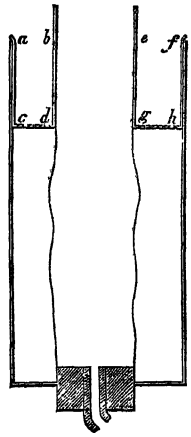


Fig. 34.

Having found it of great advantage to increase the number of cells, he now places them in two parallel lines, of ten each, upon a long table, the siphon-tubes being disposed opposite each other, and hanging over a small gutter, placed between the rows to carry off the refuse solution when the acid requires to be changed; and as a uniform action may be kept up by occasionally adding a small quantity of fresh liquid, he now dispenses with the dripping funnels.

Voltaic Electricity

In a subsequent paper on voltaic combinations,[1] Professor Daniell found that the power of the battery was greatly increased by an increase of temperature. Having dissolved the sulphate of copper in standard acid in place of water, the battery produced 13 in place of 11 cubic inches of mixed gases every five minutes. On another occasion, he added one part of sulphuric acid to eight parts of the saturated solution of the sulphate, and poured it into the cells, when of the high temperature produced by the disengagement of heat during the mixture, which was about 110°. The battery afforded at first 22 inches of the mixed gases in five minutes.

Influence of temperature on the power of the battery.

Wishing now to try the effect of higher temperatures, he replaced the membranous tubes with cylinders of porous earthenware. These cylinders, closed at the lower ends, had their diameter 1½ inch, and the same height as the copper cells. The bottoms of the latter are fitted with sockets in which the tubes are placed, and which confine them in their proper position, the perforated colanders, which hold the sulphate of copper, passing over their upper ends. These porous tubes require to be thoroughly soaked in dilute acid. The increase of temperature was obtained from steam, and the general result of many experiments was, *that the working rate of this battery was nearly doubled at a temperature of* 212°, provided no secondary action interfered with it.[2]

Professor Daniell's improved constant battery.

In the interesting paper which contains these observations, Professor Daniell has described an improved *constant* battery of large dimensions, the effects of which exceeded his most sanguine expectation, and which he thinks cannot be farther improved in point of simplicity and cheapness. This battery consists of *ten* copper cells, 20 inches high, and 3½ inches diameter. The interior partitions are formed by merely tying the open ends of the oxen's gullets to the rings of the colanders which hold the blue vitriol, and which are made deeper than before, and suspending them in the cells, to the bottoms of which they reach. Each bag contains rather more than a quart of the dilute acid. The zinc rods are 5-8ths of an inch in diameter, and well amalgamated, and their connections the same as formerly. At the temperature of 67° this battery produces, in the voltameter, 12 cubic inches of the mixed gases per minute, or 720 in the hour. It has great power of ignition, and while it will maintain at a red heat 6 inches of platinum wire, $\frac{1}{100}$ of an inch in diameter, it will still decompose water at the rate of 14 cubic inches in *five* minutes. When the battery is not in use, the zinc rods are taken out and wiped, and the membranous bags carefully lifted out of their cells, emptied of their acid, filled with water, and suspended from a frame placed for their reception. Professor Daniell adds, that there is no reason to think that the limits of efficiency have yet been nearly attained, and the gullets could easily be connected together so as to obtain bags of any required length. He has more recently put in action seventy series of his large constant battery, which, on the 16th February 1839, fused titanium, and brought to a red heat 16 feet 4 inches of No. 20 platinum wire.

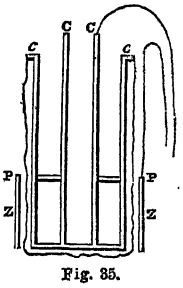


Fig. 35.

Mr Mullins' quantity battery.

Another form of the constant battery we owe to J. W. Mullins, Esq., who calls it the *quantity battery*. It consists of an earthenware pot six inches deep and four wide, which is shown in action in fig. 35, and in perspective in fig. 36, a cylinder of amalgamated zinc, Z Z, standing on legs half an inch long, and cut out of the cylinder, is placed in the pot; the height of the cylinder,

[1] *Phil. Trans.*, vol. xxxvii. p. 119, &c.

[2] The experiments of Marianini and Rogers on the influence of heat upon single voltaic circuits will be found in the *Annales de Chimie*, tome xxxiii. p. 132, and Silliman's *Journal*, vol. xxvii. p. 57, January 1835. In Roger's experiments, the deflection of the galvanometer rose from 70° to 147° while the temperature rose from 75° to 210°.

Voltaic Electricity.

including the legs, is only two inches. Within this cylinder, and at the distance of 3-8ths of an inch from it, is placed a copper vessel *c c*, having round its outer edge a rim a quarter of an inch wide, round which a thin bladder, well cleaned and moistened, is tied. The bottom of the pot rests on a circular piece of baked wood projecting a quarter of an inch beyond the cylinder. The bladder is then drawn all over and fastened round the upper rim by a cord, and it is kept clear of the copper by the circular piece of wood. The copper cylinder *c c*, which is as deep as the pot, is perforated with six holes equidistant from the top and bottom. These holes form communications with an inner cylinder of copper C C, three quarters of an inch distant from the outer one. The shelf-bottom of the space between the two cylinders is on a level with the lower edge of the holes, and soldered to the large cylinder. The object of this cylindrical chamber is to hold crystals of sulphate of copper when required, and to contain the solution, which should not rise higher than the upper edge of the holes. A small quantity of sal-ammoniac (muriate of ammonia), in the proportion of 5 parts of the saturated solution to 100 of water, is then poured outside the bladder till it reaches the upper edge of the zinc cylinder Z Z. The solution of sulphate of copper will require a few crystals of the sulphate to be added every four hours, but the ammoniacal solution needs no renewal. The connections are formed, as in fig. 36, by strips of copper soldered to the zinc cylinder Z Z, and to the inner copper cylinder C C. The wires bend over the edge of the pot, and enter two cups holding mercury, from which the wires that transmit the electrical current through any apparatus may proceed. The action of this battery will continue as long as a particle of metallic salt remains in solution. If *six* drops of a saturated solution of the sulphate of copper are added to the exhausted and colourless solution, the battery instantly resumes its original power. A constant current, therefore, may be kept up by having a few crystals of the blue vitriol on the shelf, which, by being gradually dissolved, will pass to the external surface of the copper.

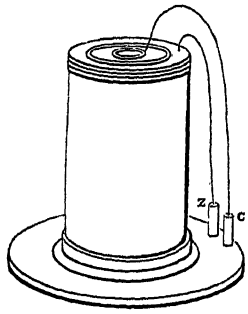


Fig. 36.

Mullins' intensity battery.

Mr Mullins has constructed also a battery for intensity, of the effects of which he has given the following description:[1]—"I have put," he says, "as in the quantity battery, a shallow cylinder of zinc within, and close to the internal surface of the earthenware pot, next the copper cylinder, as before; but instead of letting the inside of this cylinder go for nothing, the internal surface of the copper is lined with very thin caoutchouc for insulation; then comes another small cylinder of zinc, then a copper one lined as the last, then a zinc, and lastly, a copper cock, copper, of course, enveloped in membrane. In this battery the power is immense in proportion to the quantity of the metals used, which, in my opinion, depends upon a new principle which is developed in this mode of construction and arrangement, that is, *restricting* the electric current to gradually *diminishing metallic surfaces* as it advances; so that, as the quantity accumulates, the conducting surfaces are *reduced*, and of course a much higher degree of intensity is a necessary consequence. By merely altering the connections of the plates, which, by the mode I have adopted, can be done with the utmost facility, this battery can be turned into a powerful quantity one, and probably a wine glassful of the solution is amply sufficient."

Voltaic Electricity.

Rev. Mr Shillibear's sustaining battery.

Having found that a single piece of zinc, of three square inches, surrounded by a membrane, could be easily fitted up, Mr Shillibear constructed the galvanic apparatus shown in figs. 37 and 38. It consists of a copper trough, C C,

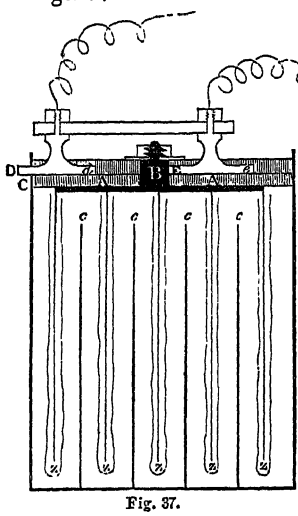
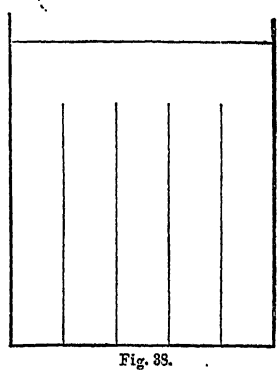


Fig. 37.


Fig. 38.

three inches deep, and two and a quarter wide, divided into as many compartments, with copper partitions, as we wish to have zinc plates. A section of a trough, for *five* plates, is shown in fig. 38. The zinc plates are soldered firmly to a copper bar, and this copper bar is fastened by a screw to a piece of hard wood which serves as a cover to the battery. The *pole director*, shown at the top of fig. 37, for directing the course of the electric current, is constructed thus: In the wood cover, C C, there is cut a groove on each side of the screw B, in connection with the zinc, and into this groove is fitted a copper slide, which carries two moveable wings, D *d*, E *e*, which may be easily brought into contact with the copper or zinc. When the wing D *d* is in contact with C, and E *e* with B, the current of electricity will go out from the wire in connection with the wing D *d*, and return by the wire connected with the wing E *e*, into the zinc plates through B. If we now shift the slide, so that E *e* is in contact with C, and D *d* with B, the current will be reversed, going out by the wire at E *e*, and returning by the wire at D *d*, to the zinc through B. In order to prevent any precipitation of the sulphate of copper upon them, the zinc plates should be lightly covered with bladder. When the trough is to be employed for sustaining a weight, the membranes should be slipped off, and diluted nitrous acid used instead of the sulphate of copper solution.[2]

Dr Hare's calorimotor.

Before concluding this part of the subject, we must notice the spiral galvanic batteries. The first battery of this kind on a large scale was made by Dr Robert Hare, who called it a *calorimotor*, from its remarkable power of producing heat. It consists of sheets of zinc and copper formed into coils, the copper coil encircling the zinc at a distance not exceeding a quarter of an inch. The sheets of zinc were about 9 inches by 6, and the copper 14 by 6, more of the copper being necessary, as shown in fig. 39, where Z Z represents the zinc, and C C the copper coil. Each coil was about 2½ inches in diameter, and they were 80 in number. All these coils were let down, by means of a lever, into 80 glass jars, 2¾ diameter, and 8 inches large, containing the acid solution for exciting them.[3]

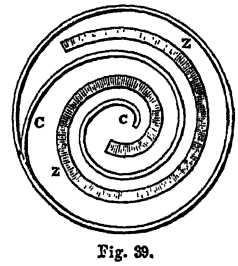


Fig. 39.

[1] *Lond. and Edin. Phil. Mag.*, 1836, vol. ix. p. 283.
[2] Sturgeon's *Annals of Electricity*, April 1837, p. 224.
[3] *Phil. Trans.*, 1823, p. 187.

Voltaic Electricity.

M. Pouillet constructed one of these with twelve couples for the Faculty of Sciences at Paris, and found it very powerful in producing great quantities of electricity with low tension. The best liquid for this battery is water, with $\frac{1}{10}$th in volume of sulphuric acid and $\frac{1}{10}$th of nitric acid.

Mr Pepys' spiral battery.

Mr Pepys constructed a similar instrument on a grand scale for the London Institution in 1822, for electro-magnetic purposes. It is represented in fig. 40, where M is the

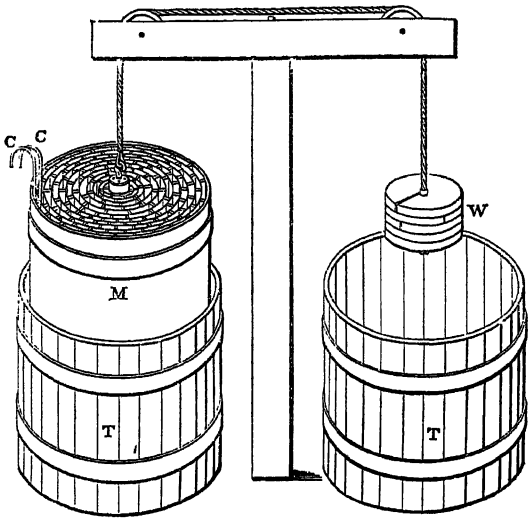


Fig. 40.

battery, CC the conductors, W the counterpoise weight, and TT the tubs, one for holding the dilute acid, and the other water. The battery M consists of two plates of copper and zinc, each 50 feet long and 2 wide, exposing a superficial surface of 400 feet. They are rolled or wrapped round a cylinder of wood, with three ropes of horse hair between each fold to keep them from contact, and these ropes are kept in their position by notched sticks, occasionally introduced in the rolling. Two conductors, C, C, of copper, about three quarters of an inch thick, are soldered to the end of each plate, from which the electric force is obtained when the instrument is in action. The battery is suspended by ropes and pulleys, with a counterpoise W, to permit its immersion in a tub of diluted acid, or when not in use in a tub of water. It requires about 55 gallons of fluid, and the solution used contains about $\frac{1}{10}$th of strong nitrous acid.[1]

Henry's galvanic battery.

A very excellent galvanic battery for producing electricity of different intensities has been described in 1835, by Mr Joseph Henry, of New Jersey College.[2] The object of the apparatus is to exhibit most of the phenomena of galvanism, and of all those of electro-magnetism, on a large scale, with one battery. It consists of 88 pairs, each of which is composed of a plate of rolled zinc, 9 inches wide and 12 long, inserted in copper cases, open at top and bottom. These elements are suspended in groups of 11 pairs, or 8 sets in all; and each of the 8 troughs which are raised up to the elements are divided into 11 cells by wooden partitions coated with cement.

Grove's constant battery.

A very valuable constant battery, invented by Mr Grove in 1839, is shown in a vertical section of it in fig. 41. ABCD is a trough of stoneware, or glass, or wood, well lined with cement, having partitions E, E, E, which divide it into four acid-proof cells. The dotted lines represent four porous vessels of unglazed porcelain or pipe-clay of a parallelopiped or cylindrical shape, and so much narrower than the cells as to allow the liquid they contain to be double of that which surrounds them. The four dark central lines represent plates of zinc, and the fine lines

Voltaic Electricity.

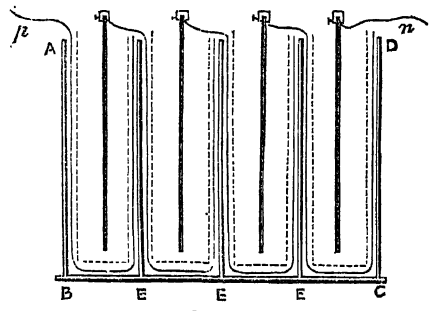


Fig. 41.

which bend under the porous vessels are sheets of platinum foil which are fixed to the zinc plates by little clamp screws. The zinc employed for the plates is the common rolled zinc, the 30th of an inch thick, which is readily amalgamated. The fluid poured into the *zinc* side or the porous vessels is either *muriatic* acid diluted with from 2 to $2\frac{1}{2}$ water, or if the battery be intended to remain a long time in action, of *sulphuric* acid (of specific gravity 1·336) diluted with 4 to 5 water. The fluid poured into the *platinum* side is concentrated nitro-sulphuric acid, of specific gravity 1·59, formed by previous mixture of equal measures of the the two acids. The apparatus should be provided with a cover containing lime, in order to absorb the nitrous gas.

With one of these batteries, consisting of four pairs of zinc and platinum foil-plate, each metal having a surface of 14 square inches, and the whole occupying less space than a cube of 4 inches in the side, Mr Grove liberated 6 cubic inches of mixed gases per minute, and heated to a bright red 7 inches of platinum wire, $\frac{1}{20}$th of an inch in diameter. It burned also with beautiful scintillations steel needles of a similar diameter, and affected the magnet proportionally.

When this battery is put in action by uniting its poles, the nitric acid assumes first a *yellow*, then a *green*, and then a *blue* colour, and after some time becomes aqueous, nitrous gas, and ultimately hydrogen, being evolved from the surface of the platina. The oxide of zinc remains almost entirely in the liquid on its own side of the diaphragm, and does not pass through the porous diaphragm to the platina, which thus retains a clean surface, which maintains essentially that constant and energetic action of the battery that makes it so valuable.

Bunsen's battery.

Owing to the extreme thinness of the platina foil, rendered necessary by its high price, the plates are frequently torn. M. Bunsen therefore substituted for the platina hollow cylinders of *carbon*, formed in iron moulds by making the powder of coke cohesive with sugar or molasses. The battery thus constructed has the cylindrical form of Daniell's diaphragm (see fig. 32), from which it differs only in the substitution of a hollow cylinder of carbon for the hollow copper cylinder, of pure or diluted nitric acid for the sulphate of copper solution, and of a cylinder of porous earth for the porous cylinder of ox-gullet or other organic membrane, containing the diluted sulphuric acid and the cylinder of amalgamated zinc. The battery thus constructed is shown in fig. 42. Each of the carbon cylinders is furnished at its upper end with a ring of copper carrying an arm *a*, *a*, which by means of pincers *p*, *p*, *p*, is put in contact with a similar arm *b*, *b*, carried by each zinc cylinder, the copper ring rising so far above the glass vessel as to prevent its touching the nitric acid. Notwithstanding this precaution,

[1] *Trans. American Philosophical Society*, vol. v.

[2] Silliman's *Journal*, vol. iii., 1821, p. 105.

Voltaic Electricity.

the acid will rise through the pores of the charcoal and alter the interior of the copper ring, so that it is necessary, every time the battery is used, to wash or clean the rings.

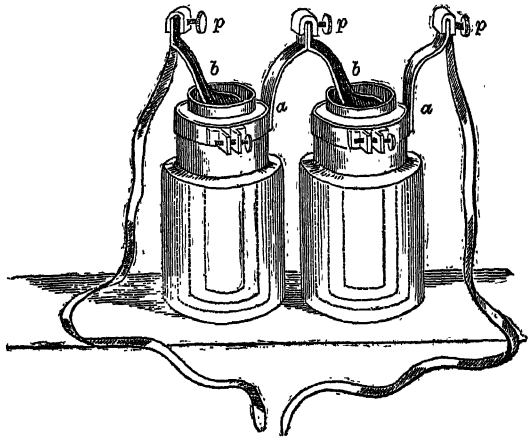


Fig. 42.

M. Bonijol's improvement.

In order to get rid of this inconvenience, M. Bonijol employs solid cylinders of carbon prepared in moulds, or obtained from pieces of well-baked coke of a good quality. In the top of each cylinder is inserted a strong copper rod, bent so as to communicate by a cup of mercury with a similar rod soldered to each zinc cylinder. Round the part of the carbon cylinder, where the copper rod is inserted, is a coating of wax, made to penetrate to a sufficient depth into the pores of the carbon which it covers, in order to prevent the nitric acid from reaching the copper rod. In this battery the amalgamated zinc is placed outside the carbon, and is a hollow cylinder immersed in the glass vessel containing the diluted sulphuric acid. The porous tube is placed in the interior of the zinc cylinder, and receives the carbon and the nitric acid into which the zinc cylinder must be immersed.

Smee's chemico-mechanical battery.

Another constant battery very generally used is that of Mr Alfred Smee, in which the pairs consist of amalgamated zinc and plates of silver, platinised by coating them with the black powder of platinum plunged into diluted sulphuric acid.[1] Having observed that the greatest quantity of gas is given off at the corners, edges, and points, Mr Smee placed a piece of spongy platinum in contact with amalgamated zinc, and found that violent action ensued. He next tried platinum platinised or coated with the black powder of platinum, and he found that 7 square inches of it gave off 5 cubic inches of gas per minute, while platinum heated gave off only 1 cubic inch in the same time, and platinum covered by air only 1 cubic inch in 6 minutes. After platinising different metals, &c., he found that platinised silver was the most powerful agent. A battery upon this principle may have various forms, but Mr Smee preferred the trough form as in an ordinary Wollaston's battery. A battery thus constructed, with 4 cells containing 48 square inches in each, decomposed 7 cubic inches of mixed gas in 5 minutes, whilst 4 cells of Daniell's battery, in which there were 65 square inches of copper in each, gave only 5 cubic inches in the same time.

Grove's gas voltaic battery.

A voltaic battery, in which the active ingredients were gases, was proposed in 1842 by Mr Grove[2], and a series of interesting experiments were made with it to ascertain the rationale of its action, and its application to eudiometry.[3] It consists of a series of tubes $o\,x$, $h\,y$, filled with oxygen and hydrogen, and containing strips of platinum foil $\frac{1}{4}$ of an inch wide, shown by the dark lines in the axis of each tube. The foil is covered with a pulverulent deposit of the same metal (voltaically deposited from the chloride). "The platinum foil passed through the upper part of the

Voltaic Electricity

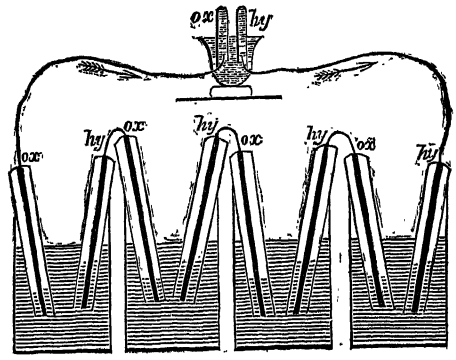


Fig. 43.

tubes, which are closed with cement, the lower extremities were open. They were arranged in pairs in separate vessels of dilute sulphuric acid (specific gravity 1·2), and of each pair one tube was charged with oxygen, the other with hydrogen gas, in quantities such as would allow the platinum to touch the dilute acid. The platinum in the oxygen of one pair was metallically connected with the platinum in the hydrogen of the next, and a voltaic series of 50 pairs was thus formed." By allowing the platinum to touch the liquid, the latter will spread over its powdery surface by capillary action, and expose an extended superficies to the gaseous atmosphere. With this battery,

1. A shock was given which could be felt by five persons joining hands.
2. The needle of a moderately sensitive galvanometer was deflected 60°.
3. A gold leaf electroscope was notably affected.
4. A brilliant spark in broad daylight was produced between charcoal points.
5. Iodide of potassium, hydrochloric acid, and water acidulated with sulphuric acid, were severally decomposed.

Three forms of this battery are described by Mr Grove in the paper already referred to; but he considers the annexed form representing one cell as the most convenient. $a\,a$ is a Woolfe's glass bottle with three necks, a glass stopper b closes the centre neck, and tubes o, h are accurately fitted by means of glass collars c, c welded to them and ground on the outside. The platinum wires o, h are hermetically sealed on the tops of the tubes, and carry a small copper cup filled with mercury.

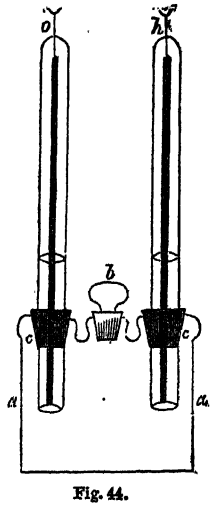


Fig. 44.

Gaugain's gas and vapour battery.

A new class of gaseous pairs has been proposed by M. Gaugain. The simplest of these is obtained by placing together two tubes of glass, one of which contains air, and the other the vapour of alcohol, and exposing them to a high temperature. With these pairs arranged end to end, he forms a true battery, which produces all the effects of an ordinary hydro-electric battery. The wires which connect the glass tubes act only as simple conductors, and the electricity is supposed to arise solely from an action between the oxygen and the glass that is brought to a state of fusion.[4]

[1] See *Phil. Mag.*, April 1840, vol. xvi. p. 315.
[2] *Phil. Mag.*, December 1842, vol. xxi. p. 417.
[3] *Phil. Trans.*, 1843, p. 91–113.
[4] See De la Rive's *Electricity*, vol. ii. p. 736.

Voltaic Electricity.

Sect. II.—*On Voltameters.*

The name of *Voltameter* has been given to instruments for measuring the power of the Voltaic battery. This has been done in three ways—1st, By measuring the quantity of gas liberated in a minute in the decomposition of water, or the number of minutes required to liberate a given quantity, as proposed by Mr Faraday; 2d, By the quantity of heat produced, and shown in the expansion of a platinum wire, as proposed by M. Gaspard Delarive, or by the induction of a Breguet's metallic thermometer, as proposed by M. Augustus Delarive; and, 3d, By the expansion of the air in the ball of a thermoscope containing a platinum wire, which gives out its heat to the air, and raises the coloured fluid to an altitude proportional to its temperature, which measures the strength of the battery.

Faraday's voltameter.

The first of these voltameters, that of Mr Faraday, consists of a graduated glass tube, *a* (fig. 45), closed at the upper end. Platina wires *b*, *b'*, terminating in two platinum plates within the tube, pass through the tube, and are fused into the glass. The tube is fitted, by grinding, into one of the necks of a two-necked bottle. If the bottle is ½ or ⅔ds full of dilute sulphuric acid, it will, by inclining the tube, flow into the tube and fill it. When an electric current, therefore, is passed through the instrument between the plates, the evolved gases collect in the upper part of the tube, without being subject to the recombining power of the platina. The stopper *c* is taken out. By replacing the stopper, and refilling the tube with the liquid by inverting the bottle, a second measure of gas may be obtained on replacing the wires at *b*, and *b'*.

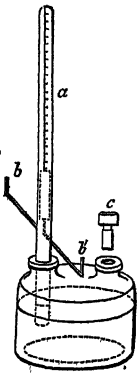


Fig. 45.

These instruments, however useful, are imperfect, and have been superseded by the electro-magnetic galvanometers of Schweigger, Nobili, and Dubois Remond.

Sect. III.—*On the Tension or Dry Pile.*

Effects and properties of the electric or dry pile.

In producing electricity of high tension, or its statical effects, a great number of pairs must be used, as in the dry pile or electric column, first constructed in 1805 by Behrens, who formed a column of 80 pairs of discs of zinc, copper, and gilt paper. In 1810 M. De Luc constructed a pile consisting of discs of zinc and silver paper an inch in diameter. These discs succeed each other in the following order: zinc, silver, paper; sinc, silver, paper. When from 500 to 1000 discs are enclosed in a dry glass tube, and the plates are pressed together by a brass cap and screw at each end, the pile will produce distinct electrical effects. When the columns of 1000 series each are fitted up as in fig. 46, and placed vertically in a glass receiver, a brass ball, suspended by a thread of raw silk, will, by the action of the two piles, continually strike the two bells placed at the lower end of the piles.

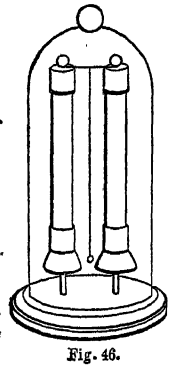
De Luc.

Mr Forster.

Mr B. M. Forster succeeded in making an apparatus analogous to the preceding, which rung continually for five months.

Mr Singer.

Mr Singer made one which rung continually for fourteen months, and De Luc had a pendulum which kept vibrating for more than two years.


Fig. 46.

Mr Singer found that, when the paper was perfectly dry, the pile lost all its power, and that it was deteriorated when too much moisture was present. M. Jaeger, however, observed, that when the paper, after being dried to excess, was heated by exposing the pile to a temperature of from 104° to 140°, the pile began to act as powerfully as before. When the paper is in its driest natural state the pile is active, and it loses its activity only when the paper is subjected to a degree of heat capable of scorching it. By means of a pile of 20,000 groups of silver, zinc, and double discs of writing paper, distinct sparks were obtained. A jar, having a coated disc of 50 square inches, was charged in ten minutes, and gave a disagreeable shock in the elbows and shoulders. The charge of this jar fused 1 inch of platina wire, the five-thousandth of an inch in diameter. This pile, though exhibiting such power, did not exercise the slightest chemical action.

Voltaic Electricity.

M. Jaeger.

The two ends of the electric pile are in opposite electric states, the *zinc* extremity being *positive*, and the *silver* extremity *negative*, the middle part being in a neutral state.

M. de Luc and M. Haussman observed that the rays of the sun increased the power of the column, an effect which they thought was not due to heat. Mr Singer, however, found that his column was always more powerful in summer than in winter, and in a room with a fire than in one without it.

Haussman.

M. de Luc has shown how the dry pile may be used in determining the conducting power of bodies, and also their insulating qualities, and he has likewise employed it as an aerial electroscope for indicating the electrical changes which take place in the atmosphere.[1]

In 1812, Professor Zamboni of Verona made a considerable improvement on the dry pile. He dispenses entirely with the discs of zinc, and employs only discs of paper, one of whose surfaces is silvered, or rather *tinned*, and the other covered with a thin film of the peroxide of manganese pulverised in a mixture of milk and flour. The faces of tin are placed in contact with those of manganese, the *tin* being the *positive*, and the *peroxide* the negative element.

Zamboni's dry pile.

In 1840, Mr Gassiot[2] succeeded in exhibiting the chemical power of the dry pile. Having constructed a pile of 10,000 series of discs of laminated zinc, paper, and oxide of manganese, each about 1 inch in diameter, he divided it into separate piles of 1000 each. With this apparatus he succeeded in obtaining sparks which passed through the space of $\frac{1}{10}$th of an inch. When the distance of the points was $\frac{1}{50}$th of an inch, the stream of sparks was so powerful as to produce that peculiar phosphorescent odour (that of ozone) which is always perceptible in the action of the electrical machine. With one of the piles of 1000 series, a spark passed through a space of the $\frac{1}{5000}$th of an inch; but what was of more interest, M. Gassiot succeeded, after many trials, in obtaining chemical decomposition of a solution of *iodide* of *potassium*. He fastened about 2 inches of platinum wire to each end of the pile of 10,000 series, the two points of his micrometer electrometer being brought parallel to each other, so as to be about a quarter of an inch apart. A piece of bibulous paper, saturated with a solution of iodide of potassium, was placed on a slip of glass, and then brought into contact with the ends of the wires from each extremity of the pile. The iodine then appeared invariably on the end of the wire attached to the end of the pile, which terminated with the oxide of manganese.

Mr Gassiot obtains chemical decomposition by the pile.

In 1840, Mr Crosse constructed a tension pile or water battery of 1626 cells of copper and zinc excited with river water, and by means of it he obtained a spark between slips of tinfoil pasted on sealing-wax.

Crosse's water battery.

Having received an account of this battery, M. Gassiot constructed a very powerful one, composed of 3520 pieces, or series of copper and zinc cylinders, each peice being placed in a separate glass vessel, covered with a coat of

M. Gassiot's water battery.

[1] See Nicholson's *Journal*, vol. xxvii. pp. 81, 161, 241, and also vol. xxviii. p. 5; *Phil. Mag.*, 1810, vols. xxxv., xxxvi., and xxxvii., and Singer's *Elements of Electricity*.

[2] *Phil. Trans.*, 1840, part i. p. 191, note.

Voltaic Electricity.

gum-lac varnish. The glass cells are placed on slips of glass, covered on both sides with a thick coating of lac. The 3520 cells thus insulated are placed on 44 separate oaken boards, also covered with lac varnish, each board carrying 80 cells. The boards or trays slide into a wooden frame, when they are further insulated by resting upon pieces of thick plate-glass similarly varnished.

M. Gassiot's water battery.

The water battery is shown in the annexed figures, where

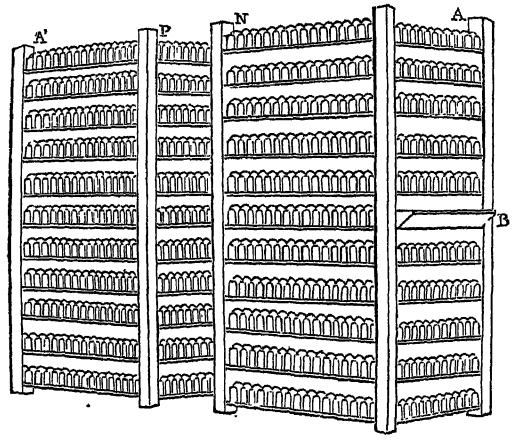


Fig. 47.

A A represents the wooden frames in which are placed the 44 boards containing the entire battery, B a shelf for holding a galvanometer, N A P the terminals or poles. Fig. 48

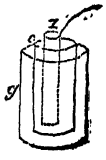


Fig. 48.

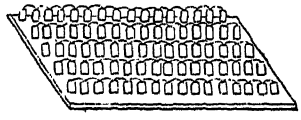


Fig. 49.

shows a single cell, *g* being a glass vessel, *c* copper, *z* zinc; and fig. 49 one of the boards when removed from the entire series. This battery is charged with pure water, and the only precaution to be taken is to pour water occasionally into the cells to replace what is lost by evaporation. For several years this battery constantly gives electric sparks at each of its poles which are insulated.

Bohnenberg's electroscope.

The dry pile has been applied with much success by M. Bohnenberg, in constructing an electroscope of great delicacy. Having suspended between the two opposite poles of two piles a single strip of gold leaf, he found that this leaf, however slightly it was electrified, was drawn to one or other of the poles, according to the nature of the electricity with which it was influenced. In this way he obtained an instrument, not only sensible to small electrical influences, but capable of indicating the kind of electricity which was present.[1]

All the dry piles we have mentioned lose their power in course of time. According to Delarive those which last longest, though less powerful than those of Zamboni, are made of Dutch silver paper and Dutch gold paper, stuck together by the surfaces where the paper is bare. When placed above one another, the discs are kept together by a very fine silk cord impregnated with varnish. The column is then inclosed in tubes of varnished glass, and supported between varnished rods of glass, the lowermost disc rests upon a metal plate, and the uppermost is pressed down by a metallic screw terminated by a bulb. The tension of the electricity is not increased by the size of the discs.

Voltaic Electricity.

With four columns thus constructed, containing 2230 pairs of discs an inch in diameter, M. Riess obtained 96 small sparks in a minute. At the end of four months he got only 48 sparks in the same time. With a similar column of 1800 discs, M. Dubois Remond made a magnetised needle deviate, and produced contractions in a prepared frog. With 2000 pairs, each 12½ inches long and 7 broad, M. Delezenne decomposed water. Mr Watkins constructed a dry pile of zinc alone, one side of the plate being rough and the other polished, and with one of 60 or 80 plates, with their rough faces turned in the same direction, and placed the 20th of an inch distant, in a wooden trough, he developed electricity at each pole so largely as to show that the *polished* face was *positive*, and the *rough* face *negative*, the air acting as a moist conductor.[2]

Before concluding this part of the subject, we shall describe some pieces of apparatus, which have been employed both in this country and on the continent, in conducting the important researches to which we shall afterwards refer, respecting the reduction of oxides and earths by *weak electric* currents. M. Becquerel used only a single pair of plates, in connection with his decomposing cell. Having closed a glass tube at one end by a plug of moistened clay, he immersed it in a weak solution of common salt. The solution of the metallic salt to be decomposed was then placed in this glass tube, and a compound metallic arc, formed of zinc and platinum, was placed in the solution in such a manner that the platinum leg was immersed in the tube containing the metallic solution (the *negative tube* of Becquerel), while the zinc dips in the solution of salt. Chemical decomposition then takes place, and in a few hours or more, sometimes a few weeks, the metal appears on the plate of platinum, in a form more or less crystallised.

M. Becquerel's decomposing cell.

Dr Golding Bird, in prosecuting similar researches, has contrived a simple form of the battery, which, with Becquerel's cell, enables us to perform this class of experiments with facility and certainty. It consists of a large glass cylinder A (fig. 50), 8 inches deep and 2 in diameter. Within this is fixed, by means of corks, another glass cylinder B, 1½ inch in diameter, and 4 inches long, and closed at one end with a plug or bottom D of plaster of Paris, 0·7 of an inch in diameter. A piece of sheet copper C, 6 inches long and 3 wide, loosely coiled up, and having the conducting copper wire, F, soldered to it, is placed in the cylinder D, while an equal sized piece of zinc, E, loosely coiled up, and furnished with a conducting wire, G, is placed in the cylinder A. When the cylinder A is nearly filled with weak brine, and the smaller one, B, with a saturated solution of sulphate of copper, the apparatus is com-

Dr Bird's decomposing battery.

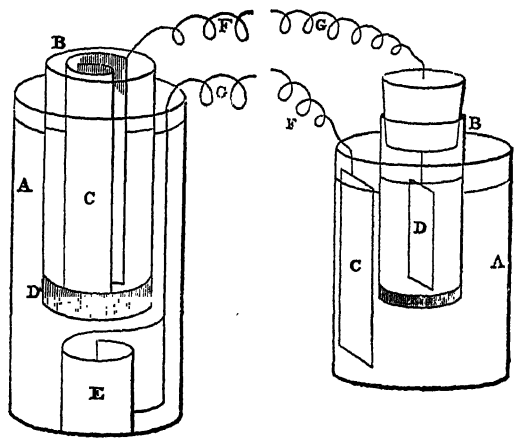


Fig. 50.

Fig. 51.

[1] See *Annales de Chim. et de Phys.*, tome xvi. p. 91, and *Bibl. Univ.*, tome xv. p. 163; Gilbert's *Annalen der Physik*, vol. xlix.

[2] Delarive's *Electricity*, vol. ii. p. 859.

Voltaic Electricity.

plete; and if the fluids in the two cylinders are kept at the same level, a continuous current of electricity will be maintained for some weeks. The mode of connecting this battery with the decomposing cell is shown in fig. 51. This cell is the counterpart of the battery, consisting of two glass cylinders, A, B, the latter having a plaster of Paris bottom. The tube B is about 3 inches long and half an inch wide, and receives the metallic or other solution to be decomposed, the outer tube A being filled with weak brine. Into this brine is plunged a strip of amalgamated zinc, C, connected with the wire F of the battery, while a strip of platinium foil, D, is immersed in the metallic solution, and is connected with the wire G of the battery. This apparatus, therefore, consists of an active single battery, of which C, E, is one of the two metallic elements, and C, D, the other; and the fluid between C and E, separated by the porous diaphragm D, one fluid element, and the fluid between C and D, separated by a porous diaphragm, another fluid element.[1]

CHAP. II.—ON THE GENERAL PHENOMENA AND EFFECTS OF GALVANISM.

General phenomena of galvanism.

In our article on ELECTRICITY,[2] we have already given a brief account of the results obtained by Dr Faraday, which established the identity of all the various kinds of electricity, and the relation by measure of ordinary and voltaic electricity, as obtained by the same distinguished philosopher, and of his new law of electrical conduction.

Notwithstanding the identity of character of *common* and *voltaic* electricity, the effects which they produce are almost infinitely varied, some of these effects being exalted, while others are diminished. All these variations, however, are explicable by the differences in quantity and intensity of these two kinds of electricity.

In the case of ordinary electricity, a piece of glass or sealing-wax, excited by friction and kept near the cap of a gold-leaf electrometer, will produce a great and instantaneous divergence of the leaves; but in voltaic electricity the same effect is not produced, even by a battery of 100 pair of plates.

Difference between ordinary and voltaic electricity.

When the extremities or poles of such a battery are examined by the electrometer, they are found to be *positive* and *negative*, the gold leaves *repelling* each other at the *same* pole, and *attracting* each other at *different* poles, even when above half an inch of air intervenes. Hence *ordinary* differs from *voltaic* electricity, in having a much higher degree of *tension*, or *intensity*, that is in acting with a greater elastic force in a given direction. From this property it acts so powerfully on the electrometer, and is discharged with such facility through air, whether highly rarefied or heated. On the other hand, *voltaic* differs from *ordinary* electricity in the enormous quantity of electricity which it develops and puts in motion, and in the continuity or perpetual reproduction of the current.

In order to convey some idea of the immense difference in this respect of the two electricities, Dr Faraday has stated that "the chemical action of a grain of water upon four grains of zinc can evolve electricity equal in quantity to that of a powerful thunder-storm." That if a Leyden battery is charged with 30 turns of a large and powerful plate electrical machine in full action, it would require 800,000 such charges to supply electricity to decompose a single grain of water, or to equal the quantity which is naturally associated with the elements of that grain of water, endowing them with their mutual chemical affinity.[3] Or to put the comparison differently, the quantity of electricity in $25\frac{1}{4}$ grains of water is equal to above 24,000,000 of charges of the Leyden battery above mentioned, or would keep any length of platina wire $\frac{1}{101}$th of an inch in diameter red hot for an hour and a half. Voltaic Electricity.

We have already seen that voltaic electricity at rest, like ordinary electricity, produces attractions and repulsions. We shall therefore proceed to give an account of the effects of voltaic electricity in motion, or of voltaic currents.

SECT. I.—*On the Conducting Power of Solids and Fluids for Voltaic Electricity.*

When a voltaic battery is in a state of activity, and when wires of different metals are placed between the poles of the battery, so as to complete the circuit, the current of electricity passes through them with different degrees of facility, that is, the different metals transmit the electricity with different degrees of resistance.

The following table contains the results obtained by Becquerel, Davy, Harris, &c., respecting the conducting power of different metals, for different kinds of electricity.

Conducting power of different metals for different electricities.

Metals.	Becquerel.[4] Voltaic Electricity.	Davy. Voltaic Electricity.	Harris.[5] Ordinary Electricity.	Cumming.[6] Thermo-Electricity.	Christie.[7] Electricity of Induction.	Pouillet.[8] Electricity of a single couple.
Copper.....	100	100	100	100	100	100
Gold.....	93·6	73	66·7	35·2	110	84
Silver.....	73·6	109	100	176·5	15·2	116
Zinc	28·5	...	33·3	53	52·2	...
Platina	16·4	18	20	21·6	24·5	13
Iron...	15·8	14·5	20	24·3	22·3	16
Tin.....	15·5	...	16·7	23·9	25·3	...
Lead	8·3	69	8·3	16·8	12·4	brass 12

These results are, generally speaking, greatly at variance, the only ones that admit of comparison being those of Becquerel and Sir W. Snow Harris. Much depends on the purity of the metals; and Sir William has ascertained that the conducting power of alloys is very different from that of their component metals. This appears very distinctly from the number for brass, which bears no relation in M. Pouillet's column, to the measures for copper and zinc, and also from his measure for gold of 18 karats, which we find to be only the 7th of copper, and the 6th of fine gold. The conducting power in the same metal increases directly as the area of the section of the wires, and inversely as the length of the wire.

Pouillet.

M. Pouillet has found that the same law holds in liquids included in cylindrical tubes. By comparing, in this way, the conducting power of different saline solutions, the conducting wires being formed of the metal whose oxide was in solution, he found, as Fechner had done, that the intensity was rigorously in the direct ratio of the section and the inverse ratio of the conductibility. In this way he found that 433 feet of platinum wire 0·006 inch in diameter, had the same conducting power as a column of saturated solution of sulphate of copper $3\frac{1}{4}$ feet in length, and 0·8 inch in diameter, from which it follows that the conducting power of the platinum is *two million and a half* times greater than that of the solution.

The following table shows the results of his observations, the conducting power of the copper solution at 59° Fahr., being taken as unity.

---

[1] See *Phil. Trans.* 1837, part i. pp. 39, 40; and Graham's *Elements of Chemistry*, pp. 237, 238.
[2] Vol viii. pp. 574–5.
[3] Faraday's *Exp. Researches*, pp. 253, 258, and 861, 873.
[4] *Traité de l'Electricité*, vol. iii. p. 91.
[5] *Phil. Trans.* 1817.
[6] *Camb. Trans.* 1823, p. 63.
[7] *Phil. Trans.* 1833, p. 95.
[8] *Traité de Physique*, ii. p. 315.

Voltaic Electricity.

	Conducting Power.
Saturated solution of sulphate of copper	1·00
„ diluted with one volume of water	0·64
„ „ two „	0·44
„ „ four „	0·31
„ „ sulphate of zinc	0·417
Distilled water	0·0025
„ with $\frac{1}{10000}$ of nitric acid	0·015

Marianini. M. Marianini has obtained a great number of interesting results respecting the conducting power of water holding in solution different acids, alkalis, or salts, compared with that of distilled water, at the temperature of 3° of Reaumur. The following is a selection from his results:—

	Conducting Power.		Conducting Power.
Distilled water, temperature, 3° Reaumur	1·000	Benzoic acid	70·67
Hydrocyanate of soda	10·96	Sulphate of soda	74·02
Hydrocyanic acid	18·27	Sulphate of Potash	80·00
Liquid ammonia	24·45	Citric acid	85·71
Soda	32·06	Tartrate of potash	92·00
Phosphate of potash	44·74	Tartaric acid	98·66
„ of Soda	46·00	Sea water	100·00
Tartrate of potash and antimony	50·07	Hydrochlorate of lime	110·00
Sulphate of zinc	51·69	Oxalate of potash	149·00
Potash	55·68	Acetate of copper	154·00
Nitrate of lime	57·00	Oxalic acid	179·00
Acetate of potash	59·02	Sulphuric acid	239·00
Nitrate of Barytes	60·02	Nitrate of silver	298·00
Carbonate of potash, neutral	66·07	Nitric acid	358·00
		Hydrochlorate of platinum	418·00

The conducting power of solutions increases as the quantity of salts dissolved, but more slowly as the solution approaches to saturation. The preceding table shows that *acid* solutions have the *greatest;* and the *alkaline* and neutral solutions, the *least* conducting power.

Faraday. The relation between the conductibility of non-metallic bodies in the solid state, and that of the same bodies in the liquid state, has been investigated by Dr Faraday, with his usual ability and success. Having found that a thin plate of *ice* stopped the electric current, while the same current passed when the ice was converted into water, Dr Faraday examined a great number of non-metallic solids, and found that they assumed the conducting property during liquefaction, and lost it during congelation; but what was remarkable, all those bodies underwent decomposition when fluid, with the single exception of the *periodide of mercury*, which, though it insulated when solid, and conducted when fluid, was not decomposed in the latter state. Dr Faraday found also a great variety of bodies, which acquired no conducting power in the fluid state, such as *sulphur, phosphorus*, &c., and they were not decomposed in this last state.

The relation between conduction and decomposition is a very important one; but no less so is the relation of the conducting power for electricity to that for heat. "As the solid becomes a fluid," says Dr Faraday, "it loses almost entirely the power of conduction for heat, but gains in a high degree that for electricity; but as it reverts back to the solid state, it gains the power of conducting heat, and loses that of conducting electricity."

Conditions of electric conduction. Dr Faraday has given the following summary of the conditions of electric conduction in bodies:—

"1. All bodies conduct electricity in the same manner from metals to lac and gases, but in very different degrees.

"2. Conducting power is in some bodies powerfully increased by heat (such as in sulphuret of silver, fluoride of lead, periodide of mercury, and corrosive sublimate), and in others diminished, yet without our perceiving any accompanying essential electrical difference, either in the bodies, or in the changes occasioned by the electricity conducted.

"3. A numerous class of bodies, insulating electricity of low intensity when solid, conduct it very freely when fluid, and are then decomposed by it. Voltaic Electricity.

"4. But there are many fluid bodies which do not sensibly conduct electricity of this low intensity; there are some which conduct it, and are not decomposed, nor is fluidity essential to decomposition.

"5. There is but one body yet discovered (periodide of mercury, to which Dr Faraday subsequently added corrosive sublimate), which, insulating a voltaic current when solid, and conducting it when fluid, is not decomposed in the latter case.

"6. There is no strict electrical distinction of conduction which can, as yet, be drawn between bodies supposed to be elementary, and those known to be compounds."[1]

Sir Humphry Davy[2] has shown, that, as a class, metals have their conducting power diminished by heat; and Sir W. Snow Harris has proved, that heat does affect gaseous bodies, or at least air.[3]

Sect. II.—*On the Intensity and Direction of Voltaic Currents.*

Intensity and direction of voltaic currents. The two electricities of the pile, when disengaged by the chemical action of its elements, tend continually to reunite and form a neutral fluid, by entering the conducting bodies in their vicinity. The quantity of electricity which remains free, constitutes the *tension* of the pile, or the intensity of the current, as we have already explained.

Intensity of currents. The tension of the pile is affected by various causes. When its two extremities are united by a metallic arc, the tension at first diminishes rapidly, but the diminution becomes slower and slower, till it reaches its limit, beyond which the tension no longer decreases, however great is the length of time during which the circuit is closed.

The loss of tension in a given time increases with the number of voltaic couples, and the pile is longer in reaching the limit beyond which the tension does not decrease.

Marianini's experiments. The loss of tension is more rapid when the liquid exercises a more powerful chemical action on the oxidable metal of the voltaic couple, and the longer it is in reaching the limit of decrease. In these experiments, which we owe to Marianini, the conducting power of the metallic arc has no influence.

The electric tension lost under the preceding circumstances, is again restored by opening the pile, that is, reversing the metallic arc which united its extremities; but it requires more time to recover its primitive tension, the longer the circuit has been closed.

In studying the change produced upon the tension when the circuit is not closed by a metallic arc, M. Marianini found that a battery with new plates loses less tension in a given time, than one with oxidated plates, the new apparatus reaching its limit sooner than the old one. In piles consisting of gold and zinc couples, tension diminishes more rapidly than in the ordinary pile, and reaches its limit in a very short time; whilst in piles with lead and zinc, the tension diminishes less rapidly than with copper and zinc.

Direction of currents. The *direction* as well as the intensity of electric currents, depends on the degree of chemical action exerted by the liquid on one of the metals, particularly the most oxidable one. When the liquid and the metals are therefore known, the direction of the current can be predicted. The metal most acted upon takes away from the liquid negative electricity. Zinc, for example, is more attacked by brine than copper, and therefore takes from the brine its negative electricity; but if the liquid is a solution of sulphuret of potassium, which affects the copper more than the zinc,

[1] *Researches*, § 444–449. [2] *Phil. Trans.* 1821, p. 431. [3] Id. 1834, p. 230.

Voltaic Electricity.

the copper will take from the solution its negative electricity, and the current will take an opposite direction. Hence, in a pile with brine, the *zinc* extremity will give *positive* electricity; whereas, in a pile with a solution of sulphuret of potassium, the *zinc* extremity will give *negative* electricity.

Delarive's experiments.

M. Delarive obtained the following interesting results, by immersing different voltaic couples in nitric acid of different strengths. Each metal in the two columns is *positive* in relation to the one which precedes it.

In Concentrated Nitric Acid.	In Dilute Nitric Acid.
Oxidated iron.	Silver.
Silver.	Copper.
Mercury.	Oxidated iron.
Lead.	Iron.
Copper.	Lead.
Iron.	Mercury.
Zinc.	Tin.
Tin.	Zinc.

M. Becquerel mentions *arsenic* and *iron* as a remarkable example of a change of polarity produced by the chemical action of the fluid. With a voltaic couple of *iron* and *arsenic*, the *iron* is strongly *positive* compared with the arsenic, when they are immersed in diluted acid, which acts slightly upon the arsenic; but when they are immersed in potash kept in fusion, the *arsenic*, upon which the potash acts powerfully, becomes *positive*.

M. Delarive's results.

M. Delarive has illustrated this branch of science with a number of valuable experiments on the changes produced upon electric currents, while passing through liquid conductors, interrupted by metallic plates. The following are the results at which he arrived:—

1. One or more metallic laminæ (platina), placed perpendicularly to the direction of the electric current, in a liquid conductor, diminish the intensity of the current which traverses them.

2. This diminution is almost nothing when the electric current is very energetic, and proceeds from a pile containing a great number of couples; but the intensity diminishes the more rapidly in passing through the same number of plates, as its original intensity is less energetic.

3. If one or two electrical currents of the same intensity, the one an original one, and the other one which has previously passed through several metallic plates, the first will have its intensity much more diminished by the interposition of a plate than the second. Hence, these currents have the same property (not by polarisation, as stated by Becquerel), as light and heat which have passed through absorbing media.[1] We have no doubt, therefore, that currents which have passed through plates of metals, will have thus acquired, or have possessed previous to their separation, other properties than that of passing more freely through other metallic plates.

From the preceding results, M. Delarive has explained the difference between the effects of a pile with a small number of couples, and a pile with a larger number. The first produces more easily the effects which took place when the circuit is closed by a very good conductor, while the second may be best employed in producing phenomena which take place in the circuit of an imperfect conductor, such as a fluid, the transmitted currents in the latter case having acquired, in passing through a greater number of plates, a greater facility of traversing an imperfect conductor.

As the intensity of the electric current had been found to increase with the surface, acted upon by the fluid, M. Delarive endeavoured to determine the law of increase. He found that an increase of surface facilitated the transmission of the current; that the augmentation of intensity produced by a greater extent of surface, increased in a *greater ratio than the surface* when the current is *feeble*, and in a less ratio when the current is intense; so that we gain more by increasing the surface when the current is weak than when it is strong.

Voltaic Electricity.

M. Delarive's results.

With regard to the influence of fluid conductors in diminishing the intensity of the electric current, M. Delarive found that nitric acid diminishes the intensity least, then muriatic acid, then sulphuric acid. Nitric acid, pure and greatly diluted, produces a less diminution than concentrated acid. The contrary takes place with sulphuric acid, which is a bad conductor. The silver solution came next, then potash and ammonia, which differ little from each other.

For further information on the subject of this section, see Marianini, *Saggio di Experience Elettromotriche*, Venice, 1825; *Ann. de Chim. et de Phys.*, tom. xxxvi. p. 33; xxxvii. p. 256; xxxviii. pp. 49, 337; xlv. p. 2; Delarive's *Esquisse Historique des principales Decouvertes faites dans l'Electricite*, Geneva, 1823; or in the *Bibl. Universelle* for 1833. See especially Becquerel's *Traité de l'Elect. et Magnet.*, tom. iii.

Sect III.—*On the Propagation of Electricity.*

Ohm's laws.

In 1827 M. Ohm[2] published his *Theory of the Voltaic Circuit*, in which he concluded, on principles purely theoretical, that the intensity I, or electromotive force of a current in a closed circuit, is directly proportional to the sum of the electromotive forces E, which are in activity in the circuit, and inversely proportional to the sum of the resistances of all parts of the circuit, or R, that is,

$$I = \frac{E}{R}.$$

By the term *electromotive force* is meant the force or forces, or causes, which produce an electric current, and by the term resistance is expressed the obstacles opposed to the passage of the current by all the parts of the circuit. This resistance is the inverse of the conducting power of all the parts of the circuit.

The resistance, which is equivalent to the sum of all the resistance, may be represented by the length of a wire of a given nature and thickness, which Ohm calls its *reduced length*.

The following laws are deducible from the preceding formula:—

1. The electromotive force varies with the number of elements in any voltaic circuit, and with the nature of the solids and fluids of which each element is composed.

2. The resistance of each element is directly proportional to the distance of the plates from each other in the liquid, and to the specific resistance of the liquid, depending on its chemical constitution, and inversely to the surface of the plates in the liquid.

3. The resistance of the wire connecting the poles of the circuit is directly proportional to its length and its specific resistance, and inversely to the area of its section.

These and other laws of the propagation of electricity have been sufficiently confirmed by experiment.

The following is a brief abstract of the laws of the propagation of electricity by good conductors, as given at great length by M. Delarive. In studying these laws, two or three pairs

[1] M. Becquerel, to whose excellent work we are indebted for the latest and best information on this subject, asks "if we will from analogy say, that the current, in traversing different plates, *acquires* a polarisation similar to that of light." Certainly not. When white light passes through a certain thickness of any coloured medium, or any similar number of coloured plates, it loses a certain portion of its rays, say $\frac{1}{10}$ths, and the transmitted light is red. Now, this *red* light may be transmitted through the same number of the same plates, and yet not lose $\frac{1}{10}$th of its light; but there is no polarisation. The first plates absorbed all the rays but the red, and having the property of transmitting the red rays freely and more copiously than any other, they passed through in greater abundance. As these transmissions are all at a vertical incidence, polarisation can have nothing to do with the matter.

[2] See Principal Forbes' *Dissertation*, p. 982, for an account of Ohm's laws of electrical conduction.

Voltaic Electricity.

of Daniell's or Grove's battery, for obtaining the electromotive force, and metal plates, wires, and saline or acid solutions, will, to obtain the resistances, be sufficient for ascertaining the laws of the propagation of electricity.

1. The first law which M. Delarive established for solid and liquid conductors in 1824 and 1825, is the tendency of the dynamic electric current to distribute itself or to occupy the whole extent of a conductor, which it does in small parallel filaments of equal intensity.

Hence it follows that the intensity of the current is proportional to the narrowness of the portion of the conductor through which it passes.

2. Two or more electric currents are propagated independently, and without modifying each other, in the same conductor.

This was proved by Marianini, who also transmitted a third current through a liquid while it was transmitting other two, and this in a direction perpendicular to them. This fact is analogous to the transmission of light, but the analogy is only apparent, as electrical currents undergo neither reflection, refraction, nor polarisation.

3. The electrical current is diminished in intensity when its passage through a liquid mass is obstructed by diaphragms or metal plates.

This phenomenon is, according to M. Delarive, one of conductibility; but, in addition to it, he remarks, that there is a *resistance of passage* due to the mere fact of the currents passing from a solid into a fluid, or the reverse.

4. The same quantity of electricity traverses at the same time all the successive parts of a closed circuit, including the apparatus which produces the current, however different be their form, their nature, and their extent, "circumstances which influence only the absolute quantity of electricity in circulation, and not its relative intensity in different parts of the circuit." "Also," M. Delarive continues, "if we have in the same circuit, first the pile, then a wire coming from one of its poles and entering into a liquid, and two or three parallel wires extending from this liquid to the other pole, the quantity of electricity that, under the form of a current, traverses the pile itself, the first wire, the liquid, and the two or more parallel wires, is exactly the same."

This law was indicated to Ampere, more accurately proved by Becquerel, demonstrated by Pouillet and Fechner, but more completely by Delarive. This law is implicitly admitted by Ohm in his *Theory of the Battery*.

From this law it follows, that the absolute intensity of an electrical current passing through a closed circuit depends upon two circumstances alone—the forces that produce the electricity, and the resistances to conductibility occasioned by the whole circuit. This latter element was first pointed out by Delarive in 1825, and in some degree anticipated Ohm's law already referred to.

5. If we increase or diminish the resistance of any part of a circuit, the total intensity of the current diminishes or increases, *cæteris paribus*, in a proportion the same as that existing between the resistance added or removed, and the total new resistance of the entire circuit. This law is deducible from the fourth and from Ohm's formula.

If R in the formula, $I = \frac{E}{R}$ becomes $R + r$ or $R - r$, we have $I = \frac{E}{R + r}$, or $I = \frac{E}{R - r}$; and calling I', the intensity in the one case, and I'', the intensity in the other, we have

$$I : I' : I'' = \frac{I}{R} : \frac{1}{R + r} : \frac{1}{R - r}, \text{ and consequently}$$

$$I - I' : I = r : R + r, \text{ and}$$

$$I'' - I : I = r : R - r;$$

that is, the diminution of intensity is to the original intensity as the increased resistance r is to the new total resistance $R + r$, and the increase $I'' - I$ is to the original intensity as the suppressed resistance r is to the new total resistance $R - r$. Voltaic Electricity.

This law was verified experimentally by Fechner and Pouillet.

6. The resistance opposed to a current by any conductor is directly proportional to its length, and inversely to the area of its section.

This law, which may be demonstrated directly, follows from the preceding. It is the same as the law of conductibility adopted by preceding writers, namely,

The conducting power of a wire is inversely as its length, and directly as the area of its section.

The 6th law requires to be proved by direct experiment, but the 7th is deducible from the uniform distribution of electricity in motion throughout every portion of a homogeneous conductor, a fact which shows that voltaic or dynamic electricity does not pass to the surfaces of bodies like ordinary electricity.

Fechner verified the 6th law in liquids as well as solids, in so far as length is concerned, but in reference to section he found it verified only when the surface of the electrode is equal to that of the section.

8. If two parallel conductors placed in the voltaic circuit are of the same nature, diameter, and length, as is the case with two similar wires, the current will divide itself equally between them. But if they are of different lengths, L and l, the proportion of the current that passes along each of them is inversely, as its length and the total intensity of the current is the same as if a single wire of the length $\frac{L}{L + l}$ were substituted for the two. In like manner, if R, r, are the resistances in any two conductors, the total resistance will be $\frac{Rr}{R + r}$. The two conductors must be both metallic or both liquid.

This law is the result of the preceding ones, and has been confirmed by experiment.

The theory of what is called *derived* or *diverted* currents is a consequence of this law. A current is said to be derived, when in a closed circuit two points of it are connected by another conductor, called by Mr Wheatstone a *branch* conductor. By the theory of Ohm, Mr Wheatstone has shown that the four intensities in the different parts of the compound circuit will be Derived currents.

$$I = \frac{E}{L + l'}, \quad I' = \frac{E(l + l')}{L(l + l') + ll'},$$

$$I'' = \frac{El'}{L(l + l') + ll'}, \quad I''' = \frac{El}{L(l + l') + ll'}.$$

In these formulæ, l represents the reduced length of the portion of the circuit from which the current is partly derived, L' that of the diverting wire, and that of the principal or undivided current, the force of the original current before the branch was introduced, I' that of the principal portion L, I'' that of the portion l, from which the current was partly diverted, and I''' that of the branch l' which diverts the current.

The laws which regulate the properties of derived or diverted currents have been applied by Mr Wheatstone[1] to the construction of very beautiful instruments and apparatus which he has used for determining with great precision the constants of a voltaic circuit. In the valuable paper in which he has described these instruments and the processes in which they are used, he has employed some new terms which it will be convenient to explain. Ampere had em-

[1] *Phil. Trans.* 1843.

Voltaic Electricity.

ployed the term *reophore*, from ρεω, to flow, and φερω, to carry, to designate the connecting wire of a voltaic battery, from its being the cause of the current; and Peclet had proposed the word *rheometer*, which has been adopted by French writers as synonymous with galvanometer. Mr Wheatstone uses *rheometer* to denote any apparatus whatever which originates an electric current, and he calls a single pair or element in a battery a *rheomotive element*, and a voltaic or thermo-electric battery a *rheomotive series*. An instrument which periodically interrupts a current he calls a *rheotome*, and an instrument which alternately inverts it, a *rheotrope*. An instrument which simply indicates the existence of an electric current he names a *reoscope*, while he gives the name of *rheostat* to an instrument for adjusting or regulating a voltaic circuit, so that any constant degree of force may be obtained.

Mr Wheatstone's rheostats.

In the important paper to which we have referred, he has described two rheostats for measuring the electromotive forces and resistance of a circuit, the one intended for circuits in which the resistance is considerable, and the other where it is small.

Rheostat for considerable resistance.

The first of these is shown in fig. 52, and consists of

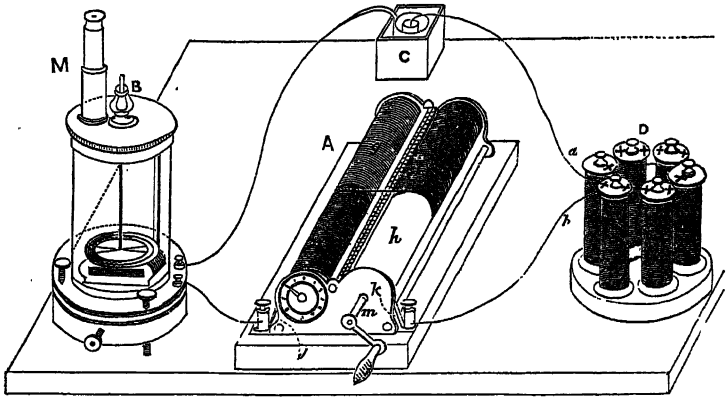


Fig. 52.

three parts, A the rheostat, B a delicate galvanometer, with an astatic needle, and a microscope, M, for reading off the divisions of the circle, and C, the rheometer. In the rheostat, *g*, is a cylinder of wood, and *h* one of brass of the same diameter, and with their axes parallel. A spiral groove is cut in the wood cylinder, and at one end of it is fixed a brass ring, to which is attached one of the ends of a long and slender wire, which, when coiled round the wood cylinder, fills the entire groove, and is fixed at its other end to the farther end of the brass cylinder. Two springs, *j* and *k*, pressing one against the brass ring, and the other against the end of the brass cylinder *h*, are connected with the wires of the circuit by two binding screws. The moveable handle *m*, when on the cylinder *h*, and turned to the right, uncoils the wire from *g*, and coils it upon *h*, and when placed on *g*, and turned to the left, it produces the reverse effect. The coils on *g* being insulated by the groove which separates them, the current passes through the entire length of the wire upon that cylinder, but the coils on the brass cylinder not being insulated, the current passes immediately from the point of the wire which is in contact with the cylinder to the spring *k*. The effective part of the length of the wire is the variable portion on the wood cylinder.

In the instrument usually employed by Mr Wheatstone, the cylinders are 6 inches long and 1½ in diameter, the threads of the screw are the 40th of an inch, and the brass wire the 100th of an inch in diameter. The wire is very thin, and a bad conductor, for the purpose of introducing a greater resistance into the circuit.

Voltaic Electricity.

By means of a scale which measures the number of coils unwound,—and the fractions of a coil are shown by an index and graduated circle,—we can readily determine the exact length of the wire introduced into the circuit, and the variations which it undergoes. The figure shows the arrangement of the apparatus when ready for an experiment.

The rheometer or voltaic element C consists of a glazed porcelain cell 2 inches square and 1½ high, in the centre of which is placed a small porous cylinder of earthenware or wood, filled with a liquid amalgam of zinc, a solution of sulphate of copper occupying the space between the two cells. This arrangement Mr Wheatstone considers as not only constant in action but extremely economical and easy to manipulate.

Rheostat for feeble resistance.

The rheostat employed by Mr Wheatstone for circuits with feeble resistances, is shown in fig. 53, and consists of three parts A, B, and C; *a* is a cylinder of dry wood, 10½ inches long by 3¼ in diameter, on the surface of which a spiral groove is cut, filled with a copper wire the 16th of an inch thick, forming, as it were, the thread of a screw with 108 coils. A triangular bar of metal, *b*, is placed above *a*, carrying a slide, *c*, which presses against the spiral wire, one end of which is fixed to a brass ring, *e*, against which presses a spring, *f*, connected by a binding screw to one end of the circuit, the other end being held by the binding screw, metallically connected with the bar *b*. The handle, *h*, causes the slide *c* to advance or recede along the bar, so that as the slide touches a different point of the wire, a different resistance is introduced into the circuit, namely, the portion of the wire between the slide and its extremity at *f*.

The thermo-electric circuit, in which this instrument is interposed, is shown at C, and the galvanometer B, which instead of leaving numerous coils of fine wire, as in the one in fig. 52; consists of a single thick plate or wire, with a single convolution. Any rheometer with a small resistance may be substituted for C. In place of the wooden cylinder in these rheostats, M. Rhumkorff of Paris has introduced cylinders of glass.

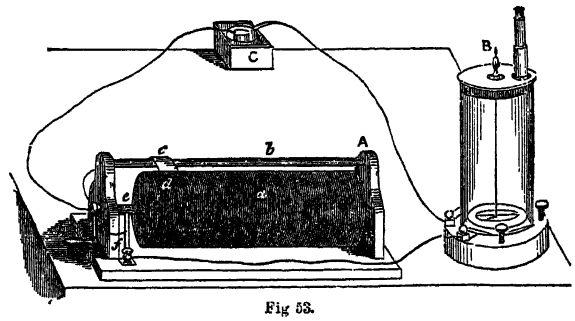


Fig 53.

Instruments, founded on the same principle as these, were contrived independently by Jacobi and Poggendorf. In that of Jacobi,[1] called a *volta-agometer*, the variable wire was of platinum, and in that of Poggendorff,[2] of German silver. Mr Wheatstone's rheostats are more convenient and better known.

M. Jacobi has constructed an agometer with mercury as the standard of resistance, and, as Delarive remarks, has with this instrument measured resistances with a precision which permits of the probable error being diminished to the 100,000th part of the total resistance.

When small differences of resistance are to be measured, the preceding rheostats are inapplicable. The differential galvanometer of M. Becquerel, though theoretically perfect, is not practically useful for this purpose. Mr Wheatstone

[1] *Athenæum*, 1840, No. 678.

[2] *Annalen*, lii. p. 526.

Voltaic Electricity.

has therefore contrived two forms of the *Differential Resistance Measurer*, which we regret our limits will not permit us to describe. We must therefore refer the reader to his important paper, not only for an account of those and other ingenious instruments, but for an account of the processes which he has employed in obtaining the following results.

1. In conformity with theory, the magnitude of an element produces no difference in its electromotive force.

2. In five small elements charged with five different solutions, the electromotive forces were equal, though the force of the current in each was very different.

3. In conformity with theory, the electromotive force of a circuit is proportional to the number of similar elements of which it is formed, arranged in series.

4. The contrary electromotive force which is introduced into a circuit when a voltameter or decomposing cell is interposed, is constant in 3, 4, 5, 6 elements with decomposing cells, and is to that of a single standard element as 7 : 3.

5. The highest electromotive force of a voltaic element of two metals and one liquid, is when the liquid is the solution of a salt of the negative metal.

6. The proportion of zinc in the liquid amalgam of zinc does not affect the electromotive force of the voltaic element of which it forms a part.

A very high electromotive force was obtained from an element in which the positive metal was amalgam of potassium, and the negative metals chloride of platinum and platinum.

7. A still higher electromotive force may be obtained by employing with the amalgam of potassium, a platinum plate covered with a plate of peroxide of lead, a substance experimented with by Schönbein and Delarive. A rheomotive series of *ten* such elements have an electromotive force equal to 33 of Daniell's battery, and 50 of Wollaston's apparatus.

8. If these metals be taken in their electromotive order, the electromotive force of a voltaic element formed of the two extreme metals is equivalent to the sum of the forces of the two elements formed of the adjacent metals.

9. The electromotive force of a thermo-electric element of bismuth and copper, with the temperature of its opposite joints 32° and 212°, is to that of a standard voltaic element of amalgam of zinc, sulphate of copper, and copper, as 1 is to 94·6.

By a different process, Pouillet had found the ratio to be as 1 to 95.[1]

Sect. IV.—*On the Production of Light, Heat, and Cold, by Voltaic Electricity—the Ignition of Wires.*

Electrical light, heat, and ignition.

The phenomena of light and heat, and the ignition of metals and wires by ordinary Electricity, having been fully described under that article, we shall here confine ourselves to the analogous phenomena produced by voltaic currents.

Van Marum, &c.

Soon after the discovery of the pile, Van Marum, Pfaff, and Tromsdorff discovered that thin leaves and fine wires of metal placed between the poles of a pile, became incandescent, and even burned, while conducting the electrical current; and some time afterwards, M. M. Fourcroy, Vauquelin, and Thenard observed that piles with large plates deflagrated metals more powerfully than piles with a great number of plates of smaller surfaces.

Fourcroy, &c.

It was in England, however, that the calorific and luminous effects of the pile were principally developed. In 1813, the immense battery of the Royal Institution, composed of 2000 couples, and exposing 28,000 square inches, enabled Sir H. Davy to produce light and heat of the highest intensity. When the ends of the wire from each pile terminated in two charcoal points, the most dazzling light passed from the one to the other, and continued for several hours. Steel wires and thin leaves of different metals, were made red hot and burned, and water was boiled by plunging into it an iron wire two feet long and $\frac{1}{100}$th of an inch in diameter, and placed between the poles of the battery. Platina, sapphire, quartz, and lime, &c., when exposed to this source of heat, were instantly melted, and the diamond and charcoal disappeared, as if they were completely volatilised. These effects were produced in vacuo as well as in air.

Davy.

Voltaic Electricity.

By means of the splendid battery described in a preceding part of this article, Mr Children obtained many important and curious results. His experiments commenced in 1809, but it was in 1815 that he brought into play the powerful instrument which we have already mentioned. He found that metallic wires connecting the two piles of the battery became red-hot in the following order :—

Children.

Platinum.	Copper.	Zinc.
Iron.	Gold.	Silver.

And hence Mr Children concluded, that the conducting power of these metals was in the inverse order, silver being the most conducting, and platinum the least.

With this battery, five feet six inches of platinum wire, 0·11 inch in diameter, were brought by Mr Children to a red heat throughout, so as to be visible in daylight.

Eight feet six inches of platinum wire, 0·44 inch in diameter, were heated red.

A bar of platinum $\frac{1}{5}$th of an inch square, and 2·25 inches long, was heated red, and fused at the end.

The oxides of tungsten, uranium, cerium, titanium, and molybdenium, were fused. Having filled an opening in an iron wire with diamond powder, the diamond disappeared, and the iron was converted into steel.[2] Effects still more powerful have been since obtained by the batteries of Grove and Bunsen.

Wollaston.

At the same time that Mr Children was constructing the greatest voltaic battery ever made, Dr Wollaston was occupied in constructing the smallest. He took a small thimble, as we have already stated, and having removed the bottom, he flattened the remaining cylinder, till its sides were about $\frac{1}{5}$th of an inch distant. He then placed between these two surfaces a small plate of zinc, which did not touch either side of the thimble. With a platinum wire about $\frac{1}{40}$th of an inch long, and $\frac{1}{3000}$th of an inch in diameter, he united externally the plate of zinc with this thimble; and when this little galvanic couple was immersed in acidulated water, the platinum wire became red-hot, and was melted! This important result led Dr Wollaston to the valuable conclusion, that in order to obtain powerful calorific effects, we must increase the surface of the copper or negative metal.

Brandes.

In repeating the experiments of Davy on the light developed by charcoal points, M. Brandes discovered that this light, like that of the sun, affected the combination of chlorine and hydrogen, and the decomposition of muriate of silver and other bodies.

Hare.

By means of the powerful voltaic battery which Dr Hare calls a *deflagrator*, and which we have already described, this able chemist obtained some splendid results. A brilliant light, equal to that of the sun, was produced between charcoal points; and plumbago and charcoal were fused by Professors Silliman and Griscom. By a series of 250, baryta was deflagrated; and a platina wire, $\frac{3}{16}$ths of an inch in thickness, "was made to flow like water." In the experiments with charcoal, the charcoal on the copper side had no appearance of fusion, but a crater-shaped cavity was formed within it, indicating that the charcoal was volatilised at this side, and transferred to the other, where it was condensed

Fusion of charcoal.

[1] *Elemens de Phys. Exp.*, ed. 3, tome i. p. 631.

[2] See *Phil. Trans.* 1815.

Voltaic Electricity.

and fused, the piece of charcoal at this pile being elongated considerably. This fused charcoal was four times denser than before fusion.

Fusion of charcoal.

Owing to its superior conducting power, a continued voltaic current will maintain in a state of incandescence a greater length of silver wire than of platinum or iron; but if we form a wire of short pieces of silver and platinum wire alternately, the platinum portion will become red-hot, while the silver ones remain cold. In this case, the current which passes readily along the silver wire, encounters the degree of obstruction in the platinum which produces the red heat. This fact is no doubt connected with the very remarkable

Peltier.

one observed by M. Peltier, in the passage of weak currents through metallic circuits, where *cold* was produced at the points of junction of certain crystallizable metals.

Oersted.

In his experiments with liquids, Oersted found that the elevation of temperature was 36°·9 at the positive pile, 32°·4 at the negative pile, and 41°·4 in the middle. This curious

Delarive.

result was obtained also by M. Delarive, who, at the same time, observed that the heat in the interior of a liquid placed in the circuit was increased by dividing it into several compartments by diaphragms of bladder or gold-beater's skin, that it was higher in the middle compartment, and that in each compartment it was 4° higher close to the diaphragm than elsewhere. A current passing through a liquid column in a glass tube produces a temperature which is stationary, while the same current passing through a skein of cotton of the same length and diameter produces a temperature which rises considerably, owing to the cells of the copper in which the liquid lodges.

Liquids, like solids, which are the worst conductors, are the most heated by electrical currents, a result arising from the resistance which the current experiences.

The laws which regulate the calorific effects by static

Sir W. Harris.

electricity, have been studied by Sir W. Snow Harris and

M. Reiss.

M. Riess. The results obtained by Sir William have been given in our article ELECTRICITY. Those of Riess, more recently made, are represented by the following general law:—

"The elevation of temperature T of the normal section of a homogeneous wire inserted in the circuit of a battery is inversely as the fourth power of its radius r, and directly as the quantity q of electricity accumulated, divided by z, the time of the discharge, that is—

$$T = \frac{a}{r^4} \times \frac{q}{z},$$

a being a constant quantity depending on the nature of the wire.

The production of heat by the continuous currents of dynamic electricity depends, as Delarive observes, upon the construction of the apparatus, whereas, in statical electricity it depends only on the conductor that forms the arc for joining over the battery, and the extent of its surface. With a voltaic pile, the apparatus forms a part of the circuit traversed by the current, as well as the wire that is heated, and all the conductors by which these wires are connected with the poles, whilst with a Leyden battery the case is different. Another difference, continues Delarive, which renders all comparison difficult, is, that the discharge must be instantaneous, whilst the current has a certain duration, so that the slow escape of the same quantity of electricity does not produce the same calorific effect as when this electricity, instead of coming from a pile, is derived from an electrical machine, or a Leyden battery. Notwithstanding these differences, some of the laws which regulate the calorific phenomena of a continuous current are the same as those obtained in electrical discharges.

According to the experiments of Joule, Lenz, and Becquerel, the caloric liberated by a current of voltaic electricity propagated in a given time along a metallic conductor, is proportional to the resistance of the conductor multiplied by the square of the electric intensity or the force of the current. Voltaic Electricity.

Another law, established by Peltier and confirmed by Becquerel is, that whatever be the length of a conducting wire, if it transmit the same quantity of electricity in the same time, the temperature of each of its points is the same.

A series of valuable experiments were made by Dr Robinson of Armagh,[1] to ascertain the influence which the heating of the wire has upon its resistance to the electric current. The result of these is, that when a wire is heated by a voltaic current, its resistance to the passage of the current gradually increases till the wire is fused, and that this increase is exactly proportional to the temperature. Dr Robinson found also, that the true law of the heating of a wire by a current was, that the heat liberated is proportional to the square of the intensity of the current and to the *actual* resistance of the wire, namely, the resistance arising from its heating. Dr Robinson's experiments.

The influence of the gaseous medium on the heat liberated by a wire transmitting a voltaic current has been studied by Mr Grove. It was well known that a platinum wire becomes red-hot more easily in vacuo than in air; but Mr Grove obtained the following results, or the number of degrees to which water becomes heated by surrounding the platinum wire successively with different gases:— Mr Grove's experiment.

Hydrogen	10°	Oxide of carbon	19°·8
Sulphuretted hydrogen	10·8	Oxygen	21
Olifiant gas	16·5	Nitrogen	21·6
Carbonic acid	19·8		

While in static electricity, we have the interesting phenomenon of the *electric spark*, already discussed in the article ELECTRICITY, we have in voltaic electricity the no less interesting phenomenon of the *voltaic arch*, which was discovered by Davy. It is represented at $a\,b$, in the annexed figure, as produced between two charcoal points The voltaic arch. Davy.

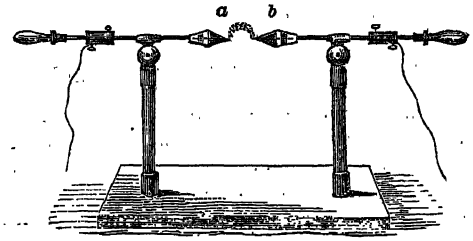


Fig. 54.

4 inches distant, transmitting a current from 2000 pairs of zinc and copper, having each a surface of 32 square inches charged with acidulated water. It has the form of an arc convex above, and when the most refractory substances were placed in it, they became incandescent, and disappeared as if by evaporation. When one of the points, a, was charcoal and the other, b, plumbago, the particles of charcoal were transferred in the state of vapour to the plumbago, from the positive to the negative pole, and by interchanging the poles the plumbago was transported to the positive pole, as first shown by Dr Hare.

The appearance and length of the arc varies with the nature of the *electrodes* or points a, b, between which it appears. Mr Grove found that the longest and most brilliant arc, when shown in air, was produced when the electrodes were potassium, sodium, zinc, mercury, iron, tin, lead, antimony, bismuth, copper, silver, gold, and platinum, the first giving the largest and brightest arc, and the rest as in their order. Mr Grove also observed, that in vacuo the transported matter was in the state of metallic powder when the medium was hydrogen, nitrogen, or a vacuum, and an oxide in air or in oxygen. Hare. Grove.

[1] *Irish Trans.* vol. xxii. p. 3.

Voltaic Electricity.

Many interesting phenomena have been observed, in reference to the voltaic arc of the transportation of the molecules of the electrodes, by Von Breda, Delarive, Grove, Gassiot, Matteucci, and Tyrtow. Von Breda found, that in the case of an electrical discharge, there was an emanation of particles from both poles, though more powerfully from the negative. In the case of a thick and insulated plate of iron placed in vacuo between two copper balls as electrodes, the negative ball gained 4½ grains of iron from the plate, and the positive only 1 grain.

M. Delarive has given the following summary of the leading facts respecting the effects of dynamic electricity:—

"1. That the production of electric heat and light cannot take place without the establishment of a closed circuit, all the parts of which exercise the same exterior electrodynamic action, conformably with Ohm's laws.

"2. That this production of electric heat and light cannot take place without the establishment of a closed circuit, all the parts of which exercise the same exterior electrodynamic action, conformably with Ohm's laws.

"3. That this production takes place in the points of the circuit where the electricity in motion (whether discharge or current) experiences the greatest resistance.

"4. That the parts of the conductors which limit the portions of the circuit where the resistance is greatest, and where, consequently, the heat and light arise, undergo calorific, luminous, and molecular modifications, which depend at the same time upon their proper nature, and upon that of the electricity (positive or negative) of which they are the electrodes.

"5. That these modifications seem to indicate, that the movement of rotation of the particles, whose acceleration, produced by the transmission of electricity, is the probable cause of electric light and heat, is influenced either by the nature itself of the substances, or by the direction of the discharge or of the current, which determines, in the case of the spark and of the arc, a movement of transmission over and above that of rotation."[1]

Sect. V.—*On the Chemical Effects of Voltaic Electricity.*

Chemical effects of voltaic electricity.

In a preceding article we have given a full account of the general chemical effects of *ordinary electricity*. We shall therefore confine ourselves at present to the chemical effects of the voltaic pile. No sooner was this apparatus made known in England, than Messrs Nicholson and Carlisle applied it to chemical inquiries. Although Volta had inferred from the shock, that the action of the pile was electrical, yet it was to the above inquirers that we are indebted for determining by means of the revolving doubler, that the *silver* end of the battery was in a *negative*, and the *zinc* end in a positive state of electricity. In the course of their experiments, they observed a disengagement of gas, which smelt of hydrogen, from water which happened to be in the circuit; and on the 2d of May 1800, they discovered that water was decomposed into its elements, viz., oxygen and hydrogen, when the water formed part of the circuit between the positive and negative ends of the pile. Mr Cruickshanks of Woolwich confirmed this result, and found that *hydrogen* was always emitted from the *silver* or *copper* end of the pile, and *oxygen* from the other. He discovered also the important fact, that metals could be revived from their solutions, under the same circumstances, the reduced metal being deposited at the end of the wire; and he succeeded in decomposing some of the neutral salts. Dr Henry decomposed the nitric and sulphuric acids and ammonia; and he reduced the oxymuriatic to the state of muriatic acid.

Nicholson and Carlisle.

Decomposition of water.

Cruickshanks.

Henry.

The attention of our illustrious countryman, Sir H. Davy, was about this time attracted to the subject. So early as 1802, he had made experiments on the chemical agency of the pile; but in 1806, in his first Bakerian Lecture, he was led to the conclusion, *that chemical attraction and repulsion were produced by the same cause, acting in the one case on particles, in the other on masses, and that the same property, under different circumstances, was the cause of all the phenomena exhibited by different voltaic combinations.* In October 1807, he decomposed potash and soda, and proved that they were oxides of two new metals, *potassium* and *sodium*. With a voltaic battery of 2000 plates, he decomposed several of the earths, and discovered their metallic bases, *barium, strontium, calcium*, and *magnesium*. In attempting to decompose the proper earths, he was less successful. He succeeded in proving, however, that they consist of bases united to oxygen, but the completion of the inquiry was left to Wohler, Bussy, and Berzelius, who found that all the bases of these earths, except silica, were metallic, and capable of uniting with iron.[2]

Voltaic Electricity.

Davy.

Our narrow limits will not permit us to give an account of the successive labours of different philosophers, in effecting decompositions by the voltaic battery. We shall content ourselves with giving a brief account of the researches of our distinguished countryman, Dr Faraday, to whom this branch of science owes its greatest acquisitions.

The phenomena of electro-chemical decompositions have been generally ascribed to two opposite powers, residing in the two poles of the voltaic battery. Grotthus[3] regards the pile as an electric magnet with *attracting* and *repelling* poles, the one attracting hydrogen and repelling oxygen, and the other attracting oxygen and repelling hydrogen. The force exerted upon each molecule of the body is supposed to be inversely as its distance from the poles, and a succession of decompositions and recompositions is supposed to exist among the intervening molecules. Sir H. Davy. Davy adopts the idea of attractions at the poles, diminishing to the middle or neutral points, and he thinks a succession of decompositions and recompositions probable. Messrs Riffault and Champre regard the *negative* current as collecting and carrying the acids on to the *positive* pole, and the *positive* current as doing the same, with the bases towards the *negative* pole. M. Biot attributes the effects to the opposite electrical states of the decomposing substances in the vicinity of the two poles. M. Delarive considers the portions decomposed to be those contiguous to both poles, the current from the *positive* pole combining with the hydrogen or the bases which are there present, and leaving the oxygen or acids at liberty, but carrying the substances in union with it across to the negative pole, where it is separated from them, entering the conducting metal, and leaving on its surface the hydrogen, or its bases. Dr Faraday regards the poles as exercising no specific action, but merely as surfaces or doors by which the electricity enters into or passes out of the substance undergoing decomposition. He supposes that "the effects are due to a modification of the electric current, and the chemical affinity of the particles through or by which that current is passing, giving them the power of acting more forcibly in one direction than in another, and consequently making them travel by a series of successive decompositions and recompositions in opposite directions, and finally causing their expulsion or exclusion at the boundaries of the body under decomposition in the direction of the current, and that in larger or smaller quantities, according as the current is more or less powerful."

Grotthus.

Riffault & Champre.

Biot.

Delarive.

Faraday.

In resolving a compound body into its elements, liquidity is an essential condition of the body. A plate of iron, the

[1] Delarive's *Electricity*, vol. ii. p. 333.

[2] See our articles CHEMISTRY and DAVY for a full account of Sir Humphry Davy's electro-chemical researches.

[3] *Ann. de Chim.* 1806, tome lviii. p. 61.

Voltaic Electricity.

sixteenth of an inch thick, placed between the two sides of the pile, will stop completely the most powerful electrical current.

When the elements of a body are separated by electric action, the current communicates to each a definite direction, the oxygen travelling towards the zinc, and the hydrogen towards the platina pole.

Faraday's researches.

By an irresistible body of evidence, Dr Faraday has established the important proposition, "that the chemical power of a current of electricity is in direct proportion to the absolute quantity which passes;" and this is true of all bodies capable of electro-chemical decomposition.

The same eminent philosopher has also deduced, from a variety of facts, the following conclusion, "that the quantity of electricity, which, being naturally associated with the particles of matter, gives them their combining power, is able, when thrown into a current, to separate these particles from their state of combination; or, in other words, that *the electricity which decomposes, and that which is evolved by the decomposition of a certain quantity of matter, are alike.*" According to this theory, "the equivalent weights of bodies are simply those quantities of them which contain equal quantities of electricity, or have naturally equal electric powers, it being the *electricity* which determines the equivalent number, because it determines the combining force; or if we adopt the atomic theory or phraseology, then the atoms of bodies which are equivalents to each other in their ordinary chemical action, have equal quantities of electricity naturally associated with them."

Decomposable bodies.

When exposed to the voltaic current, bodies are decomposed with different degrees of facility. Dr Faraday found by experiment, that the following bodies were decomposed with currents of different intensities, those at the top of the list being decomposed by currents of lowest intensity.

Iodide of potassium (solution).	Iodide of lead (fused).
Chloride of silver (fused).	Muriatic acid (solution).
Proto-chloride of tin (fused).	Water acidulated with sulphuric acid.
Chloride of lead (fused).	

All compound bodies are not decomposable by electric currents. The following bodies are not decomposed under ordinary circumstances:—

Chlorides of sulphur, phosphorus, and carbon.	Boracic acid.
	Iodide of sulphur.

The following bodies are not decomposed:—

Chloride of antimony.	Periodide of mercury.
Hydro-carbon.	Ammonia.
Acetic acid.	

All solid non-conductors which become conductors when liquefied by heat, with the exception of *periodide of mercury*, are decomposed.

Mr Faraday is of opinion that all *binary compounds*, one of whose elements goes to the *negative*, and the other to the *positive* pole, are decomposable, but not ternary compounds.

Indecomposable bodies.

The following bodies, being non-conductors of electricity, are not decomposed by it:—

Sulphuric acid.	Nitric acid.
Phosphoric acid.	Chloride of sulphur.
Arsenic acid.	Proto-chloride of phosphorus.
Hyponitrous acid.	Proto-chloride of carbon.

The perchlorides of mercury and of antimony, being conductors when liquid, are decomposable; but periodide of mercury, though a conductor when liquid, is not decomposable.

The following bodies are not decomposable by voltaic electricity:—

Nitre.	Tartaric acid.
Nitrate of ammonia.	Tartrates.
Sulphurous acid.	Benzoides.
Hydrofluoric acid.	Sugar.
Fluorides.	Gum.
Acetates.	

Voltaic Electricity.

Indecomposable bodies.

The following table contains a list of the elementary constituents of decomposable bodies, with their electro-chemical equivalents:[1]—

Constituents of decomposable bodies.

Elements which go to the POSITIVE *Pole.*

Oxygen..... 8	Selenic acid.....64	Tartaric acid.....66
Chlorine..... 35·5	Nitric acid 54	Citric acid.....58
Iodine.....126	Chloric acid.....75·5	Oxalic acid.....36
Bromine ..... 78·3	Phosphoric acid..35·7	Sulphur?.....16
Fluorine..... 18·7	Carbonic acid....22	Selenium?
Cyanogen 26	Boracic acid.....24	Sulpho-cyanogen.
Sulphuric acid.. 40	Acetic acid.....51	

Elements which go to the NEGATIVE *Pole.*

Hydrogen..... 1	Baryta ..... 76·7	Platina..... 96·6?
Potassium.....39·2	Strontia ..... 51·8	Gold?
Sodium.....23·3	Lime..... 28·5	
Lithium.....10	Magnesia ..... 20·7	Ammonia..... 17
Barium.....68·7	Calcium ..... 20·5	Potassia ..... 47·2
Strontium .....43·8	Magnesium..... 12·7	Alumina?
Copper.....31·6	Manganese..... 27·7	Protoxides generally.
Cadmium.....55·8	Zinc..... 32·5	
Cerium.....46	Tin ..... 57·7	Quinia.....171·6
Cobalt .....29·5	Lead .....103·5	Cinchona.....160
Nickel .....29·5	Iron..... 28	Morphia. 290
Antimony.....64·6	Bismuth 71	Vegeto-alkalies generally.
Soda .....31·3	Mercury 200	
Lithia.....18	Silver.....108	

The laws of electro-chemical decomposition have been more recently studied and extended by Daniell, Matteucci, Becquerel, and Miller, and apparent exceptions to them have been removed by the researches of Kitsorff, Beetz, Almeida, and Ruff; so that the law of chemical equivalents has been confirmed within the limits of errors of observation.

Influence of the electrodes.

The influence of the electrodes on chemical decomposition has been the subject of careful research by Delarive, Fechner, Boggendorff, Vorsellmaun, De Peer, Leny, Jacobi, Meidinger, Despretz, Grove, and others, of which a full account has been given by Delarive.[2] It follows from these researches that the chemical affinity of the substance of the electrode for one or other of the elements of the electrolyte, facilitate its decomposition and the passage of the current,—a property which Becquerel has successfully applied to the production of various compounds arising from the combination of the electrodes with one of the elements liberated by the current,—compounds obtained by using only small electric force, such as that of a single pair.

Movements in electrolytic liquids.

Nobili.

Very remarkable movements, especially in mercury, have been observed in electrolytic liquids during the passage of the current, and have been studied by Davy, Serullas, Herschel, Nobili, Porret, and Wiedemann. The process of Nobili consists in plunging a drop of mercury into a bottle of sulphuric acid, and touching it at the edges with the extremity of an iron wire, or any other easily oxidisable metal. The drop immediately contracts, and ceases to touch the iron; then, resuming its natural form, it comes anew to meet the iron point, to contract, and again to expand; thus continuing an alternate motion of contraction and dilatation so long as the voltaic action of the three elements of the pair continues, namely, mercury, iron, acid.

Porret.

From the experiments of Porret, it follows that a liquid traversed by an electric current travels from the positive to the negative pole, provided that it presents a certain resistance to the passage of the current; and Wiedemann found

[1] Faraday's *Experimental Researches*, p. 247, § 846.

[2] *Electricity*, vol. ii. part iv. chap. iv.; vol. ii. pp. 394–424.

Voltaic Electricity.

that the quantities transported in equal times were proportional to the intensities of the current. When a liquid is transported through a porous partition, the force of transport, according to Wiedemann, is measured by a hydrostatic pressure directly proportional to the intensity of the current, to the electric resistance of the liquid, and to the thickness of the partition, and inversely proportional to the surface of the partition.

Graham.

Mr Graham considers ordinary endosmose as produced by the electricity of chemical action.[1]

Combination of gases by metals.

Faraday.

In the course of his electrical researches, Dr Faraday[2] discovered the very remarkable fact, that metals and other bodies had the power of promoting the combination of gaseous bodies. When a plate of clean platinum was put into a mixture of oxygen and hydrogen gas, the two gases gradually disappeared, in consequence of having united and formed water. When the platinum plate was made very clean, by placing it in sulphuric acid, it acted with such energy on the gases, that the tube became warm, the platina became red-hot, and the residue of the gases was inflamed. A solution of tartaric or acetic acids gave the platinum plate the power of producing explosion in the mixed gases, but strong sulphuric acid was most certain and powerful. *Gold* and *palladium*, when acted on by hot oil of vitriol, possess also the power of combining oxygen and hydrogen.

Dobereiner.

Instantaneous light apparatus.

Dobereiner had previously discovered the remarkable property possessed by platinum, which, in the state of a fine black powder, or spongy, became hot, and ignited a jet of hydrogen. This is the well-known instantaneous light apparatus. The following is the theory of these remarkable facts:—The particles of hydrogen repel each other, so do those of oxygen; but the strong adhesion of the gaseous particles to the platina suspends, as it were, upon its surface the above repulsive forces, and brings the particles of oxygen and hydrogen within the influence of their mutual affinity.

Spongy platinum also decomposes ammonia and its salts, when mixed with atmospheric air, and passed over the metal at 572° of Fahr. Non-metallic bodies, such as pounded glass and charcoal, have, at 600° Fahr., the same property as platinum.

Sect. VI.—*On the Stratification in Electric Discharges.*

Stratification of electric light.

Davy.

When the voltaic arc is formed in a vacuum, by making the electric current pass through a globe or cylinder of glass, as in the experiment called the electric egg, Davy found that the arc was about 6 or 7 inches long, double of what it was in air, and fully as vivid. When the air in the globe is sufficiently rarefied, and the current passes between a crescent-shaped piece of metal, with a number of angular projections, and a circular segment of metal with corresponding projections, the interior of the globe is filled with a magnificent light, and like the *aurora borealis*, columns of fire dart from the projections of the one plate to those of the other.

Grove.

When Mr Grove made the electrical current, produced by Rhumkorff's inductive coil, pass through an exhausted receiver containing a small piece of phosphorus, the luminous discharge was striated throughout its course by transverse non-luminous bands. On subsequently repeating the experiment, he found "that the transverse bands can be produced in other gases, when very much attenuated, though they are more easily seen in the phosphorus vapour." When these bands are barely visible, he observed a well-defined dark space "intervening between the glow surrounding the negative, and the stream of light proceeding from the positive terminal." This dark space he regards as the same as the dark discharge described by Faraday, as produced by the electrical machine.[3]

Voltaic Electricity.

This stratification of the discharge was subsequently observed by Rhumkorff in the vapour of alcohol, and by Masson, Du Moncel, Quet, Seguin, Dr Robinson, and M. Gassiot, who has studied it with great care in the Torricellean vacuum. In Du Moncel's figures, the strata are concave towards the positive terminal, gradually becoming parallel towards the centre, and then concave to the negative, whereas, in Dr Robinson's figure, they are all positive towards the positive.

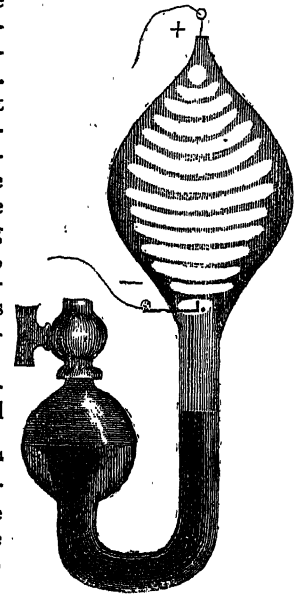


Fig. 55.

Gassiot.

The phenomenon of the stratified discharge, as produced in the Torricellian vacuum, and observed by M. Gassiot,[4] is shown in fig. 55, the upper wire being positive and the lower negative. When the mercury is allowed to rise, so as to cover the negative wire, the stratification disappears, and the interior of the globe is filled with bluish light. When four or five cells only are used to excite the coil instead of one or two, and the discharges are made sudden, the lower portion of the striæ were observed by M. Gassiot, as shown in fig. 56.



Fig. 56.

M.M. Quet and Seguin.

With the vacuum tubes constructed by M. Giesler of Bonn, the stratifications from the inductive discharge are most beautifully and strikingly exhibited.

M.M. Quet and Seguin[5] have found that the luminous strata are produced when the electricity of a Leyden phial, feebly charged, is transmitted through a Giesler tube. If the charge is powerful, an unstratified flow of light is produced by the first discharge, but subsequent ones more feeble fill the whole tube with stratified light. If the Giesler tube is turned into a condenser, by covering it with tinfoil, and if it is charged as a Leyden phial with ordinary electricity, the luminous strata will appear in the rarefied gas which the tube contains, where the tube is uncovered, and upon the armature of tin, when the second conductor communicates with the ground. The strata appear even if we replace the tin by the hand grasping the tube. The tube may be charged by the electrophorus.

If, when the stratification is produced by the inductive current, we grasp the tube with two fingers, so as to embrace it, or surround it with a sheet of tinfoil communicating with the ground, the brilliant strata separate from one another in front of the conductor on the side of the positive pole, and there is formed on the side of the conductor a large obscure stratum. With a feeble pile, and by supporting the hammer, this stratum may have a length of nearly $2\frac{1}{2}$ inches. When the tinfoil or the fingers are moved to the positive pole, the strata in front of them enter into one another, while they seem to emerge from one another, if these conductors are moved towards the positive

[1] See Delarive's *Electricity*, id. ed. chap. iv. pp. 424–443.
[2] Id. id. p. 195, § 564, &c.
[3] *Phil. Trans.* 1852, or *Phil. Mag.* Dec. 1852, Suppl. p. 514.
[4] *Phil. Trans.* 1858, p. 7.
[5] *Comptes Rendus*, &c., Dec. 15, 1858, tome xlvii. p. 964.

Voltaic Electricity.

pole. In these experiments the conductors—viz., the hand and the tinfoil—are electrified by influence.

Stratification of electric light.

The influence of a magnet upon the voltaic arc and upon the luminous strata is very remarkable. Arago, after the discovery of electro-magnetism, suspected this influence, but Davy proved it on an arc from 1 to 4 inches long. A powerful magnet attracted or repelled with a rotatory movement the arc or luminous column, according to the position of the pole of the magnet and the direction of the current. An electro-magnet acted more energetically; and Daniell observed that the effect was sometimes so great as to extinguish the flame. In 1858, Mr Grove[1] found that in a vacuum tube, 2 feet 9 inches long, he could stop the discharge in a Rhumkorff's coil by bringing a magnet near the positive terminal wire, while no effect was produced when the magnet approached the negative; but M. Gassiot has not been able to produce this effect in any of his vacuum tubes by the induction coil, however much he reduced the intensity of the discharge or varied that of the electro-magnet.

Grove.

Gassiot.

He succeeded, however, in obtaining a similar result by the use of his water-battery, after having carefully cleaned it and recharged it with rain-water. In an apparatus with two carbonic acid vacuum tubes containing potash, he found that the luminous discharge in both tubes, obtained with less than 1000 series, and also with the full series of 3520 cells, was, under certain conditions which he has described, *entirely destroyed or interrupted by the power of the magnet.*[2]

The cause of the stratifications of electric light has not been satisfactorily established. Mr Grove supposed that they might be owing to interference. M. Gassiot thinks, that the stratifications in the positive discharge do not arise from interference, but from a succession of impulses or pulsations, from the force meeting a resisting medium; but "he ventures to assume, that the dark discharge between the positive and the negative arises from interference."

Sect. VII.—*On the Vibratory Movements and Sounds produced by Electric Currents.*

Sounds of electric currents.

So early as 1785, the Canon Gottoin of Como, a friend of Volta's, observed, that an iron wire 30 feet long, when stretched in the open air, emitted a sound in certain states of the atmosphere. Page, Delezenne, Gassiot, and Marrianini, observed sounds from electric currents under different circumstances; but it is to Delarive that we owe the most interesting experiments on the subject. When a magnetic but unmagnetised body, such as iron or steel, is placed in the interior of a bobbin, very remarkable rotatory movements are produced by discontinuous currents passing through the wire which encircles the bobbin. Two sounds are always distinguished, one a series of blows or shocks, like the noise of rain falling on a metal roof, and the other musical. A mass of iron 4 inches in diameter, and weighing 22 lb., placed within a large tube, gave out a very clear and brilliant musical sound; but the most brilliant of all are those obtained by stretching on a sounding-board well annealed wires from 3 to 6 feet long, and $\frac{1}{16}$th of an inch in diameter. From these and the fine experiments of Wertheim it follows,—"that magnetisation in the passage of the electric current produces a molecular derangement in magnetic bodies, and that the sounds arise from the oscillations of the particles of bodies round their positions of equilibrium, under the influence of currents, whether exterior or transmitted."

Delarive.

Wertheim.

Sounds of a different kind have been observed by Quet and Delarive, during the action of magnetism upon the voltaic arc. With a vertical voltaic arc, which Quet formed between the two vertical polar faces of an electro-magnet, he saw it transform itself into a horizontal dart, like the flame made by a blowpipe, and the formation of the dart was attended by a peculiar whizzing, which lasts as long as the dart, and which is changed into a very powerful detonation when the dart ceases. Delarive supposes that the hissing is due to the transport of the matter of the positive electrode more or less liquefied; and that the detonations arise from the tearing off of these same particles, when the substance which is disaggregated is not highly heated. But what is very extraordinary, he adds, is, that the hissing and detonations take place only when the arc is under the action of the magnet.

Voltaic Electricity.

Delarive.

A remarkable vibratory motion produced by electricity was observed by Mr Fearn of Birmingham, in his electro-gilding establishment. When a brass tube 4 feet long and $\frac{1}{2}$ an inch in diameter was placed upon, and at right angles to, two horizontal and parallel brass tubes 9 feet long and an inch in diameter, and the latter connected with a strong voltaic battery of from two to twenty pair of large zinc and carbon elements, the transverse tube immediately began to vibrate, and finally to roll upon the other two.

Fearn.

Mr G. Gore, who repeated the experiment under various circumstances, found that when the resistance was small and uniform, the rolling tube continued to move in the same direction imparted to it; but that when the resistances were not uniform, it continued to roll backwards and forwards as long as the electric current was passing.

Gore.

In order to obtain a continuous rolling motion, Mr Gore constructed the apparatus in fig. 57, where A is a circular

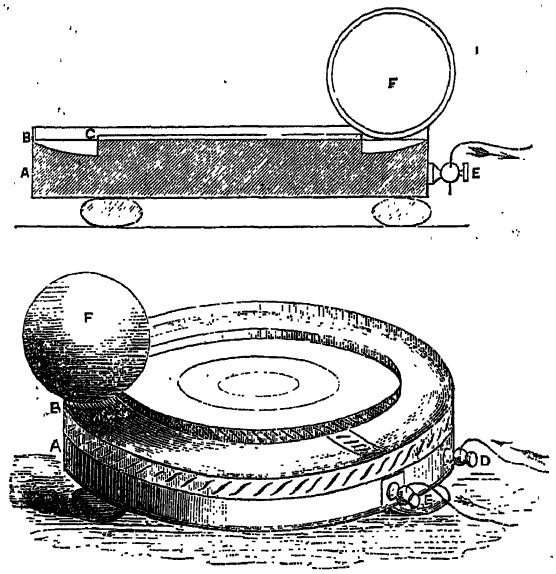


Fig. 57.

base of wood provided with two brass rails or hoops, B and C, about $\frac{1}{16}$th of an inch thick, the outer one being $\frac{1}{4}$th of an inch higher than the other, and both being uniform and equidistant. F is a perfectly round thin copper ball, hollow, equally thick, and weighing about 500 grains.

When the circular base, EA, is made level, the ball F placed upon the rails, and a voltaic current, copious in quantity and moderate in intensity, introduced at the screws D and E, the ball will immediately begin to vibrate, and increase its motions till it revolves upon the rails. It revolves with equal facility in either direction as long as the current is passing, and it becomes much heated during its motion. With three zinc and carbon batteries, the zinc cylinders being 6 inches high and $3\frac{1}{2}$ wide, and strongly charged with dilute sulphuric and strong nitric acids, the ball was propelled at the rate of sixteen revolutions per minute.

[1] *Phil. Mag.* 1858, vol. xvi. p. 18.

[2] *Proceedings of the Royal Society*, vol. x. p. 269.

Voltaic Electricity. Gore.

"In all cases yet observed," says Mr Gore, "the motion has been attended by a peculiar crackling sound at the surfaces of contact, and by the heating of the rolling metal; and in experiments on a large scale with thick tubes, strong vibrations, accompanied by the emission of musical sounds, were observed similar in a moderate degree to Trevelyan's experiment with heated metals. In a dark place, sparks appeared occasionally at the points of contact." He considers "the cause of the motion to be an intermittent thermic action taking place at the surfaces of contact, at a point a minute distance behind the centre of gravity of the rolling metal."[1]

Trevelyan.

Mr Trevelyan's experiment here referred to consists in placing a heated bar of iron with one end on a solid block of lead. The bar in cooling vibrates considerably, and produces sounds similar to those of an Æolian harp.[2] Professor Forbes[3] referred this class of vibrations to "a repulsive action exercised in the transmission of heat from one body into another, which has a less power of conducting it;" but having been led by Mr Gore's paper to repeat the experiment, by passing an electric current through the hot and cold metal, he found that energetic vibrations took place like those in the ordinary form of the experiment. The vibrations took place whatever was the direction of the electric current, and between metals of the same kind, as well as heterogeneous metals. When a brass bar vibrating on cold lead was heated, and electricity applied as before, the effects are superadded to one another whichever way the current passes, and if there is a musical note it becomes grave. The effect from electricity he considers to be due to the repulsive action of the electricity in passing from the one metal to the other, which he regards as a confirmation of his explanation of the calorific vibrations. In extending his experiments, he found that carbon resting upon brass gave very energetic vibrations, and that bismuth is not merely inactive as a vibrator, but during the passage of electricity through it has a *quelling* power, which brings the vibrating bar to instantaneous rest.[4]

SECT. VIII.—*On Electro-chemical Decompositions by weak Electric Currents.*

Effects of weak electric currents.

The precipitation of metals from their solutions, by the presence of other metals, has been long known. A plate of copper, for example, will throw down metallic silver from a solution of the nitrate. Ritter, Sylvester, and Bucholz found that these precipitations were owing to electric currents, and obtained some interesting results. It is to M. Becquerel, however, a distinguished member of the Institute of France, that we owe the successful investigation of this curious subject. In 1826, he found that, by very feeble electric forces, metals easily reducible were precipitated from their solutions by plates of the same metal as that held in solution. In 1827, he formed chlorides and iodides in the same way, and also double chlorides and double iodides. In 1829, he succeeded in forming sulphurets, iodides, and bromides by similar methods; and when the electric energy of the apparatus was exceedingly feeble and the decomposition slow, the sulphurets had time to assume a regular crystalline form, and he thus obtained crystals of almost all the metals. In a similar manner, he obtained distinct crystals of the metallic iodides.

Discoveries of M. Becquerel.

In 1830, M. Becquerel found that new compounds were formed during these processes, by the reaction of the oxide of the metal at the positive pole of a solution. By the reaction of two solutions, one of which was the sulpho-carbonate of potash, and the other the sulphate of copper, and by employing an arc of copper and lead, the copper plunging into the sulphate, and the lead into the sulpho-carbonate, he succeeded in depositing on the lead small octohedral crystals of sulphur, with rhomboidal faces, exactly similar to the natural crystals of this substance. In this manner, by a skilful combination of solutions and metallic arcs, and a profound knowledge of the reactions which arise from the contact of these different substances, he succeeded in obtaining, in a crystalline state, compounds which had never been procured under that form.

Voltaic Electricity. Discoveries of M. Becquerel.

M. Becquerel has been equally successful in reducing the bases of certain oxides, and in obtaining immediately from their solutions, in their metallic, and even crystallised state, iron, zirconium, glucium, and magnesium. In 1832, he also obtained crystals of metallic oxides, such as those of the anhydrous black oxide of copper, of the red oxide, of the protoxide and peroxide of lead, and the oxide of cobalt.

The same distinguished philosopher has employed the effects of weak electric forces to explain the process of cementation by which iron is converted into steel, by the combination of carbon with all the interior molecules of the iron; and that remarkable mineralogical process by which the elements of many rocks are transferred from within to without, and replaced by others without any disintegration. The process of cementation is the consequence of the opposite electric state of the carbon and the iron, which, with the aid of high temperature, produces electric currents that convey the atoms of carbon from molecule to molecule to the very interior of the iron. In like manner, pieces of iron, which have been buried in the metallic state, are almost wholly oxidated; and ancient copper medals have been found changed entirely into the protoxide of copper.

Phosphorescence.

By studying this class of phenomena, M. Becquerel has been led to an explanation of the phenomena of phosphorescence, which he ascribes to the recomposition of the natural electricities of each molecule, which have been separated by heat or some other cause. The restoration of phosphorescence to bodies that have lost this property, or that never possessed it, by repeated electrical discharges, as ascertained by Mr Pearsal, confirms the ingenious explanation of M. Becquerel.[5]

Mr Crosse's experiments.

Our countryman, Mr Andrew Crosse of Bromfield, by processes differing from those of Becquerel, arrived at similar results, not long after the publication of the discoveries of the French philosopher. There can be no doubt, however, that Mr Crosse was unacquainted with these discoveries, and that his results were entirely independent of them. By means of voltaic electricity, he obtained the following substances, namely, calcareous spar, arragonite, quartz, red oxide of copper, arseniate of copper, blue carbonate of copper, phosphate of copper, sulphuret of copper, carbonate of lead, sulphuret of silver, carbonate of zinc, chalcedony, oxide of tin, yellow oxide of lead, the sulphurets of antimony and zinc and iron, protoxide of iron, and crystals of sulphur.

SECT. IX.—*On the Coloured Rings formed on Polished Metallic Plates by Voltaic Currents.*

Nobili's experiments on metallic colours.

This new class of phenomena are remarkable from their beauty and singularity, as discovered by M. Nobili, and called by him *Electro-chemical appearances*. They may be produced by a small battery like that of Wollaston, with twelve elements of an inch square, in the manner shown in fig. 58. A small apparatus, not shown in the figure, is

Discoveries of M. Nobili.

[1] *Phil. Mag.* July 1858, Suppl. vol. xv. p. 519.
[2] *Edin. Trans.* vol. xii. p. 187.
[3] *Edin. Trans.* vol. xii. p. 459.
[4] *Proceedings of the Royal Society of Edinburgh*, Jan. 1859.
[5] See *Ann. de Chimie et de Phys.* tome xxxiv. p. 152; xxxv. 126; xlii. 225; xliii. 131; xlvii. 5, 13; xlviii. 337; lii. 181; liii. 105, 243. See also Becquerel's *Traité de l'Electricité*, &c. tom. iv. v.

Voltaic Electricity.

constructed so as to move up and down the pincers RS, which hold two pieces of large platinum wire PN, pointed at their extremity, the one communicating with the positive, and the other with the negative pole of the battery. A polished metallic plate AB, intended to receive the coloured rings, is placed horizontally in a saucer or plate which contains the fluid to be used, suppose a solution of sulphate of copper.

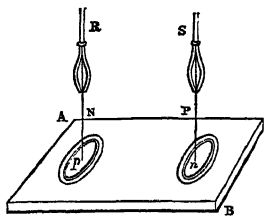


Fig. 58.

Rings from sulphate of copper.

When the solution of copper is poured into the saucer above the silver plate AB, and the point of one of the wires N brought as near as possible to *n*, while the other point *p* is plunged in the solution, there will be formed round the point *n*, *four* or *five* concentric circles, alternately bright and dark. When the point *p* is used, there will be formed round it *three* small circles of copper. The *two* extreme circles are of a deep red colour, and the middle one of a higher colour; sometimes *four* or *five* are formed, which alternate like the preceding.

Acetate of lead.

When a solution of *acetate of lead* is used, and the plate of gold or silver is positive, while the point is negative, the concentric rings are as brilliant as the coloured rings of Newton. When we increase the number of negative points, there are formed as many systems as there are points of concentric wires or rings, which never cross each other, but which, when they meet, extend outwards so as to form only one exterior ring.

Acetate of copper.

The effects are the reverse with a solution of *acetate of copper*, that is, the concentric rings are formed only when the plates are negative, while positive plates exhibit nothing remarkable.

Urine.

When the fluid is *urine* and the plate silver and positive, several orders of very brilliant coloured rings are formed round a dark centre. M. Nobili has obtained very remarkable effects of colour by using different animal substances, such as milk, white and yoke of an egg, saliva, &c.; and vegetable substances, such as the juice of carrots, onions, parsley, grapes, apples, &c. Animal and vegetable substances yield colours more beautiful and brilliant than ordinary chemical solutions. The colours produced by the leaves of plants are more marked than those arising from the decomposition of the roots. In some chemical solutions the phenomena are equally beautiful on the positive as on the negative plate; but when the circles meet, the two figures experience, as it were, a sort of compression, and when the coloured rings are impressed only on one plate, they may be made to disappear, if not wholly, at least in part, by inverting the direction of the current.

M. Nobili has drawn the following conclusions from a great number of experiments:—1. Certain electro-negative substances possess the property, in some circumstances, of attaching themselves to the surface of some of the less oxidable metals, in layers so thin and regular as to exhibit, under an infinity of varied forms, the beautiful phenomena of coloured rings. 2. That when electro-negative substances do not deposit themselves in thin layers on polished metals, they attack their surface, not uniformly, but at regular intervals.

The most varied and remarkable appearances were obtained by M. Nobili when the polished metal was positive; but he succeeded in obtaining equally remarkable phenomena when the metal was negative, either by augmenting the force of the current, or by using compound solutions.

He took, for example, a mixture of acetate of copper and nitrate of potash, and upon a negative plate of silver he formed a series of concentric rings, the centre of which retained the metallic brilliancy. The two next circles were green, then came rings of white, red, and green, then a zone of copper of a fine red colour. This zone was surrounded with a blue circle, marked with radiating lines, like a graduated circumference, its rays extending even to the circle of copper; then came a second copper zone, wider than the first, but equally brilliant, surrounded with a circle of beautiful green, which terminated the figure. The same appearances were obtained on gold and platina.[1] Voltaic Electricity.

Becquerel's process.

The following interesting process has been given by Becquerel for producing tints as vivid as those of Nobili's thin plates, by covering metallic surfaces with a deposit of peroxide of lead. The object, *a b* (fig. 59) to be coloured is attached to the positive pole of a Bunsen's battery of 2 or 3 pair, and plunged into the vessel AB, containing peroxide of lead dissolved in potash. The platina wire C, attached to the negative pole, is then moved about in the liquid at a certain distance from the plate. The peroxide is then deposited, presenting the successive colours of thin films. If the wire is near the middle of the plate, a series of vivid coloured rings, like those of Nobili, varying in thickness from the centre to their circumference, is formed. But if the wire is held a little higher above the plate, the coloured film is uniform, the tints being those of the transmitted tints in Newton's scale. The plate must then be well washed in water, to remove the potash. This is the process by which the hands and the heads of screws in watches are coloured.[2]

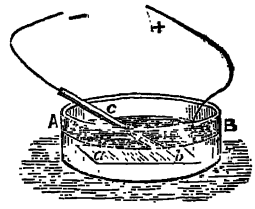


Fig. 59.

Becquerel.

Dubois Remond.

The production of electro-chemical appearances has been carefully studied by M. A. Becquerel, who thought that it was subject to a law analogous to that which governs the colour of thin plates. MM. Dubois Remond and Beetz have shown that the phenomenon was more complex, and depended on several circumstances connected with the laws of colour.

Grove.

Mr Grove has discovered electric appearances of different kinds produced by the action of Rhumkorff's induction currents upon gases. On the plate of a good air-pump he placed a silvered copper plate, with its polished silver surface uppermost (fig. 60). A receiver, with a rod passing through a collar of leather, is placed above the plate, and to the lower end of this rod is fixed a steel needle, which can be brought to any required distance from the silvered surface. Having placed in the receiver an atmosphere of air rarefied to about $\frac{1}{2}$ or $\frac{3}{4}$ths of an inch of mercury, and mixed with hydrogen and a little vapour of water, he placed the needle $\frac{1}{10}$th of an inch from the silvered surface, and saw formed upon the plate, when it was positive, a dark circular stain of oxide, presenting in succession *yellow*, *orange*, and *blue* tints. On reversing the poles, and making the plate negative, the spot was wholly removed. In rarefied air without any hydrogen, oxidation took place whether the plates were positive or negative, but most rapidly when positive. In pure rarefied hydrogen and nitrogen, no oxidation took place. With needles of copper, silver, and platinum, and plates of bismuth, tin, zinc, or iron, similar effects were obtained.

Grove's experiments.

In order to study the formation of the spots, Mr Grove used an atmosphere, rarefied as before, consisting of one volume of oxygen with four of hydrogen. The plate was made positive, and the point of the steel needle was brought opposite different portions of the silver plate at distances of $\frac{1}{50}$th, $\frac{2}{50}$ths, $\frac{3}{50}$ths, $\frac{4}{50}$ths, and $\frac{5}{50}$ths of an inch; and the appearances thus obtained are shown at Nos. 1, 2, 3, 4, and 5.

[1] See *Ann. de Chim.* &c. tome xciv. p. 210, and Becquerel's *Traité*, &c. tome iii. pp. 274–287.

[2] See Delarive's *Electricity*, vol. iii. p. 562.

Voltaic Electricity.

The colour of the central spot was *yellow-green* in the centre, surrounded by a *blue-green*, then a clear ring of polished silver not oxidised, then another ring *crimson*, with

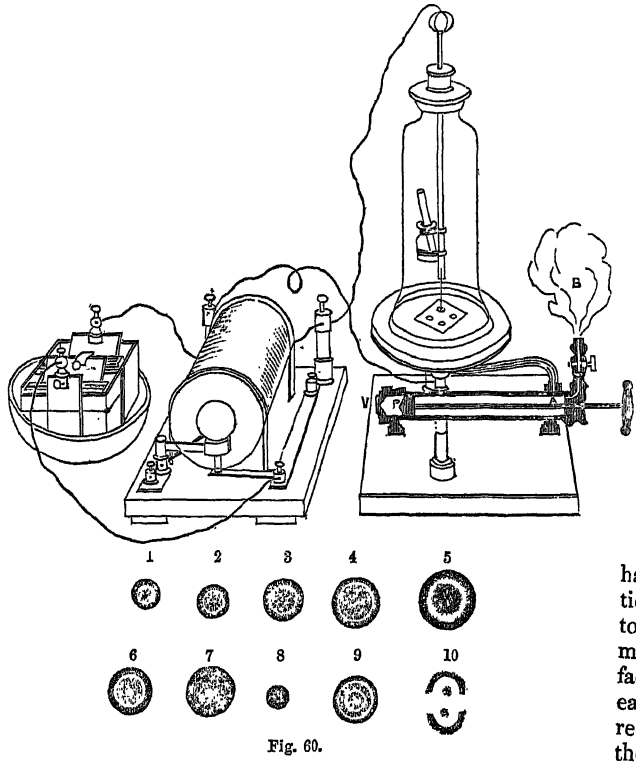


Fig. 60.

a slightly *orange* tint on its inner side, and *deep purple* on its outer. As shown in No. 6, a small polished speck was seen opposite the point of the needle. When a plate was negative, a similar speck was seen, as in No. 7, surrounded with a dark and badly defined aureola. The silver plate being positive, No. 8 was obtained from a platinum wire enclosed in a glass tube, and No. 9 from a steel needle. No. 10 was produced by a copper wire $\frac{1}{60}$th of an inch above the plate, and an adjoining platinum wire $\frac{1}{60}$th above the copper wire.

Mr Grove regards these phenomena as analogous to those of interference in light, as Nobili had previously supposed.[1]

Sect. X.—*On the Physiological Effects of Voltaic Electricity.*

Effects of galvanism on living animals.

The effect of voltaic electricity on animal bodies is analogous to that of ordinary electricity, a subject which we have already treated at considerable length.[2]

The galvanic shock is not conveyed through the skin of the human hand in the same manner as the electric shock. This arises from its low intensity, in consequence of which it can be transmitted only through good conductors. The best way is to grasp, with both hands wet, two silver spoons, or two metallic belts, and by means of them form a connection between the poles of the battery.

A luminous spark is produced by voltaic electricity, when the eye forms part of the circuit. This may be done by placing a piece of silver between the gums and the upper lip, and inserting a silver probe into the nostrils. If a piece of zinc is then laid upon the tongue, and the two metals brought into contact, the flash will be seen. This

Influence on the eye.

and other affections of the eye were observed by Ritter, who declares that when the positive pole was inserted in his eye he *saw objects darker and less*, and when the negative pole acted upon the eye, he saw the same objects *brighter and larger*. But according to Purkinje, the only difference is, that the *positive* pole excites less light than the negative pole. Purkinje also observed, that by the application of the positive pole to the eye, a *yellow* light was excited, while the *negative* pole excited a *violet* light, brighter and more abundant than the yellow. He also observed that the luminosity was excited principally at the base of the optic nerve, and at the *foramen centrale* of the retina. With the *positive* pole the base of the nerve exhibited a bright *violet* light, and the dark foramen was surrounded with a double rhomboidal limb of *yellow* light; but with the *negative* pole the base of the nerve was *black*, and the foramen was *violet*, and surrounded with a *violet* rhomboidal limb, at a little distance from the foramen. He noticed also, that when the voltaic circuit was broken, the preceding colours passed into their opposite or complimentary ones.

Voltaic Electricity.

If a living leech, or an earthworm, is placed upon a crown piece laid upon a piece of zinc of a larger size, it experiences no uneasiness while it touches the silver only; but when it stretches itself and touches the zinc, it instantly draws itself back as if it had received a shock.

Effects of galvanism after death.

The influence of voltaic electricity upon the muscles of animals after death is very remarkable. This subject has been recently investigated by Marianini, Nobili, Pelletier, and Becquerel; but our limits will not permit us to give even the shortest account of their labours.[3] We must content ourselves with mentioning a few interesting facts. If the negative and positive wires are inserted in the ears of an ox or sheep taken from the body of the animal recently killed, strong convulsive motions will be excited in the muscles of the face whenever the circle is completed, provided the battery have an hundred pair of plates. Life seems to be restored, and the animal to be under great suffering. The eyes open and shut, and roll in their sockets; the pupils dilate; the nostrils expand and vibrate; and the jaws move as in mastication. If a horse is subjected to powerful galvanic action, when recently killed, the struggles of its limbs can scarcely be restrained by several persons.

Dr Ure's experiments.

Similar experiments were made in Glasgow in 1811, by Dr Ure, on the body of a criminal after execution. He used a battery of 270 pair of four-inch plates. When the spinal marrow and sciatic nerve were made the points of communication with the positive and negative poles, the whole body shuddered as with cold. The left side was most powerfully convulsed; and upon moving one of the rods from the hip to the heel, the knee being previously bent, the leg was thrown out with such violence as nearly to knock over one of the assistants. By acting upon the nerves connected with the respiratory system, a laborious breathing instantly commenced, and the chest heaved and sunk. When a communication was made between the superorbital nerves and the heels, "most extraordinary grimaces," says Dr Ure, "were exhibited, by running the wire in my hand over the edges of the plates in the last trough, from the 220th to the 278th pair. Thus, fifty shocks, each greater than the preceding ones, were given in two seconds. Every muscle of his countenance was simultaneously thrown into fearful action. Rage, horror, despair, and anguish, and ghastly smiles, united their hideous expression in the murderer's face, surpassing far the wildest representations of a Fuseli or a Kean. At this period several of the spectators were obliged to leave the room from terror or sickness, and one gentleman fainted." The last experiment made by Dr Ure consisted in transmitting the voltaic current from the spinal marrow to the

[1] *Phil. Trans.* 1852, or *Phil. Mag.* Dec. 1852.

[2] See Electricity.

[3] See Becquerel's *Traité*, &c. tome iv. p. 211–255, for full and interesting details on this branch of the subject.

Voltaic Electricity.

ulnar nerve. "The fingers now moved nimbly, like those of a violin performer. An assistant who tried to close the fist, found the hand to open forcibly in spite of his efforts. When one rod was applied to a slight incision on the top of the fore finger, the fist being previously clenched, the fingers extended instantly; and from the convulsive agitation of the arm, he seemed to point to the different spectators, some of whom thought he had come to life." In these experiments the *positive* wire communicated with the *nerve*, and the *negative* with the *muscles*.

After having made a great many experiments upon the bodies of criminals that had been executed, Wassali, Julio, Rossi, and Fowler, believed that they had found a specific action of electricity upon the heart, and upon other muscles, such as those of the stomach and intestines.

Becquerel.

M. Becquerel mentions the effect produced by a pile of 100 plates upon the head of a person who had been guillotined. The two poles of the pile communicated with the two ears, wetted with salt water. The muscles of the face experienced the strongest contractions, and the action of the eyelids was extremely distinct. Aldini obtained analogous, though feebler effects, in experiments on a body after a natural death. Experiments of a similar kind have been made upon insects and fishes. M. Zanotti of Bologna, having killed a cigala (grasshopper), he placed it in contact with the two extremities of the pile, when it immediately moved, and emitted the sounds which are peculiar to it. M. Becquerel mentions also, that a fish whose head had been cut off half an hour before, struck the table with its tail when excited by the voltaic current, and its whole body leaped about the table.

Action of electricity upon plants.

The action of electricity upon vegetable bodies is extremely limited. Slight movements have been observed in the leaves and branches of the *Mimosa sensitiva* or the *Mimosa pudica*, when the electric current has been made to pass through them. A more remarkable effect has been observed by MM. Dutrochet and Becquerel, in the globules which circulate between every two knots of the *Chora*. Electricity produces a torpor in the motion of these globules, without disorganising the plant, as it recovers its natural power after a repose of greater or less duration. The circulation of the globules is accelerated by heat.

Therapeutic effects of electricity.

The therapeutic effects of electricity have been treated of at great length by Delarive,[1] in a long chapter deserving the special study of medical practitioners. He describes the various beautiful instruments which have been used by physiologists, especially the inductive apparatuses of Breton and Duchenne (first suggested by Masson), and the voltaic chain of Pulvermacher; and discusses the various cases of paralysis and other nervous affections in which they have been employed, and of other maladies in which they have been ineffective, or successful, or injurious.

In the treatment of tumors, whether lymphatic or glandular, and of aneurisms, electricity has been found useful; and when metals have been absorbed into the system, either as remedies, or when introduced in the arts and trades which require them to be employed, a current of voltaic electricity passed through the body has been found to carry along with it the metallic particles, and deposit them in the metal of the bath.[2]

Sect. XI.—*On the Application of Voltaic Electricity to the Arts.*

Application of voltaic electricity to the arts.

There is perhaps no science, not even excepting chemistry, which has made such donations to the fine and useful arts as voltaic electricity. Those which depend on galvanism are the art of protecting the copper sheathing of ships; the galvano-plastic art, or that of multiplying works of art in metals, electro-metallurgy, and the reduction of the metals, the electrotype, or the art of copying and multiplying engravings, and galvanic etchings. Voltaic Electricity.

1. *Protection of Copper Sheathing.* This art, invented by Sir H. Davy, has been already sufficiently described in our article Davy. Protection of copper sheathing.

2. *The Art of Multiplying Works of Art in Metal.* This beautiful art seems to have been invented about the same time by Mr Jacobi of St Petersburg, and Mr Spenser of Liverpool. Mr Jacobi, who announced his discovery in October 1831, called it the galvano-plastic process, and Mr Spenser had, previous to the knowledge of Mr Jacobi's labours, executed medals in copper, which were called electrotypes or voltatypes. Both Mr Jacobi and Mr Spenser had confined their invention to the deposition of copper upon metallic bodies; but Mr Murray announced in January 1840, that non-conducting substances, such as *plaster of Paris*, *wax*, *wood*, &c., might have metallic copper thrown down upon them by previously *metallising* their surface with black lead. Voltatype, or electrotype.

Method of copying medals.

The single cell apparatus for taking casts of coins and medals is shown in fig. 61, which consists of an outer vessel A, containing a saturated solution of sulphate of copper, and some undissolved crystals of the sulphate suspended near the upper surface of the fluid. The medal *m*, to be copied, is suspended in the copper solution. The inner vessel B, made of porous earthenware, contains the usual dilute acid, which acts upon a rod or plate of zinc Z, the upper end of which is connected with the bent wire *w* which suspends the medal *m*. When the medal has remained two or three hours in the copper solution, the copper will be found to have deposited itself on every part of its surface, so as to afford a perfect intaglio or *hollow* impression of the medal. If the surface of the medal or any part of it is greased, no copper will be deposited on the greased part. The obverse and reverse of the coin or medal being thus copied, and the two retained at their proper distance, the next step is to place them at *m* in the copper solution, and we obtain in the same manner a *raised* impression from the intaglio one, accurately resembling the original.

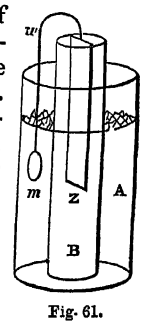


Fig. 61.

Instead of obtaining the intaglio cast directly in copper, it is thought best to take it either in fusible or type metal, or in some non-conducting substance, such as sealing wax, bees' wax, rosin, plaster of Paris, stearine, &c. When non-conducting substances are employed, those which are absorbent, such as plaster of Paris, must be prevented from absorbing the fluid, by rubbing the surface of the intaglio mould with tallow or spermaceti; they are then to be metallised by covering their surface with black lead.

When we wish to form gold and silver medals, a gold or silver surface is necessary, as non-conducting bodies are not well fitted for this branch of the art. For a gold medal, a strong nitro-muriatic solution of gold should be used, and the medal to be copied should, according to Mr Smee, be connected with the zinc end of a series of from four to twelve batteries. A very fine platinum wire, according to the same author, immersed in the solution to a trifling depth, must be united to the platinised silver of the battery, and the deposit of gold will then take place. For silver medals a solution of the nitrate, sulphate, or acetate, may be used. The solution should be weak at first, and then gradually increased. If we do not wish to have the whole medal of solid gold and silver, a thin layer

[1] *Electricity*, vol. iii. p. 585–704.

[2] Poey and Vergnès, *Bibl. Univers.* tome xxviii. p. 208.

Voltaic Electricity.

may be deposited, and the rest completed by copper. On the same principles medals of platinum or palladium may be formed from their solution. Great care must be taken to prevent bubbles of air from forming on the mould.

The difficulty of coining large medals gives great value to this art. Mr Smee mentions a very fine medal of Boulton, about four inches in diameter, which required no less than 300 blows to ensure a perfect impression. Seals, plaster casts, and various other works of art, may be copied in copper and other metals by the above process. When the galvano-plastic process is applied to the production of pieces of sculpture of great size, the co-operation of a founder is required to fabricate particular parts and unite the pieces. To do this the Duke of Leuchtenburg founded a great establishment at St Petersburg for reproducing colossal statues. Chef-d'œuvres, busts, full-length statues, and even statues 10 feet high, and numerous bas-reliefs, have been in this way produced, and many of them shown in the Universal Exhibition in Paris of 1855; but in consequence of the great expense incurred, the establishment has been abandoned.

Duke of Leuchtenburg's galvano-plastic establishment.

Multiplication of engraved copper plates.

3. *On the Multiplication of Engraved Copper Plates.* The difficulty of procuring good and pure copper plate for engraving has been entirely removed by this new art. A prepared copper plate with a good surface may have copper deposited upon it, so that the deposited plate has the same perfect surface, with the additional advantage of consisting of pure copper. It is advisable, however, to hammer and prepare with charcoal the deposited plate to give it elasticity, &c., and such plates have been found superior to all others for the purposes of engraving.

The method of copying *engraved* copper plates, of the most delicate execution is shown in fig. 62, where D is a vessel, a gallipot for example, about 8 inches high and 6 inches internal diameter. The dotted line, E E, is a copper cylinder 6½ inches high and 5 in diameter, and O O O is a porous cylinder, which may be made of brown paper when a quick action is wanted; but, in general, a thin unglazed gallipot is preferable. A cylinder of zinc, Z Z, as large as possible, is then placed within the porous cylinder without touching it, nearly at the distance of 1-8th of an inch. A perforated cover, S S, of earthenware, is made to rest either on the cylinder E E, or upon a rim in the gallipot about an inch from its top. The object of it is to hold crystals of sulphate of copper for keeping the solution in a state of saturation. Wires X, Y, are soldered to the cylinders of copper and zinc, and these are connected with the wires in the other vessel by a binding screw *s*, fig. 63, used by Mr Spencer, uniting the two wires M, N. The square cell, A B, contains the engraved plate, *b*, to be copied, and connected by the wire, *b* X, with the zinc cylinder of the battery; and *c b* is the plate to be oxydised and to be attached to the zinc cylinder of the battery. The secondary cell, or precipitating trough, which may be made of earthenware, wood, or glass, is filled with a saturated solution of sulphate of copper. In this way a reverse copy of the plate itself is obtained in relief, and from this copy, or relief, another copy

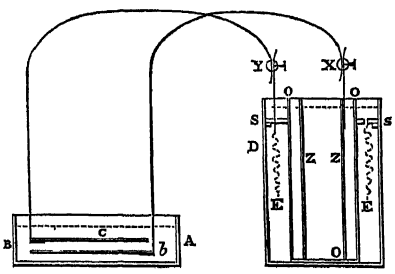


Fig. 62.

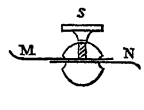


Fig. 63.

in intaglio is to be taken by the same method. It is considered preferable, however, to take a perfect mould from the engraved plate in white wax or plaster of Paris. When this mould is rubbed with black lead, an electrotype plate is then deposited upon it. In like manner steel plates may be copied by first taking moulds from them in lead, wax, or plaster. It is a curious fact, that the deposited plate is always superior to the engraved plate. Mr Palmer has succeeded in thus copying the works of our finest engravers. Mr Matheot of the United States prevents adherence between the plates by a solution of 1 grain of iodine in 20,000 grains of concentrated alcohol. He has thus succeeded in electrotyping *seven* times in succession, both in relief and in intaglio, the same engraved plate, without the least difference being perceptible between the original and the last electrotype of it. In this way he has reproduced the large charts of the coasts of the United States.

Voltaic Electricity.

Process of Mr Matheot for producing large plate.

Wood-cuts may be reproduced on copper by metallising the surface of the wood by plumbago.

The Duke of Leuchtenburg has obtained fine results in the reproduction of designs, by substituting for the printing ink a mixture of resin of Damara, red oxide of iron, and essence of turpentine, with which an impression is taken off on thin paper. While fresh the impression is applied upon a polished plate of copper or silver, so that the design touches the plate. When dried, the paper is removed by water, and a plate or intaglio is reproduced from it by the electrotype.

M. Robell's process.

M. Robell of Munich's process of galvanography depends on a similar principle. The drawing to be reproduced on copper is washed upon a plate of silvered copper with a colour not very thick, or the Damara mixture mentioned above. Upon this drawing a layer of copper is deposited by the galvanoplastic process, and a fine intaglio obtained.

Messrs Grove and Gassiot's process.

Messrs Grove and Gassiot have succeeded in transforming daguerrotype plates into engraved plates. These plates are so delicate that only a small number of impressions can be taken from them. The plate to be etched is to be made a positive electrode in an electrolyte of two volumes of hydrochloric acid and one of distilled water.[1]

M. Paul Pretsch's photo-galvanography.

Mr Paul Pretsch's photo-galvanographic process, or engraving by light and electricity, is one of great ingenuity and beauty, as may be seen in his interesting work entitled *Photographic Art Treasures*, of which several numbers have been published.[2]

For farther information on this subject, see Spencer's *Instructions for the Multiplication of Works of Art in Metals*, &c., in Griffin's *Miscellany*, Glasgow, 1840; *Jacobi's Die Galvanoplastik*, Petersburg, 1840; *Annales de Chimie et de Physique*, September 1840, tome lxxv. p. 24; Smee's *Elements of Electro-Metallurgy*, Lond. 1841; and Delarive's *Electricity*, vol. iii. part vii. chap. 2.

Voltaic etching.

4. *Voltaic Etching.* In this new art, which is fully described by Mr Smee, the copper plate having the design drawn upon the etching-ground, as in ordinary etching, and having its back and sides coated with wax, is connected, by means of a wire, with the silver plate of one of Mr Smee's batteries. "A piece of copper," says Mr Smee, "of the same size as the plate, should then be connected to the zinc, when both the copper plate and the piece of zinc are to be placed in a solution of sulphate of copper. Immediately copper will be reduced from the solution on the negative plate, and copper from the etching plate will be dissolved to keep up the strength of the solution. Whatever is favourable to the increase of electricity causes the copper to be more quickly acted upon, and whatever diminishes the galvanic current retards the solution of the

[1] *Phil. Mag.* Sept. 1841, vol. xix. p. 247.

[2] See *Photographic Journal*, vol. iii. p. 58.

Voltaic Electricity.

metal; so that the nearer the etching-plate, forming the positive pole, and the piece of copper, forming the negative, are approximated, the more rapid will be the action. In the same way the intensity of the battery also affects the rate at which the plate is bitten in. The negative plate of copper, however, should not exceed in size the copper plate on which the etching is executed, or else there is a risk of some of the lines being more deeply bitten in; and, in like manner, if any considerable part of the plate has a great deficiency of lines, compared with other parts, that part must be stopped out rather before the other, to ensure a uniformity of depth, or else the negative copper opposite the part must be so bent, that it is at a greater distance. The advantages of galvanism for etching are, the absence of poisonous nitrous fumes, which are evolved in the ordinary process; the greater uniformity of action which takes place than when acids are used, and that the rapidity of biting may be regulated to the greatest nicety. The lines may be made of any depth, and are sharper and clearer than when acid is used; and, lastly, no bubbles are evolved, which the engraver well knows are apt to tear up the ground, or to cause unequal action."[1]

Voltaic gilding and silver plating.

5. *Voltaic Gilding and Silver Plating.* We owe the art of gilding upon *silver* and *brass*, by electricity, to M. Delarive, who was led to it by witnessing the dreadful effects which are produced at Geneva by the use of mercury in gilding. Gold, platinum, palladium, silver, copper, and carbon, when their surfaces are smooth and chemically clean, and freed from adhering air, may be gilt by means of a feeble voltaic current which deposits the gold from a weak nitro-muriatic solution of that metal, and in this way a coating of any thickness can be obtained. By a similar process, metals may be platinated or palladinated by using the nitro-muriatic solution of these metals. Metals may, in like manner, be covered with nickel by means of its nitrate.

By similar means fruit, vegetables, leaves, seeds, may be coated with copper; and crystallised copper may be deposited on wicker-work, baskets, &c., after they are black-leaded, or upon articles of earthenware. Mr Smee has succeeded in coating copper with almost every other metal; but for an account of Delarive's and Mr Smee's processes we must refer to the *Bibliothèque Universelle*, April 1840; the *Comptes Rendus*, &c., 1840, No. 14, p. 578; to Delarive's *Electricity*, vol. iii. p. 545; and to the work of Mr Smee, already quoted, book iii.

Recent improvements by Elkington.

Since Delarive published his results in 1840, the art of electro-plating has become one of the most important of the industrial arts, through the great improvements introduced by Elkington in England, and Rudz in France. Mr Elkington began with gilding in the moist way without electricity; but on December 8, 1840, he took out a patent for his second process, in which he plunged the object to be gilt (as the negative electrode of a constant battery in which the positive was platinum) in a solution containing 482½ grains of gold converted into oxide, 7723 grains of common cyanide of potassium, and 244 cubic inches of water, all of which are boiled together for half an hour. The gilding goes on more rapidly when this liquid is boiling than when cold. The thickness of the gold film increases with the time of immersion.

De Ruolz.

M. De Ruolz, in the same year, December 19, took out his patent for gilding by the battery, a process which has great advantages. He found that the best and cheapest solutions of gold were the double chloride of gold and sodium dissolved in soda, the chloride of gold, 1 part dissolved in 2 parts of yellow ferrocyanide of potassium, with 100 of water, and the sulphuret of gold dissolved in the neutral sulphate. The second of these is most used in practice, and the third is the best on bronze and brass. Voltaic Electricity.

In electroplating, the best solution is 1 grain of dry cyanide of silver dissolved in 100 grains of water, c ontaining 10 grains of the yellow ferrocyanide of potassium.

In platinating, 0·015 grains of platinum will cover 0·08 square inches with a film 0·0000004 inch thick.

M. Ruolz has succeeded in coppering, leading, and tinning various vessels in common use.

Mr Elkington has, to a considerable extent, used inductive currents in his manufactory.

Chemical application

Among the chemical applications of electricity, one of the most interesting is that of employing its dynamic force in separating elements, which will not yield to the ordinary chemical forces. By its agency the following metals have been discovered,—sodium, potassium, calcium, barium, magnesium, lithium, chromium, and aluminium.

Becquerel.

M. Becquerel, in his treatise on electricity, has described most valuable processes for the electro-chemical treatment of the ores of silver, lead, and copper.

Light and heat.

One of the greatest gifts of voltaic electricity to the arts is in its production of a safe and brilliant light, and of a heat capable of very singular applications. The light produced, when the voltaic current passes between two electrodes of charcoal, rivals almost the sun in brilliancy; and on this account it has been proposed to use it in lighthouses especially during fogs, when all ordinary lights would be invisible. The first idea of an apparatus for fixing this light and making it useful was constructed in 1848 by our countrymen, Messrs Staite and Petrie. M. Foucault, about the same time, had constructed one in France, and soon afterwards, MM. Breton Brothers, M. Duboscy, M. De Bretti, and M. Liais, invented different ingenious varieties of apparatus for the same purpose, for the description of which we must refer to M. Delarive's work. The electric light is disagreeably bluish, but it may be rendered reddish by using carbon electrodes of alderwood.

Light.

The electric light has been employed in optical experiments, also for illuminating submarine work, and for making explorations at the bottom of the sea, or raising submerged property, the wires being in these last cases insulated with gutta-percha. M. Boussingault and Delarive proposed to use it in the illumination of coal mines, by conveying the current of a fixed pile by long conductors to carbon electrodes in a hermetically sealed globe. To avoid the difficulty of sealing the globe hermetically, Mr Grove proposes to use a helix of platinum wire made incandescent by the voltaic current, and placed over water in the interior of a glass tube. With fifty pairs of nitric acid and platinum, and eight square inches of surface, he calculated that he could produce a light, the intensity of which would be to that of a wax taper as 1444 to 1, and which would cost only four shillings per hour. The expense of lighting 800 workmen at the Napoleon docks at Rome, is only 38·08 francs per night, or 4½ centimes per man.[2]

Heat.

In the production of heat, voltaic electricity is no less valuable. It raises the temperature of the solids and fluids through which it passes. It deflagrates and fuses metals, and it boils water. A platina wire, incandescent during the continuous passage of the current, is used as an illuminated wire in astronomical instruments; and in the same state it has been used as a cautery in surgical operations, when a uniform and continuous heat was required.[3] The late Dr Hare suggested the use of an incandescent wire in the explosion of mines; but we owe to Mr Roberts the process of realising the idea, by the use of cartridges placed where the explosion is to take place.

M. Ruhmkorff successfully substituted the inductive

[1] Smee's *Electro-Metallurgy*, pp. 138, 139. [2] *Comptes Rendus*, 1854, tome xxxviii. p. 813. [3] Id. xxxix. p. 1165.

Electro-Magnetism.

spark for the incandescent wire in igniting the gunpowder, —an economical process, as in place of 15 or 20, it requires only 1 pair of Bunsen's battery to produce the spark. M. Verdu,[1] a Spanish officer, has greatly improved the process, and has exploded six small mines in the same circuit, at the distance of 320 yards from the apparatus, a process made more secure and certain by M. Dumoncel,[2] who has used it in the excavations at the port of Cherbourg.

PART II.—ON ELECTRO-MAGNETISM.

Electro-magnetism.

Various insulated facts and experiments, observed and made by Franklin, Van Marum, Cavallo, Ritter, Mojon, and Maschmann, led to the belief that electricity produced magnetical effects; and this opinion was strengthened by the magnetical changes which had been repeatedly observed in compass needles struck by lightning. It was not, however, till 1820, that electro-magnetism was discovered by

Oersted.

Professor H. C. Oersted of Copenhagen. In the month of July of that year, after obtaining several feeble magnetical effects from wires conducting the galvanic current, he at last succeeded, by using larger wires, in establishing the fundamental law, that *the magnetical effect of the electrical current* has a circular *motion round the current.*

Ampere.

Soon after this important discovery was made, M. Ampere established a second fundamental law of electro-magnetism, that the two conducting wires from the poles of the battery, when conveniently suspended, *attract each other when they transmit electrical currents moving in the same direction, and repel each other when the currents which they transmit have opposite directions.*

Arago.

On the 25th September 1820, M. Arago communicated to the French Institute the important discovery, that the electrical current possesses, in a very high degree, the power of developing magnetism in iron and steel. Sir H. Davy communicated a similar fact to Dr Wollaston on the

Seebeck.

12th November 1820, and Dr Seebeck laid before the Royal Academy of Berlin a series of experiments on the same

Savary.

subject. M. Savary of Paris has more recently found that steel needles, placed at different, but small distances from a wire conveying an electrical discharge, are not all magnetised in the same direction.

Thermo-electricity.

The most important addition to voltaic electricity, since the discovery of Oersted, is that of Dr Seebeck, who found that electro-magnetic currents can be produced by heat alone, a subject which will be treated in a separate chapter on *Thermo-electricity.*

Fundamental experiments in electro-magnetism.

When we join the two poles of a galvanic battery by a metallic wire, this wire is called the *conductor,* or the *uniting wire,* and the galvanic circle is said to be *closed* when this wire is single and unbroken, or when it consists of two wires in contact. When these two wires are not in contact, the circuit is said to be *open,* in which case the wires have no action upon magnetic needles.

Let A B (fig. 64), be the conducting wire of a closed galvanic circuit, along which electricity is carried from A to B, A being the *positive* end, and B the *negative* end; then, if a delicate magnetic needle is suspended near A B, its direction is changed in the following manner:—

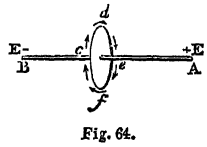


Fig. 64.

1. When the needle is *above* the wire, its north pole will go from the observer as at *d,* in the upper part of the ellipse, *c d e f,* fig. 64.

2. When the needle is *below* the wire, its north pole will approach the observer, as at *f,* in the lower part of the ellipse

3. When the needle is in the same horizontal plane as the wire, and stands between the observer and the wire, its north pole is *elevated,* as at *c.* Electro-Magnetism.

4. When the needle is in the same plane, but on the other side of the conductor, its north end is *depressed,* as at *e.*

Hence, it appears, that the direction of the magnetic current is *c d e f,* when the electrical current is in the direction A B.

If the uniting wire is bent into parallel directions, as in fig. 65, the two exterior surfaces of the branches A C, B D, will exercise similar actions on a needle N S, and so will the two interior surfaces, the actions at *e* and *f* being similar, and also those at *g* and *h.*

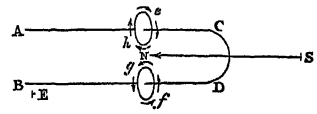


Fig. 65.

From these experiments, Professor Oersted concluded *that the magnetical action of the electric current describes circles* round the conductor, and hence he gave the name of *revolving magnetism* to this magnetical action. Revolving magnetism.

This action of *revolving magnetism* was at first opposed by Professor Schweigger, on the ground that if it were true, a magnet might be made to revolve round the uniting wire. Dr Wollaston drew the same conclusion, but for the purpose of producing such a revolution. Before he had effected his purpose, however, Dr Faraday went a step farther, and found experimentally not only *that a magnet could be made to revolve round the uniting wire, but that a moveable uniting wire might be made to revolve round a magnet.* An apparatus for exhibiting these remarkable properties is shown in fig. 66. A wire *a,* from the voltaic battery, passes into the glass vessel M, through a hole in its bottom, so as to communicate with mercury contained in the vessel. The lower end of a small magnet *b,* of the form of a cylinder, is fixed by a thread to the bottom of the vessel, so that it floats almost vertically in the mercury. A wire C*e*d, communicating with the other end of the battery, by means of the brass pillar C, dips with its lower end *d* into the mercury in M; and as soon as the voltaic current is established in the direction of the arrows, or *a d e* C, the pole *b* of the magnet will revolve round the fixed conductor *d e* C.

Apparatus for exhibiting electro-magnetic rotations.

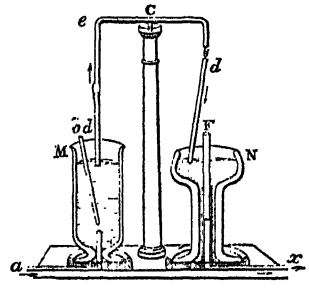


Fig. 66.

The revolution of the conductor round a magnet is exhibited in the same figure, where N is a glass vessel containing mercury, and having a small cylindrical magnet F fixed to its bottom, and projecting a little above the surface of the mercury. The wire *d,* being attached by a hook to the horizontal arm C, will commence its revolutions round, as soon as the voltaic current passes in the direction of the arrows, or *x* F, *d* C. If we make the current pass in the direction *a d e* C F *x,* from the zinc to the platinum end of the battery, both the above revolutions will go on simultaneously. When the current was made to pass in the opposite direction, the direction of the rotation was likewise changed.

Ampere's rotatory magnet.

The rotation of a magnet round its own axis was first effected by M. Ampere. The magnet was made to float vertically in mercury, by a platina weight at its lower end. When the electrical current descended through the upper half which stood above the mercury, it was carried off by

[1] *Comptes Rendus,* 1854, tome xxxviii. pp. 801 and 1024.

[2] Id. id. tome xxxix. p. 649.

Electro-Magnetism.

the mercury without entering the other half of the magnet. Had a positive current entered the other half, after passing through the first half, it would have tended to make the upper pole revolve from left to right, and the under pole from right to left, and these contrary forces would have balanced each other; but when it is prevented from entering the lower half, the positive current produces a rotation in the magnet from left to right. Mr Watkins[1] has constructed the apparatus in fig. 67, for showing this experiment in a better way. A flat bar magnet M is supported vertically by the bent wire WSW, fixed to the stand AB. The lower end of the magnet, which is pointed, rests in an agate cup C, while its upper end is a pivot, turning in a hole in the screw S. At the centre and lower end of the magnet are circular grooves containing mercury, into which dip small bent and pointed wires, fixed to the magnet, as seen in the figure. When the voltaic circuit is completed in the usual manner, the current passes only through the lower half of the magnet, and being a moveable part of the circuit, it turns round on its two pivots with a velocity depending on the strength of the magnet, the power of the battery employed, and the freedom from friction at the pivots. A current from another battery might be passed from the top of the magnet to its centre, which, by producing a rotation in the same direction, would increase the velocity of revolution.

Ampere's rotatory magnet.

Watkins' rotatory magnet.

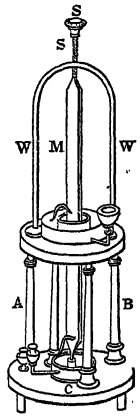


Fig. 67.

Revolving conductor.

Upon the same principles, a conductor may be made to revolve round its axis. An instrument for showing this was invented by Professor Barlow, and has been improved by Mr Watkins, by applying it to the horse-shoe magnet.[2]

Rotation of liquid conductors.

The rotation of liquid conductors may likewise, as Sir H. Davy has shown, be produced by the pole of a magnet. If mercury is placed in a shallow dish between the two poles of a battery, a magnet placed either above or below the mercury will cause the mercury to revolve round the points from which the currents issue. The rotation of the flame produced by the passage of a powerful voltaic charge between two charcoal points, arises from the same cause.

Daniell's method.

Professor Daniell gives the following pleasing method of showing this effect. He makes a powerful horse-shoe magnet part of the conducting wire of a constant battery of a moderate number of cells; the flame which may then be drawn from one of its poles will revolve in one direction, while that from the other will revolve in the opposite direction.[3]

Mutual action of electric currents.

Soon after the discovery of electro-magnetism, M. Ampere made the important discovery that the conductors attract each other when they are transmitting electrical currents having the same direction, but repel each other when the currents have opposite directions. This may be proved experimentally by the apparatus in fig. 68, invented by M. Ampere. It consists of a bent wire, ABCDEFGH, the parts of which at B and G are kept insulated by a non-conducting substance *m*, to which they are tied. The extremities A, H, with steel points dip into iron cups of mercury, K, M, at the ends of the brass wires, JK, LM, fixed into a piece of wood NO. When the electric current enters at J, passes along the conductor ABCDE, &c., and issues at L, the conductor is put in motion by means of a magnet. When the south pole of a magnet is directed against the side BCD, it will repel the conductor, but will attract it when directed against the opposite side.

The conductor in the above apparatus may also be moved by the earth's magnetism. For this purpose the plane, CDEF, must stand perpendicularly to the magnetic meridian. When the current enters at A, the vertical part FE will be placed towards the west, but if the current enters at H, the part FE will be placed towards the east.

Electro-Magnetism.

Rotation produced by the earth's magnetism.

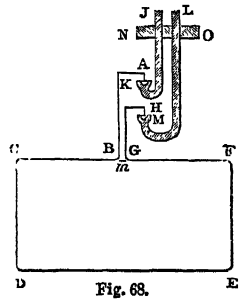


Fig. 68.

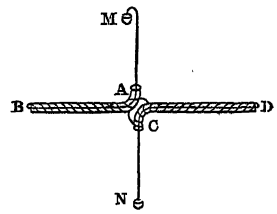


Fig. 69.

Ampere's electro-dynamic cylinders.

Ampere's electro-dynamic cylinder is shown in fig. 69, where M is the extremity of a wire, with a steel point resting in a cup of mercury. The wire, after descending to A, passes horizontally through a glass tube AB, and is then wrapped round it to form a helix or spiral, returning to A. It then passes to C, where it is wrapped in a similar manner round the glass tube CD; and when it reaches the end D, it returns through the tube to C, when it descends vertically with its steel point into another mercury cup N. This instrument is a complete imitation of a magnetic cylinder, and, while an electric current is passing through it, it possesses all the properties of a magnet, and may in every case be substituted for one.

Marsh's improvement.

Another electro-dynamic cylinder, invented by Ampere, and improved by Mr Marsh, is shown in fig. 70. It consists of a coil or helix of wire AB, the ends of which return along its axis to its middle point C, and are there fixed to the wires *n*, *p*, of a small voltaic battery MN, which consists of a single plate of zinc *z*, surrounded by a plate of copper *c c*, and floating in a basin of diluted acid, in which it can freely move. This spiral ACB will place itself in the magnetic meridian, when acted upon by the magnetism of the earth, and will likewise yield to the action of another magnet placed near either of its poles.

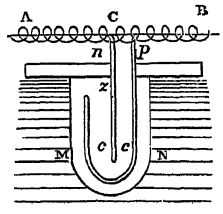
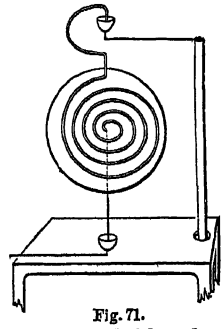


Fig. 70.


Fig. 71.

Various forms have been given to these electro-dynamic cylinders. In some the coils all lie in one plane, as in fig. 71, where one face of the coil has north, and the other south polarity, the magnetic poles being as it were situated in the centre of each disc.

When the helix is constructed, as in fig. 72, its power is so great that a small steel bar SN, placed within it, and supported perpendicularly, will, as soon as the connection is made with the voltaic battery, by means of the mercury cups P, *p*, start up, and place itself in the air, where, like Mahomet's coffin,

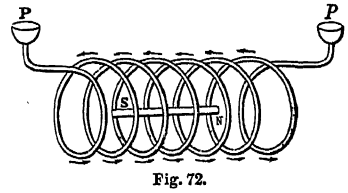


Fig. 72.

[1] *Popular Sketch of Electro-Magnetism.* [2] Ibid. [3] *Introduction to Chemical Philosophy*, § 815.

Electro-Magnetism.

it will remain suspended without any visible cause, and in opposition to the power of gravitation.

Ampere's revolving battery.

We owe also to M. Ampere the very interesting apparatus of a small voltaic battery made to revolve round a magnet. This is shown in fig. 73, where ABCD, *a b c d* exhibits a section of two cylinders of copper soldered to a copper bottom, so as to hold a fluid. This double cylindrical vessel is suspended by a bent wire *a* F *b* (having a cavity at F), upon the north pole N of a vertical magnet NS. A light cylinder of zinc *z z* is also so suspended by a bent wire *z* E *z*, and a steel pivot at E upon the same pole N of the magnet. The cylinder *z z* can therefore revolve upon this pivot. When the cylinder ABD *d b a c* CA is filled with dilute acid, so as to constitute a small battery, the cylinder *z z* will revolve from left to right when N is the north end or south pole, and from right to left when N is the south end or north pole. Owing to the attraction of the fluid, the cylinder of zinc is often drawn to one side, and prevented from moving; but this may be avoided by making the space A *c* sufficiently wide. Mr Watkins has ingeniously applied this contrivance to the poles of a horse-shoe magnet, as in fig. 74. It consists of a horse-shoe magnet AB, fixed to a stand SS. Above each pole is suspended a double cylindrical copper vessel, with a bent metallic wire fixed to the top of the inner cylinder, and a vertical wire pointed at each extremity, fixed in the middle of the bent wire. The lower ends of the vertical wires of each cylinder rest in the holes at each pole of the magnet. Within the above double copper vessels are placed two hollow cylinders of zinc, having similar bent wires with holes in the lower side of each, in which holes the upper ends of the vertical wires are inserted. When the copper cylinder is filled with dilute acid, the voltaic action begins, all the four cylinders revolving round their respective axes. The copper cylinders turn slowly and heavily, from their weight, in opposite directions to one another, and the zinc cylinders, with great velocity, in opposite directions to the copper ones. Very delicate suspensions are necessary to ensure the rotation of the copper cylinders.

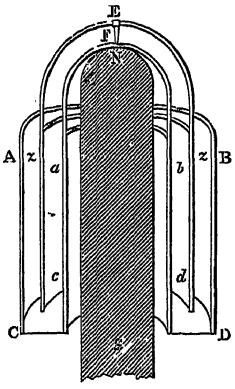


Fig. 73.

Mr Watkins' improvement upon it.

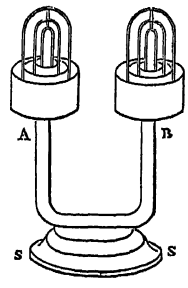


Fig. 74.

Delarive's apparatus.

A very simple apparatus for showing the magnetic state of a single coil, is shown in fig. 75, where Z and C represent the elements of a small galvanic battery of one zinc and one copper plate attached to a cork which floats on dilute acid. Each plate is half an inch wide, and two inches long. A piece of copper wire W, with silk thread wrapped round it, is bent into a ring, one end of which is soldered to the zinc, and the other to the copper plate. An electric current now passes in the direction of the arrow, and the ring W becomes a flat magnet, having its poles in the centre of its two surfaces, the one being north and the other south. This floating magnet will, when acted upon by a real magnet, exhibit the usual magnetic attractions and repulsions. Mr Marsh has improved this apparatus by doubling the copper plate, as in fig. 76, and converting it into a vessel for holding the dilute acid. The plates are then placed in a glass cylinder which may float in water.

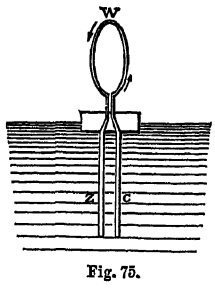


Fig. 75.

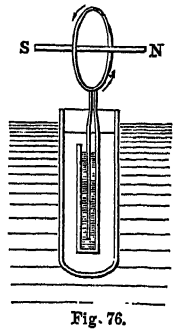


Fig. 76.

Electro-Magnetism.

Marsh's improvement upon it.

Mr Watkins' revolving helices.

A very beautiful apparatus for exhibiting helical rotations has been constructed by Mr Watkins, and is shown in fig. 77. A horse-shoe magnet, with its poles uppermost, is fixed upon a wooden box S. Two helices of copper, having slender bars across their summit, with needle or steel points in their centre, move in conical holes drilled in the poles of the magnet, with small platina cups to hold a small portion of mercury. The lower extremities of each helix terminate in steel points, which dip into the mercury in wooden cups below, screwed to the legs of the magnet. A wire likewise goes from the lower end of each cistern, and being bent upwards, terminates in a small cup with mercury. The brass rod R, fixed to the stand, carries a forked piece MN, the ends of which are two points which dip in the mercury in the platina cups. On the top of the coil, another mercury cup is placed on the fork MN; and when the voltaic current is made to pass through the apparatus, the helical coils will revolve rapidly in opposite directions, the directions changing with the disposition of the wires which connect them with the voltaic battery.

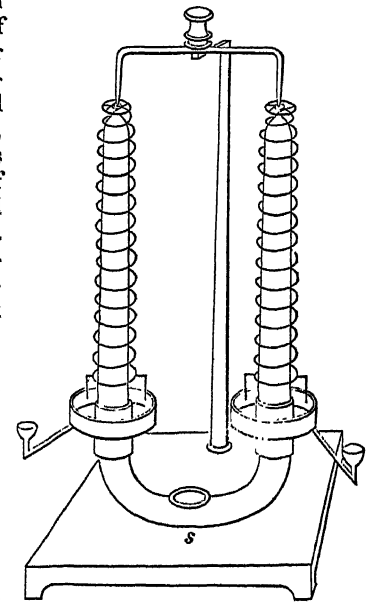


Fig. 77.

Arago's discoveries.

We have already mentioned the fine discovery of M. Arago, of the power of electrical currents to develop magnetism in iron and steel. M. Arago found that the uniting wire of a powerful voltaic battery attracts iron filings often with such force as to form a coating round the wire ten or twelve times thicker than itself. This attraction, as he found, did not originate in any magnetism previously possessed by the iron filings, which he ascertained would not adhere to iron; and that it was not a case of common electrical attraction, was evident from the fact that copper and brass filings were not attracted by the uniting wire. He likewise found, that the iron filings began to rise before they came in contact with the uniting wire, and hence he drew the conclusion, that the electric current converted each small piece of iron into a temporary magnet. In following out this view, the French philosopher converted large pieces of iron into temporary magnets, and also small steel needles into permanent ones. Sir H. Davy and Dr Seebeck obtained analogous results without knowing what had been previously done in France. M. Savary of Paris obtained also some very important results relative to the magnetic action of the uniting wires at different distances but we have already given a brief account of them, as well as of the experiments of Professor Erman, in our article ELECTRICITY.

Electro-magnetic inductions.

Electro-Magnetism.

Powerful magnets made by voltaic electricity.

The next step in the progress of discovery, was that of making magnets of extraordinary power by means of a voltaic battery. This seems to have been first accomplished by Professor Moll of Utrecht, and Professor Henry of Princetown College, who was able to lift thousands of pounds' weight by his apparatus, but as we have already given a full account of the construction of such magnets, and of the experiments of M. Quetelet of Brussels, and Mr Watkins of London, in our article MAGNETISM, we must refer our readers to that part of the work.

Rev. Mr Callan's huge electro-magnet.

Since these important discoveries, however, were made, an electro-magnet of extraordinary power has been constructed by the Rev. N. J. Callan,[1] Professor of Natural Philosophy at Maynooth. It has the form of a horse-shoe, and is *thirteen feet long, two and a half inches* in diameter, and weighs *fifteen stone*. The distance between its poles is seven inches, and a copper wire one-sixth of an inch in diameter, is wrapped round the bar from one pole to the other. The total length of this thick wire is 490 feet, but it is divided into seven parts, each 70 feet in length. A copper wire, about the fortieth of an inch in diameter, is soldered to one of the thick wires, about a foot from one of its extremities, and is wrapped round the horse-shoe bar in the same direction as the thick wire, and in one continuous helix. When the opposite ends of the seven thick wires are connected with the opposite poles of a voltaic battery, the horse-shoe bar is converted into a magnet of extraordinary power, and when the battery communication is broken, an electric current of singular intensity is established in the long coil of small wire. The armature or keeper of Mr Callan's magnet was a horse-shoe bar of iron 20 inches long, two and a half in diameter, and weighing 28 lb. Its poles were seven inches apart, and the apex of the arch seven inches high. Such was the power of the magnet that it was found impossible to separate the keeper from it by any force acting in a direction perpendicular to the touching surfaces. The calorimotor, consisting of a single pair of plates, with 18 square feet of copper, and 16 of zinc, was found by Mr Noad more effective in exciting the magnetism than a Wollaston battery of 100 double pairs highly excited. When the connection was broken between the battery and the charcoal points fixed to the thick wires, the succession of sparks formed a continued blaze of brilliant light, and when a succession of sparks was sent rapidly through a large fowl, they produced instant death.

Electro-magnetism applied as a mechanical power.

The idea of applying the powerful agency thus developed in a bar of iron, as a mechanical power, naturally suggested itself; but there is reason to believe that Mr Thomas Davenport of Brandon, in the county of Rutland, and state of Vermont, was the first person who thought of applying it in producing rotatory motion. This uneducated individual, by trade a blacksmith, having, in 1833, accidentally seen one of Professor Henry's electro-magnets, purchased it with the idea of employing it as a mechanical power. In July 1834, he is said to have constructed a voltaic engine; and on the 16th March 1837, he took to New Haven two machines; one a *rotatory machine, composed of revolving electro-magnets, with fixed permanent magnets;* and the other, a *rotatory machine composed entirely of electro-magnets in its fixed and revolving members*, which being wholly made of soft iron, may be magnetised in an instant by a very small battery.[2] Professor Henry,[3] however, had previously, and so early as 1831, produced a reciprocating motion by magnetic attraction and repulsion, aided by electro-magnetic action.

Professor Henry's reciprocating apparatus.

In fig. 78, AB is an electro-magnet of soft iron, about "seven inches long, and moveable on an axis at the centre S. Its two extremities, when placed in a horizontal line, are about one inch from the north poles of the upright magnets C and D. G and F are two large tumblers con-

Electro-Magnetism.

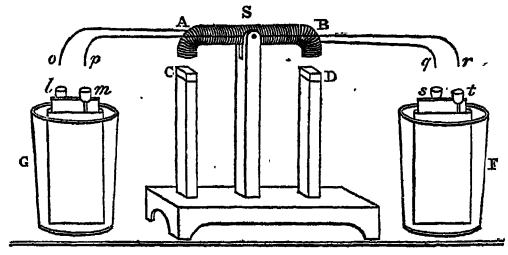


Fig. 78.

taining dilute acid, in each of which is immersed a plate of zinc, surrounded with copper. *l, m, s, t,* are four brass thimbles soldered to the zinc and copper of the batteries, and filled with mercury.

"The electro-magnet AB is wound with three strands of copper bell wire, each about twenty-five feet long. The similar ends of these are twisted together, so as to form two stiff wires, which project beyond the extremity B, and dip into the thimbles *s, t.*

"To the wires *q, r,* two other wires are soldered, so as to project in an opposite direction, and dip into the thimbles *l, m.* The wires of the electro-magnet have thus, as it were, four projecting ends; and by inspecting the figure it will be seen that the extremity *o,* which dips into the cup attached to the copper of the battery in G, corresponds to the extremity *r* connecting with the zinc F.

"When the batteries are in action, if the end B is depressed until *q, r,* dips into the cups *s, t,* AB instantly becomes a powerful magnet, having its north pole at B. This of course is repelled by the north pole D, while at the same time it is attracted by C. The position is consequently changed, and *o, p,* comes in contact with the mercury in *l, m.* As soon as the communication is formed, the poles are reversed, and the position again changed. If the tumblers be filled with strong dilute acid, the motion is at first very rapid and powerful, but it soon almost entirely ceases. By partially filling the tumblers with weak acid, and occasionally adding a small quantity of fresh acid, a uniform motion, at the rate of seventy-five vibrations in a minute, has been kept up for more than an hour. With a large battery, and very weak acid, the motion might be continued for an indefinite length of time.

"The motion here described is entirely distinct from that produced by the electro-magnetic combination of wires and magnets. It results directly from the mechanical action of ordinary magnetism—galvanism being only introduced for the purpose of changing the poles."

Rev. Mr M'Gauley's electro-magnetic power.

These contrivances have been followed by several others of great ingenuity. The Rev. J. W. M'Gauley exhibited a working model of an electro-magnetic machine to the British Association at Dublin in 1835; and in the sixth report of the Association he mentions his having "in his possession a machine of not inconsiderable power." Mr Sturgeon of Woolwich mentions that he had a galvanic machine in use on his premises, for pumping water, and for other mechanical purposes. Mr Jacobi has some time ago employed electro-magnetic machinery for impelling a boat on the Neva at St Petersburg; and Mr Davidson of Aberdeen has made a similar application to a turning-lathe.

Schweigger's electro-magnetic multiplier.

A series of beautiful instruments, of great practical value, have been invented for increasing minute voltaic effects, by electro-magnetic action. The first of these was constructed by Professor Schweigger of Halle, immediately after the discovery of electro-magnetism. It is exhibited

[1] See Sturgeon's *Annals of Chemistry*, &c., July 1837.

[2] Silliman's *American Journal of Science*, April 1837, vol. xxxii. No. 65, p. 217.

[3] Ibid., July 1831, vol. xx. p. 340.

Electro-Magnetism.

in fig. 79, where a magnetic needle SN, is placed or suspended within several bendings of the uniting wires ABCDE. Now, as each of the branches of this wire acts upon one of the poles of the needle in the same direction, the effect will be *quadrupled;* and hence the direction of the needle becomes a means of measuring any minute voltaic effects produced in the uniting wires. The power of multiplication does not, as Dr Seebeck proved in 1820, increase with the number of windings in the uniting wire, as the resistance to transmission increases with the length of the wire, thus diminishing the conducting power of the wire. Professor Oersted improved the multiplier,[1] by adding a bent magnet, as shown at JKL, fig. 80, which can be placed so as to repel the nearest end of the needle, or index, or to attract it. In the position in the figure the first of these effects is produced; but by turning the angle of the bent magnet towards the needle the second effect is produced. By causing the pillar which carries this magnet to approach to or recede from the needle, the directive power of the needle may be made scarcely sensible. In this state the instrument will show the difference in the voltaic effects produced by two pieces of metal, which differ only by $\frac{1}{100}$th of alloy when a powerful liquid is used. Professor Cumming, we believe, first suggested the idea of neutralising the directive force of the needle, arising from the earth's magnetism, which he did by placing a magnetised needle immediately beneath the moveable or index needle.[2]

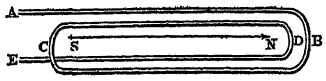


Fig. 79.

Professor Oersted's improvement upon it.

Nobili's multiplier.

M. Nobili has improved this instrument by using two needles, as in fig. 80; but he fixed the neutralising needle S′N′, to the moveable one NS, placing the one above the other, with their poles reversed. The two needles are fixed in a piece of straw GH, and suspended by a silk fibre at G. The needles were twenty-two lines long, three wide, and one-fourth thick, and GH was five lines. The wire was a copper one, one-fifth of a line in diameter, and thirty feet long, and covered with silk. It made seventy-two evolutions round the frame.

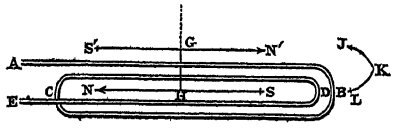


Fig. 80.

Lebaillif's multiplier.

M. Lebaillif has extended this principle by using four needles in place of two, each pair being exactly the same as in fig. 80, the one being brought near the upper surface of the coil, and the other near the under surface. In this instrument the increased weight of the needles may compensate any additional sensibility possessed by the approximation of the needles to the sides of the coil. The instrument is shown in fig. 81, where *ab, ab* are the four needles, *mnop* the square bobbin, around which the wires are coiled, one or two feet of their length at each end being left free, as at *gi, gf*, that the electric current may enter at the one and issue from the other. Instead of a single wire 300 feet long, M. Lebaillif employs *five* parallel ones, each end of which is stripped of the silk, and united by strong pressure into a bundle. The electric current thus divided into five parts, flows in five channels, which, according to M. Pouillet, transmit a proportionally larger quantity of electricity, while the diminished intensity produced by transmission through a great length of wire is avoided.[3]

Electro-Magnetism.

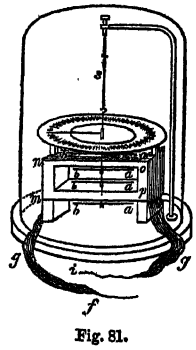


Fig. 81.

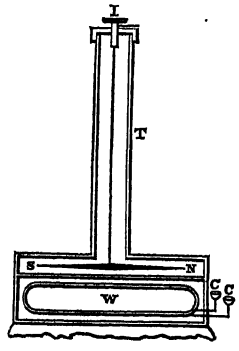


Fig. 82.

A torsion galvanometer, invented by Dr Ritchie,[4] is shown in fig. 82. Having covered a fine copper wire with a thin coat of sealing wax, he rolls it about a heated cylinder, an inch or two in diameter, ten, twenty, or any number of times. The opposite sides of the circular coil are then pressed together till they become parallel, and about 1 or $1\frac{1}{2}$ inches long. The coil W is then fixed on a proper sole, and the ends of the wires connected with two metallic mercury cups C, C. A graduated disc of paper is then placed horizontally on the upper half of the coil, having a black line drawn through its centre, parallel with the middle line of the coil. A small magnet SN, made of a common sewing needle, is then fixed to the lower end of a fine glass thread, while the upper end is securely fixed with sealing wax, in the centre of a moveable index I, as in the torsion balance. This is enclosed in a glass tube T, fitted into a disc of thick plate glass, which forms the upper surface of the box. When a voltaic current passes through the coil W, the needle SN is deflected. The glass thread is then twisted by turning the index I till the needle is brought back to its former position, and the number of degrees of torsion will be an accurate measure of the quantity of electricity, whose deflective power over the needle is exactly balanced by the torsion of the glass fibre.

Dr Ritchie's torsion galvanometer.

A very ingenious galvanoscope, for ascertaining merely the existence and direction of an electric current, is described by Dr Roget in the Library of Useful Knowledge.[5] It is shown in fig. 83, where M is the needle, T the suspending fibre, placed between four vertical spiral coils, the centres of which are brought very near the poles of the needle. The

Roget's galvanoscope.

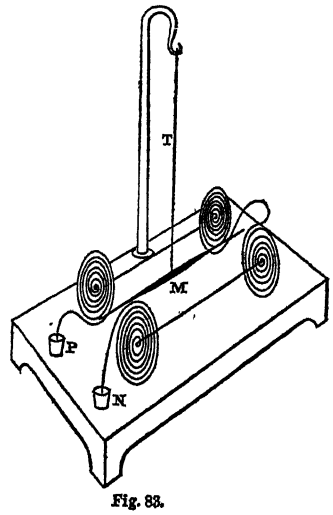


Fig. 83.

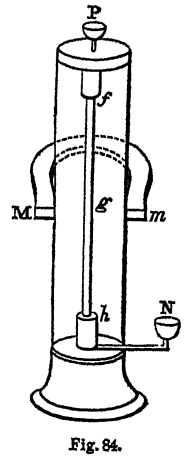


Fig. 84.

[1] For a perspective drawing on a large scale of this instrument, see *Edinburgh Encyclopædia*, art. "Thermo-Electricity," plate 522, fig. 11.

[2] *Trans. Cambridge Phil. Soc.* vol. i. p. 279.

[3] Pouillet's *Elemens de Phys. Exp.* liv. v. chap. i. sect. 412, and *Library of Useful Knowledge*, art. "Electro-Magnetism," p. 44.

[4] *Phil. Trans.* 1830, p. 218.

[5] Art. "Electro-Magnetism," part ii. chap. viii. p. 44, fig. 82.

Electro-magnetism.

same voltaic current is made to circulate through all the four spirals, which have their turns such as to produce repulsion of the contiguous pole on the one side, and attraction of the same pole on the other side. The wire of the four spiral discs proceeds from the mercury cup P, and terminates in another cup N. In this admirable instrument, the current is brought as near as possible to the needle, so that its action is very powerful. The whole force of the four discs is quadruple that of a single one, as they all concur in giving the needle a deviation in the same direction.

Gold-leaf galvanoscope.

Gold-leaf has been employed in the formation of the *gold-leaf galvanoscope*, which is similar in construction to Bennet's gold-leaf electrometer. The strength of the current is indicated by the curvature of the strip of gold-leaf *f h* (fig. 85), which is held loosely by forceps at *f* and *h*, each forceps terminating in a mercury cup, the one, P, being above, and the other, N, below. The gold-leaf is enclosed in a glass case, the middle of which is placed equidistant between the poles M, *m*, of a horse-shoe magnet. When the electric current passes through the gold-leaf, the leaf is bent, or *attracted* and *repelled* laterally by the poles of the magnet, according as the current *ascends* or *descends*, the broad surface of the leaf becoming *convex* towards the magnet in the one case, and *concave* in the other. As the degree of curvature is easily ascertained, Dr Roget considers this instrument as affording "the most delicate test possible of the existence and direction of a weak voltaic current."[1]

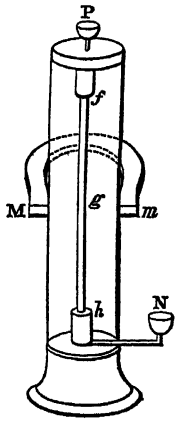


Fig. 85.

Ampere's electripeter.

We shall now conclude this part of the article with an account of a very ingenious contrivance of Ampere's for quickly altering the direction of the electric current in voltaic batteries. Two grooves RR, fig. 86, are made in the table TT, some lines in depth, and also four similar cavities *v v'*, *t t'*, communicating diagonally by means of the plates of copper *l l*, *m m*, which are kept separate at their crossing by a non-conducting substance. Mercury is then placed in the grooves and cavities, after they have been varnished with mastic. If the positive wire of a battery is immersed in the groove R, and the negative one in the groove R', the current will not flow until a metallic communication is made between each of the grooves, and one of the cavities. To do this, *b*, *b'* are two plates, fig. 87, for transmitting the current; the plate *b* may become positive or negative, according as the cavity R communicates with *t*, and R' with *t'*, or when R communicates with *v*, and R' with *v'*. In the first case, the current follows the direction R*t*, *bb'*, *t'*R', in the second it goes from R to *v*, then traverses the plate *ll'*, and afterwards goes from *b'* into *bt*, and from *v'* into R. Now, these communications may be easily made or interrupted, by means of a

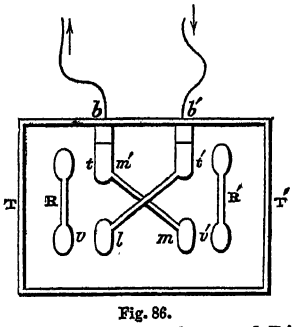


Fig. 86.

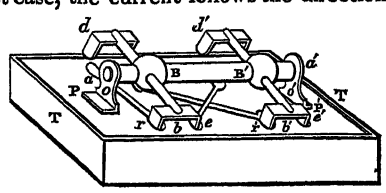


Fig. 87.

wooden rod BB', which turns round its axis in the holes *o*, *o*. Four metallic arcs *bb'*, *dd'*, are fitted to this rod, so that by merely raising or depressing it, the communications are changed. When *b* and *b'* are depressed, R and *v* communicate through *rbc*, and R and *v'* by *r'b'c'*, and when *d* and *d'* are depressed, R and *t* and R' and *t'* communicate by means of the corresponding arcs.[2]

Electro-magnetism.

Clarke's electripeter.

Mr Edward Clarke has improved this instrument, and, we believe, given it the name of electripeter. It is shown in fig. 88, where *a*, *a*, *a'*, *a'* are four mercury cups, communicating with wires beneath the stand SS'. Large mercury cups A, A', B, B', are similarly constructed for conveying the current from the battery to a machine to be set in motion. The wires CC' are moveable about a horizontal axis. Suppose them to be in the position in the figure, and that the current is passing from A to B, and back again, from any apparatus from B' to A, then, by merely pressing the other ends of the wires CC' into their respective cups *a a*, the direction of the current will be immediately changed, and it will pass from A beneath the stand to B', and back from B to A. By retaining the wires horizontally, which keeps their ends out of the cups, the passage of the current will be stopped.[3]

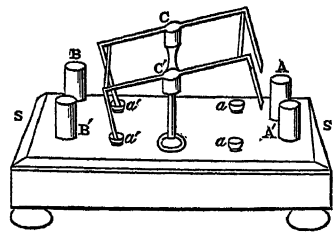


Fig. 88.

On the Applications of Electro-Magnetism.

Application.

Our limits will not permit us to do more than enumerate the principal applications of Electro-magnetism.

As a locomotive power. By Jacobi and others.

The power of electric currents to develop magnetism in soft iron is so great as to have led several philosophers to apply it to the production of a continuous movement, either rotatory or reciprocating. M. Jacobi of St Petersburg was the first who constructed such a machine, and it was for a long time used in impelling a boat on the Neva. Since that time many other electro-motors, as such machines are called, have been constructed; the most important of these are by Loiseau, Froment, Larmanjeat, Page, and Dumoncel. The late Mr Sturgeon pumped water with an electro-magnet; Mr Davidson of Aberdeen drove a turning-lathe by the same power; and in 1848 we sailed at the rate of a mile in the hour in a boat thus impelled and constructed by Mr Dillwyn of Swansea.

Joule and Scoresby.

M. Jacobi, as we have stated, has been led by Dr Faraday's discovery of magnetic electricity to abandon his expectation of obtaining anything like a valuable power from electro-magnetism; and Messrs Joule and Scoresby have come to the same conclusion. It appears from their calculations that a grain of coal consumed by a steam-engine in Cornwall will raise 143 lb. 1 foot, whilst a grain of zinc consumed in a voltaic battery can raise theoretically only 80 lb. But the price of an hundredweight of coal is less than 9 pence, whilst that of the same quantity of zinc is more than 216 pence, so that, under the most favourable conditions, the power obtained from electro-magnetism must cost twenty-five times as much as that from steam.

To the art of weaving. Bonelli.

The application of electro-magnetism to the art of weaving, made by M. Bonelli, as exhibited this year at the meeting of the British Association at Oxford, is doubtless a great invention, and though at present inferior to the Jacquard system, yet progressive improvement in the apparatus may give the electric loom a superiority over the one now employed.

---

[1] Cumming's *Manual of Electro-dynamics*, p. 178.

[2] Becquerel, *Traité d'Electricité*, &c., tome iii. pp. 9, 10.

[3] Noad's *Lectures*, p. 319.

Magneto-Electricity.

Froment's electro-sorting apparatus.

M. Froment's electro-sorting apparatus is another fine and useful application of electro-magnetism. Iron ore, reduced and pulverised, is spread continuously on one of the extremities of a revolving cloth drawn under a vertical wheel, having on its circumference twenty-eight electro-magnets. The lowest electro-magnet only receives the current, and being in the magnetic state, attracts the iron particles from the ore. After passing on a little farther, it is deprived of its magnetism, and drops the adhering iron particles upon an inclined plane. The following electro-magnet does the same, and thus the pure iron is separated from its accompanying dross.

To railway breaks. Nickles. Achard.

Electro-magnetic attraction has been employed by M. Nickles to effect the adhesion of locomotives to the rails, and M. Achard has applied it to the construction of an *electric break*, a current being made to pass along a train, and all the breaks are put in action by it as soon as the engine-driver desires to stop the train.

In astronomy, electro-magnetism has been most ingeniously employed. Messrs Bond of the United States Observatory at Cambridge have employed it in recording astronomical observations instantaneously on paper many hundred miles off, if required; and Mr Airy has applied it to various important purposes in the observatory at Greenwich, but particularly to the determination of the difference of longitude between distant stations.

To clocks. Wheatstone, Bain, &c.

To Messrs Wheatstone, Bain, and Steinhill, who were occupied almost simultaneously with the subject, we owe the beautiful contrivance of multiplying by electro-magnetism the indications of a single clock, that is by transporting to any number of counting apparatuses, or sham-clocks, the indications of a type or master clock. By this means all the clocks in a city or in an establishment may be made to move in perfect coincidence, a process finely effected by M. Froment.

As a maintaining power of clocks. Bain.

As a substitute for weights or springs in the maintaining power of clocks, electro-magnetism was first employed by Mr Bain of Edinburgh. By the action of two real magnets upon a helix traversed by a current, he maintained a pendulum in motion, an invention which was greatly improved by Froment.

Chronoscopes.

Chronoscopes, electro-magnetic instruments for measuring short intervals of time, were first proposed by Mr Wheatstone, and improved by Pouillet, Breguet, Siemens, and Henry. By these instruments the velocity of projectiles has been measured. By M. Pouillet's chronoscope, which differs in principle from the others, he has determined the time that a ball takes to come out of a cannon or musket, which is between the $\frac{1}{120}$th and $\frac{1}{180}$th of a second.

Electric seismo-graph.

M. Ralmien has constructed an electro-magnetic apparatus for registering the shocks and undulator motions of an earthquake, for which he has given the name of the Electro-magnetic Seismograph.

For an account of the application of electro-magnetism to telegraphs, see TELEGRAPH.

PART III.—MAGNETO-ELECTRICITY.

Magneto-electricity.

In the preceding chapter we have detailed the leading phenomena produced by electric currents, or electricity in motion, for no magnetic effects are produced by accumulated electricity. We now come to give an account of the new science of magneto-electricity, which we owe to Dr Faraday. Although certain effects of the *induction*[1] of electrical currents had been discovered, it had always appeared to Dr Faraday unlikely that these could be the only effects which induction by currents could produce; and whatever theory of the phenomena might be adopted, it still seemed to him "very extraordinary, that as every electric current was accompanied by a corresponding intensity of magnetic action, at right angles to the current, good conductors of electricity, when placed within the sphere of this action, should not have any current induced through them, or some sensible effect produced equivalent in force to such a current. With these views, and under the expectation of obtaining electricity from ordinary magnetism, he investigated experimentally the inductive effect of electrical currents."

Dr Faraday's researches.

Magneto-Electricity.

If the uniting wire of a voltaic battery is placed parallel to the wire connecting the two ends of a delicate galvanometer, the most powerful current along the uniting wire will produce no deviation in the needle. But if the current along the uniting wire is stopped, by *breaking the circuit*, a momentary deviation of the needle takes place, as if a wire passed in the same direction as that of the voltaic current. When the needle has become stationary, a similar impulse is given to it in the opposite direction, by *restoring the circuit*. Dr Faraday found that similar effects took place when the *current along the uniting wire being uninterrupted*, the uniting wire was made to approach or to recede *suddenly* from the wire of the galvanometer, the *approximation* inducing a current in the direction *contrary* to the inducing current in the uniting wire, and the *division* inducing a current in the *same* direction as the inducing current.[2] To this inductive action of the voltaic current Dr Faraday has given the name of *volta-electric induction*.

As the preceding effects were clearly produced by a transverse action of the current, in the first case at the instant when the current was annihilated or generated, and in the second by the mechanical motion of the uniting wire, Dr Faraday expected to obtain similar results, by the sudden induction and cessation of the same magnetic force, either by means of a voltaic current, or by that of a common magnet. By various experimental arrangements Dr Faraday verified these anticipations; but in order to connect his experiments on volta-electric induction with the present ones, he constructed a combination of helices upon a hollow cylinder of pasteboard. The wire was 1-20th of an inch in diameter, and the different spires were prevented from bending by a thin interposed twine. Each helix was covered with calico. Eight lengths of copper wire were used, or nearly 220 feet of wire. "Four of these helices were connected end to end, and then with the galvanometer; the other intervening four were also connected end to end, and the battery of 100 pairs discharged through them. In this form, the effect on the galvanometer was hardly sensible, though magnets could be made by the induced current. But when a soft iron cylinder, $\frac{7}{8}$ths of an inch thick, and 12 inches long, was introduced into the pasteboard tube, surrounded by the helices, then the induced current affected the galvanometer powerfully. It possessed also the power of making magnets with more energy apparently than when an iron cylinder was used. When the iron cylinder was replaced by an equal cylinder of copper, no effect beyond that of the helices alone was produced." "Similar effects," continues Dr Faraday, "were produced with ordinary magnets. Thus, the hollow helix just described had all its elementary helices connected with the galvanometer by two copper wires each 5 feet long; the soft iron cylinder was introduced into its axis; a couple of bar magnets, each 24 inches long, were arranged, with their opposite poles at one end in contact, so as to resemble a horse-shoe magnet, and then contact made between the other poles and the ends of the iron cylinder,

[1] By *induction* Dr Faraday intends to express the power of electrical currents "to induce any particular state upon matter in their immediate neighbourhood otherwise indifferent." *Experimental Researches*, p. 1.

[2] Ib. p. 5.

Magneto-Electricity.

so as to convert it for the time into a magnet; by breaking the magnetic contacts, or reversing them, the magnetism of the iron cylinder could be destroyed or reversed at pleasure. Upon making magnetic contact, the needle was deflected; continuing the contact, the needle became indifferent, and resumed its first position; on breaking the contact it was again deflected, but in the opposite direction to the first effect, and then it again became indifferent. When the magnetic contacts were reversed, the deflections were reversed. When the magnetic contact was made, the deflection was such as to indicate an induced current of electricity in the *opposite* direction to that fitted to form a magnet, having the same polarity as that really produced by contact with the bar magnet."

But in order to show that it was by the approximation of the magnets that the momentary induced current was excited, Dr Faraday substituted for the soft iron cylinder a cylindrical magnet 8½ inches long, and ¾ths of an inch in diameter. He introduced one end of this magnet into the axis of the helix, and then, the galvanometer needle being stationary, the magnet was *suddenly thrust in*, the needle was then instantly deflected in the same direction as if the magnet had been formed by any of the two preceding processes. "Being left in, the needle resumed its first position, and then the magnet being *withdrawn*, the needle was deflected in the opposite direction. These effects were not great, but by introducing and withdrawing the magnet, so that the impulse each time should be added to those previously communicated to the needle, the latter could be made to vibrate through an arc of 180° or more."[1]

Law of magneto-electric induction.

Although the law which governs the evolution of electricity by magneto-electric induction is very simple, yet Dr Faraday has found it rather difficult to express it, except in reference to diagrams. We shall therefore give it in his own words. "If, in fig. 89, PN represent a horizontal wire passing by a marked magnetic pole, so that the direction of its motions shall coincide with the curved line proceeding from below upwards; or if its motion parallel to itself be in a line tangential to the curved line, but in the general direction of the arrows; or if it pass the pole in other directions, but so as to cut the magnetic curves[2] in the same general direction, or on the same side as they would be cut by the wire if moving along the dotted curved line; then the current of electricity in the wire is from P to M. If it be carried in the reverse direction, the electric current will be from N to P. Or if the wire be in the vertical position, as at P'N', and it be carried in similar directions, coinciding with the dotted horizontal curve, so far as to cut the magnetic curves on the same side with it, the current will be from P' to N'. If the wire be considered a tangent to the curved surface of the cylindrical magnet, and it be carried round that surface into any other position, or if the magnet itself be revolved on its axis, so as to bring any part opposite to the tangential wire; still, if afterwards the wire be moved in the directions indicated, the current of electricity will be from P to N; or if it be moved in the opposite direction, from N to P; so that as regards the motions of the wire past the pole, they may be reduced to two, directly opposite to each other, one of which produces a current from P to N, and the other from N to P.

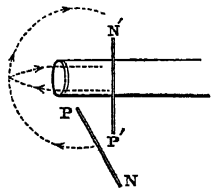


Fig. 89.

"The same holds true of the unmarked pole of the magnet, except that if it be substituted for the one in the figure, then, as the wires are moved in the direction of the arrows, the current of electricity would be from N to P, and when they move in the reverse direction, from P to N. Magneto-Electricity.

"Hence the current of electricity which is excited in metal when moving in the neighbourhood of a magnet, depends for its direction altogether upon the relation of the metal to the resultant of magnetic action, or to the magnetic curves, and may be expressed in a popular way, thus: Let AB (fig. 90) represent a cylinder magnet, A being the

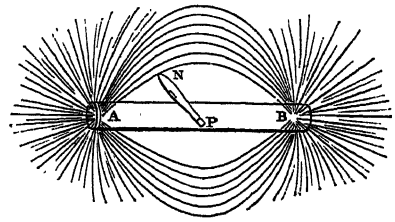


Fig. 90.

marked pole, and B the unmarked pole; let PN be a silver knife-blade resting across the magnet, with its edge upward, and with its marked or notched side towards the pole A; then in whatever direction or position this knife be moved edge foremost, either about the marked or the unmarked pole, the current of electricity produced will be from P to N, provided the intersected curves proceeding from A abut upon the notched surface of the knife, and those from B upon the unnotched side. Or, if the knife be moved with its back foremost, the current will be from N to P in every possible position and direction, provided the intersected curves abut on the same surfaces as before. A little model is easily constructed, by using a cylinder of wood for a magnet, a flat piece for the blade, and a piece of thread connecting one end of the cylinder with the other, and passing through a hole in the blade, for the magnetic curves; this readily gives the result of any possible direction.

"When the wire under induction is passing by an electro-magnetic pole, as for instance, one end of a copper helix traversed by the electric current the direction of the current in the approaching wire is the same with that of the current in the parts or sides of the spirals nearest to it, and in the receding wire the reverse of that in the parts nearest to it.

"All these results show that the power of inducing electric currents is circumferentially exerted by a magnetic resultant, or axis of power, just as circumferential magnetism is dependent on, and is exhibited by, an electric current."[3]

Electro-magnetism inapplicable to locomotion.

The great discovery of magneto-electricity by Dr Faraday led M. Jacobi of St Petersburg to abandon the theoretical view which induced him to apply electro-magnetism as a locomotive power. His machines, the electro-motive force of which he had supposed to be independent of time, produced but very restricted effects, in place of being the source of a force infinitely great. The principal cause of this limitation was the formation of magneto-electric counter-currents generated by the very motion of the machine. In his conversations with Bessel, M. Jacobi had often told him that if magneto-electricity obliged him to abandon his theoretical views, M. Bessel would be compelled one day to take an account of it in his theory of the pendulum, and perhaps even in his calculations on the planetary bodies. M. Jacobi has no scruple in placing the discovery of magneto-electricity on a level in point of importance with that of gravita- Jacobi.

[1] *Experimental Researches*, p. 11, or *Phil. Trans.* 1832.

[2] By magnetic curves, I mean the lines of magnetic forces, however modified by the juxtaposition of poles, which would be depicted by iron filings, or those to which a very small magnetic needle would form a tangent.

[3] *Experimental Researches*, pp. 32, 34.

Magneto-Electricity. Jacobi.

tion. On the authority of facts partly known and partly not yet confirmed by experiment, M. Jacobi has been led to the following conclusion,—that in every system of material bodies, every change of position gives birth to forces, the direction of which is always inverse to that of their motion, that is, they are *repulsions* when the bodies approach one another, and attractions if they recede from one another. This conclusion, he adds, takes into account only the existence of these forces and their direction. It neither expresses their intensity, nor the manner in which they depend on space and time, or on the masses and their constitution.[1]

Experiments with Dr Knight's magnet.

Dr Faraday has made several experiments with the large compound magnet of Dr G. Knight, belonging to the Royal Society, and consisting of 450 bar magnets, each 15 inches long. The electrical effects which it exhibited were very striking. When a soft iron cylinder, 13 inches long, was put through the compound hollow helix, with its ends arranged as two general terminations, and these connected with the galvanometer; then, when the iron cylinder was brought in contact with the two poles of the magnet, so powerful a rush of electricity took place, that the needle whirled round many times in succession. When Dr Faraday brought the helix alone near to or between the poles, the needle was thrown 80°, 90°, or more, from its natural position.

Dr Faraday failed in obtaining evidence of chemical decomposition by the magnet, or any sensation on the tongue, or any effect on a frog, but he afterwards, by an armed loadstone of Professor Daniell's, lifting 30 pounds, not only thought that he perceived a sensation on the tongue, and a flash before the eyes, but was able to produce a very powerful convulsion in the limbs of a frog, every time that magnetic contact was made, the convulsive effect increasing with the suddenness with which the contact was broken and restored.

Electric shock from a magnet.

Dr Faraday, as we have now seen, was the first person who obtained, in November 1831, the electric spark from a magnet. The spark which he obtained was got from a soft iron magnet, made by the influence of a voltaic current. Professor Nobili[2] and Antinori afterwards obtained the electric spark from a soft iron magnet, made by the influence of a common artificial magnet; and Professor Forbes (March 1832) obtained the electric spark from a soft iron magnet, made by the influence of a natural loadstone.[3] The method adopted by Professor Forbes is shown in fig. 91, where A is

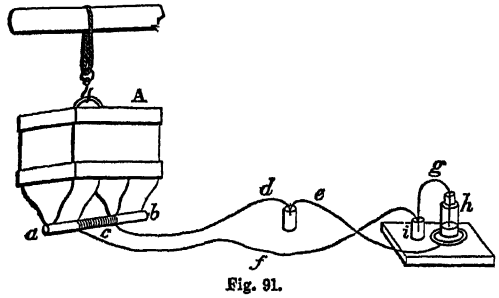


Fig. 91.

a suspended natural magnet. A cylindrical keeper or armature, *a b*, has a helix, *c*, coiled round it, about 7½ inches long, and consisting of about 150 feet of copper wire, about 1-20th of an inch in diameter; the helix consisted of four layers in thickness, separated by insulating partitions of cloth and sealing-wax. The branch *b d e* of the wire terminates in the bottom of the glass tube *h*, containing mercury, with a pure surface. The other branch *f* of the helix communicates by means of the mercury cup *i*, with the iron wire *g*, the fine point of which is brought by the hand into contact with the surface of the mercury in *h*, and is separated from it the instant the keeper *a b* is brought into contact with the poles of the magnet; the spark is then produced in the tube *h*.[4]

Magneto-Electricity.

That the action of magneto-electricity is the converse of that of electro-magnetism, is well shown in the rotatory apparatus in fig. 92. It consists of a copper disc C, revolving round a horizontal axis by means of the handle H. A powerful horse-shoe magnet, AB, is so placed that the edge of the disc C can revolve between its poles *n s*. Two conducting wires *w*, *w'*, are so placed, that two of their extremities terminate in the mercury cups of a galvanometer *g*, while the other end of the first is kept in perfect metallic contact with the axis, and the other end of the second is in contact with the circumference of the disc at the point between the poles *n* and *s* of the magnet. When this disc revolves from right to left, an electric current proceeding from the centre to the circumference of the disc, is generated in the direction of the curves, and the needle of the galvanometer is deflected. If the disc revolve from left to right, the electric current moves in the opposite direction.

Rotatory magneto-electric apparatus.

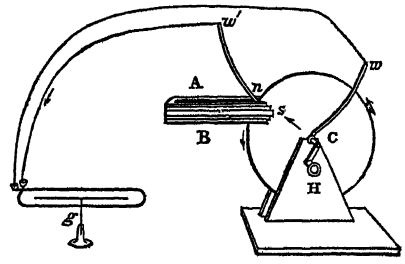


Fig. 92.

For further information on the subject of magneto-electric induction, see Mr Faraday's papers in the *Annales de Chimie et de Physique*, tome li. p. 404, &c.: *Lond. and Ed. Phil. Mag.* October and November 1840, vol. xvii., p. 281, 356; and Dr Golding Bird's *Elements of Natural Philosophy*, Lond. 1839, p. 243.

Description of Magneto-Electric Apparatus.

M. Pixii's machine.

After Dr Faraday's great discovery of *magneto-electric* or *volta-electric induction*, various machines were constructed for experimental investigation and exhibition. M. Hippolyte Pixii of Paris exhibited to the Academy of Sciences, in 1832, his *magneto-electric* machine. A powerful magnet was made to revolve with great rapidity before its keeper or armature, which had round it a coil of copper wire about 3000 feet long. By this means sparks and severe shocks were obtained, a feeble charge was accumulated in a Leyden phial, the gold leaves of an electrometer were made to diverge, and water was decomposed.

Mr Saxton's machine.

A very ingenious and complete machine was exhibited by Mr Saxton, at the meeting of the British Association in June 1833, as shown in fig. 93. The magnet A is a horse-shoe one of great power, composed of many steel plates, closely applied to each other, or it may be a soft iron electro-magnet of the same shape. A keeper, CD, of the purest soft iron, has each of its ends bent into a right angle, and is so mounted that the surfaces of their

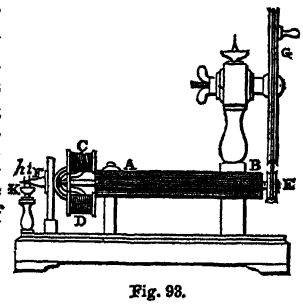


Fig. 93.

[1] See *Comptes Rendus*, &c., tome l. pp. 936, 964, May 21 and 28, 1860.
[2] *Ann. de Chim.* December 1831, and *Antologia*, November 1831.
[3] See *Phil. Mag.* June 1832, p. 401, and *Lond. and Ed. Phil. Mag.* November 1834.
[4] *Edin. Trans.* vol. xii.

Magneto-Electricity.

ends are exactly opposite and close to the poles of the magnet. In this position the keeper CD may be made to revolve round the horizontal axis EF, by means of the wheels C and E, and band GE fixed to the upright pillar B. Round each end, C, D, of the keeper, are coiled two series of copper wires, covered with silk, so as to form compound helices. The ends of these wires, which have the same direction, are joined together, and are likewise connected with a circular disc, revolving with the keeper in a cup of mercury, with which in every position of the disc it is in metallic communication. The other ends of the wires are joined, and passing together without metallic contact through the spindle EF, terminate in a slip of copper, with two opposite points, as at *i*, at right angles to the axis. These points alternately dip into and rise above the mercury in another cup, K, which may be connected with the first by means of a copper wire. Now, whenever the ends of the keeper are opposite the poles of the magnet, the keeper becomes a temporary magnet, and it ceases to be so when the line joining them is at right angles to the line joining the two poles. The instantaneous generation and extinction of the magnetic force take an opposite direction in the keeper according as its opposite ends are close to the same poles, and induce corresponding opposite electric currents in the copper wire, provided the circuit is complete by the immersion of the points at *i*. The arrangement of the points at *i* is such, that they just rise from the mercury as the ends of the keeper come opposite to the poles of the magnet; and hence the sudden breach of the circuit makes the current pass in the form of a brilliant spark. If a fine platinum wire, instead of the dipping points, forms the communication between the revolving disc and spindle, it may be kept at a red heat, its light slightly intermitting from the alternation of the currents. If a communication is formed between the two cups of mercury by two copper cylinders grasped in the hands, a strange sort of shock will be experienced, which is sometimes almost intolerable. Chemical decompositions are also readily effected, and the amount will be proportioned to the quantity of electricity in circulation.

Mr E. M. Clarke's magneto-electric machine.

The magneto-electric machine has been greatly improved by Mr E. M. Clarke, magnetical instrument maker, London. It is represented in fig. 94, where A is the battery of bent bar magnets resting against the vertical board B, and by means of a bar of brass C, with a bolt and screw-wheel, the magnets can be drawn firmly to the board B, or taken from it. One of the keepers or armatures D is screwed into a brass mandrill between the poles of the magnets, and it is made to revolve by the multiplying wheel E. This armature has two coils of fine copper wire 1500 yards long wrapped round its cylinders, the beginning of each coil being soldered to the armature D, from which also projects a brass stem carrying the break-piece H, which can be fastened in any required position by a binding screw; a hollow brass cylinder K, to which the ends of the coils are soldered, being insulated by means of a piece of hard wood attached to the brass stem. An iron wire spring O passes at one end against the cylinder K, and is kept in contact with it by a screw in a brass strap M in the wooden block L. A square brass pillar P fits also a square opening in the other brass strap N on the other side of the block L. A metallic spring Q rubs gently upon the break-piece H, and is retained in perfect metallic contact with it by a screw in the pillar P, the two straps of brass M, N, are connected by a piece of copper wire T, and in this state the parts D, H, Q, P, N are in connection with the commencement of each coil, and the parts K, O, M with the termination of each coil. The perfect metallic contact thus obtained by the spring and break, enables Mr Clarke to dispense entirely with the use of mercury, which is at all times a troublesome accompaniment of machinery.

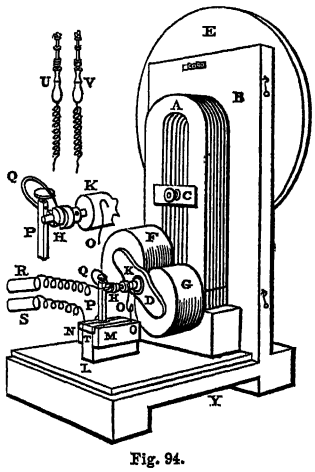


Fig. 94.

Magneto-Electricity.

But the great superiority of Mr Clarke's machine arises from his employing two different armatures, and thus being enabled to produce the separate effects of quantity and intensity to the full extent of the power of his battery. Having, in November 1834, tried the effects of coils of wire of different thicknesses, he found that the thick copper bell wire gave brilliant sparks, but no perceptible shock, while very fine wire gave powerful shocks, but very feeble sparks. By means of the *intensity armature*, which is that shown in fig. 94, the various experiments made with a number of separate galvanic plates may be performed, while the intense agony produced by its shocks is intolerable: It can, at the same time, electrify the most nervous person without occasioning the least uneasiness. It decomposes water and the neutral salts. It deflects the gold leaves of the electroscope, charges the Leyden jar; and by an arrangement of wires from the mercury-box to the battery, the electricity is made visible, passing from the magnetic battery to the armature, and sparks and brilliant scintillations of steel can be obtained.

Intensity armature.

The *quantity armature* differs greatly from the intensity one, as shown in fig. 95, which exhibits the method of producing the spark. The weight of the iron in the cylinders is much greater than in the intensity one, the copper wire is much thicker, and its length is only forty yards. By this armature all the experiments can be made which are usually performed by a single pair of voltaic plates of large surfaces, or by a calorimotor; but it will not do for any of the intensity experiments. It produces such large and brilliant sparks, that a person can read small print from the light it produces. It ignites gunpowder and platina wire, without enclosing the wire in a hermetically sealed glass case. It deflagrates gold and silver leaf, and produces brilliant scintillations from a small steel file. It produces also rotatory motions in delicately suspended wire frames round the poles of a vertical horse-shoe magnet,[1] and all the other effects of voltaic electricity.

Quantity armature.

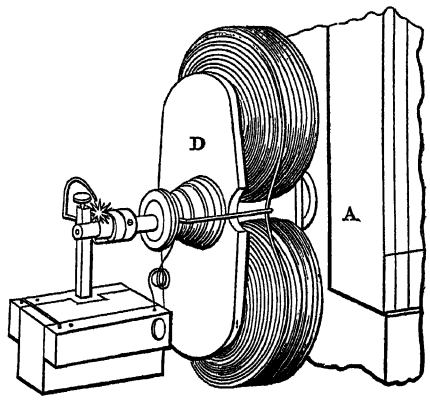


Fig. 95.

Several very curious and unexpected results were ob-

[1] See *Lond. and Edin. Phil. Mag.* Oct. 1836, No. 54, vol. ix. p. 262, and Noad's *Lectures*, p. 344.

Magneto-Electricity.

tained on a magneto-electric machine of very large dimensions, which Mr Clarke exhibited at the meeting of the Electrical Society. The battery was separated into two parts connected by the armatures, the quantity armature being at one side, and the intensity one at the other. The quantity armature had a short coil of thick insulated copper wire, and the intensity one had 15,375 yards of fine copper wire. The intensity arrangement, to the surprise of everybody, gave no decomposition, but gave an excruciating and even dangerous shock, while the quantity arrangement gave one cubic inch of the mixed gases in four minutes. Considering these unexpected results as owing to a compound action produced by the rotation of the two armatures, he arranged the magnets as in his first machines, the only difference being in the size of the new machine. The battery was composed of ten cut and polished steel bars, each four feet long, the whole weighing 156 lbs. According to Mr Noad,[1] the novel results of the experiments were the great amount of gas given by the quantity armature, viz. one cubic inch in one and a half minute, and the trifling decomposing effect of the intensity armature. The intensity spark was long, straggling, and noiseless, like a spark at the striking-distance from the prime conductor of an electrical machine, while the quantity spark had the usual stellar form, but was attended with a loud snapping noise, as in the discharge of a Leyden jar. Both the sparks, however, were equally luminous. By employing a secondary coil, Mr Noad has given shocks with the quantity armature, almost as powerful as those obtained from the intensity one, by using the form of coil first proposed by Professor Callan of Maynooth, and the contact-breaker of Dr Golding Bird.

Mr Clarke's large machine.

Dr Bird's method of breaking contact.

The following arrangement (fig. 96) for producing powerful shocks, and strong chemical action by secondary currents, was first given by Dr Golding Bird. Upon a reel, with a hollow axis three inches long, wound about 60 feet of copper wire, $\frac{1}{12}$th inch in diameter, covered with cotton thread. The two ends of the wire are connected with p, p', by means of binding screws. Over this primary coil is wound a second insulated copper wire, $\frac{1}{80}$th inch in diameter, and about 1500 feet long, and the two ends of this wire are connected with s, s', by means of binding screws. From the law of electro-dynamic induction, it is evident

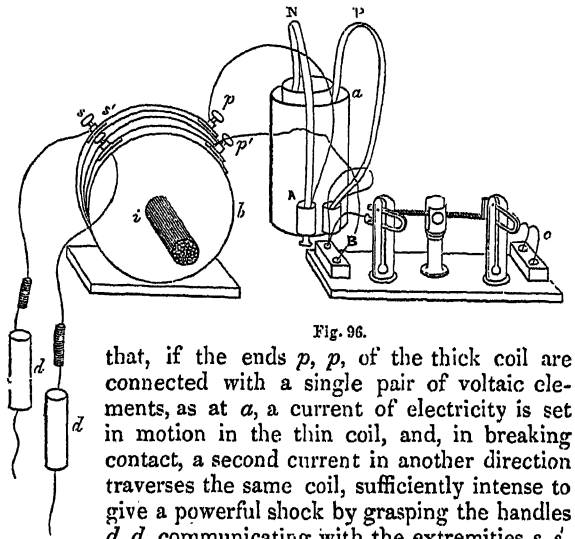


Fig. 96.

that, if the ends p, p, of the thick coil are connected with a single pair of voltaic elements, as at a, a current of electricity is set in motion in the thin coil, and, in breaking contact, a second current in another direction traverses the same coil, sufficiently intense to give a powerful shock by grasping the handles d, d, communicating with the extremities s, s', of the thin coil. The intensity of the secondary or reduced current is greatly increased by inserting a bar i, of soft wire, or, what is better, a bundle of soft iron wires, in the hollow axis of the reel, which becomes magnetic.

Magneto-Electricity.

Dr Bird's method of breaking contact.

The ingenious method of breaking contact in this arrangement, which we owe to Dr Golding Bird, though shown in

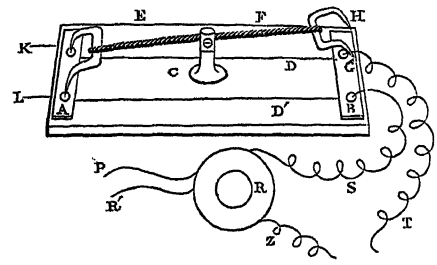


Fig. 97.

fig. 96, is more distinctly represented in fig. 97. It consists of a base of wood, eight inches long and three broad, having at both ends a piece of hard wood, A, B, each piece having two holes excavated in it to hold mercury. The holes in A communicate with those in B, by thick copper wires D, D. A piece of soft iron wire E F, five inches long, and one-eighth inch diameter, supported with screws with milled heads, moves in a vertical plane upon the upright stem C. Round the wire E F are wound two helices of thin insulated copper wire in the same direction from right to left, so that the two ends of one helix may terminate in the copper points G, H, and those of the other in the points K and L. The small horse-shoe *permanent* magnets, shown in fig. 97, are fixed on proper supports, near the ends of the wire E F, so that, in depressing the end F of the bar, it may be opposite one, suppose the *south* pole of one magnet, and consequently the end E will be opposite the other, the *north* pole of the second magnet. On raising the end F, the contrary will take place, and to effect this the similar poles of the magnet should be in the same direction. Upon connecting the mercury cups in A or B, as shown in fig. 96, with the small voltaic battery at a, the wire E F will become a temporary magnet, if the ends of either helix are allowed to dip in the mercury; and if connection with the battery is properly made, the ends or poles of the temporary magnet will be repelled by the poles of the permanent magnet to which they are opposed; the wire E F will therefore move, and make the ends of the second helix dip in the other cups of mercury,—repulsion will again take place, and so on;—in this way, about 300 oscillations of E F can be obtained in a minute. Upon connecting the ends p, p, of the thick helix with a single voltaic pair, by means of this contact-breaker, a series of powerful induced currents will be obtained from the extremities s, s', of the larger helix. This connection is best made as in fig. 97, where R is a section of the reel, S one end of the short helix, connected with a cup of mercury in the piece B, Z the other end of the short helix, connected with one plate of the battery, while the wire T connects the other cup of mercury in B with the other plate of the voltaic pair. When the points G, H, K, L, leave the mercury, very brilliant sparks are produced. A loud snapping noise accompanies them, and a vivid combustion of the mercury, clouds of the oxide of mercury being largely evolved. If the ends P, R', fig. 97, or s, s', fig. 96, have platinum points, and are immersed in water, acidulated with sulphuric acid, torrents of minute bubbles of oxygen and hydrogen are evolved; and if, instead of water, the points are pressed upon paper, moistened with iodide of potassium, iodine and oxide of potassium are separated. Solutions of sulphate of potash and soap, chloride of potassium, sodium, and antimony, and copper, are also rapidly decomposed. Dr Page was the first person who suggested the application of permanent magnets for the purpose of breaking contact,

[1] *Lectures on Electricity*, p. 352.

Magneto-Electricity.

though Dr Bird afterwards, and without knowing this, made the same application.[1]

Ruhmkorff's induction coil.

One of the most important of our magneto-electrical machines is the induction apparatus of M. Ruhmkorff, who by a succession of improvements has brought it to a high degree of perfection. In its earliest form, in 1851, it produced, with two elements of Bunsen, sparks in air 4 inches long, or in vacuo beams of light similar to those of the most powerful electrical machines. In its more recent state it produces, with twenty-five elements of Bunsen, sparks *five feet long*. The Academy of Sciences, in 1858, adjudged to its inventor Tremont's prize of 1000 francs for the years 1856–7, and also for 1858, 1859, and 1860, making in all 5000 francs.

The following is a brief description of this coil, in its best and most recent form, as constructed by Mr W. D. Hart, philosophical instrument maker, Edinburgh. In its largest size (fig. 98) the apparatus consists of a primary coil

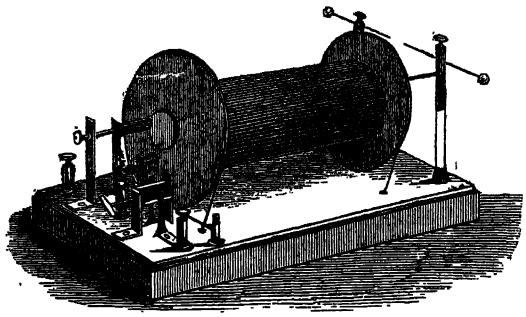


Fig. 98.

15 inches long, containing about 60 yards of stout covered wire in 400 convolutions. This coil is covered with several folds of varnished silk, in order to insulate it from the coil of fine wire in which the secondary current is excited, and the insulation may be increased by enclosing the primary coil in a glass tube. In Ruhmkorff's coil the fine wire is the 100th part of an inch in diameter, and he usually employs from 6000 to 10,000 yards of it, covered with silk and varnished. The contact-breaker is a small hammer, wrought by the attraction of the iron core in the centre of the bobbin, the points of contact being of thick platinum. On the recommendation of M. Fizeau, a large conducting surface, consisting of several square feet of tin foil, pasted on each side of varnished silk, is connected with each of the wires through which the voltaic current is transmitted. By this means the effect is greatly increased, as a more powerful battery may be made without injury to the platinum surface of the contact-breaker.

By a careful insulation of the wires more powerful results have been obtained than those from Ruhmkorff's coil, with considerably shorter lengths of wire. The length of the secondary wires, in the largest of Ruhmkorff's apparatus, is about *ten* miles. In the improved induction apparatus, shown in fig. 98, the length of the secondary wire is only *three* miles long, and sparks are obtained between the terminals from 3 to 4½ inches through free air.

We regret that our limits do not permit us to give an account of some interesting experiments of Mr Noad, on the effects of strong and weak electrical currents,[2] on long flat coils of considerable breadth of surface, and of various inventions made in the United States by Dr Henry, Dr Page, and other eminent philosophers, an account of which will be found in Professor Silliman's *American Journal of Science*.

PART IV.—ON THERMO-ELECTRICITY.

Thermo-Electricity.

Seebeck's discoveries.

While investigating the influence of heat in voltaic combinations, Dr Seebeck of Berlin was led to the important discovery that magnetism was developed in two metals forming a circuit, when the equilibrium of temperature in that circuit was disturbed.

If A B C D, for example (fig. 99), be a metallic circuit, consisting of an arch of *bismuth*, A B C, and an arch of *copper*, A D C, then if one of the junctions, A, is heated, an electrical current is established, passing into the heated junction from the bismuth to the copper. From many experiments Dr Seebeck found that, in various circuits formed with bismuth and other metals, the current always passes from the bismuth to the other metals, the bismuth losing *positive* electricity, or becoming *negative* with all the other metals.

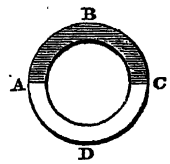


Fig. 99.

The order of the metals, beginning with galæna, in which they are negative in reference to those which precede them, is given in the following table, which, excepting some additions and alterations, was drawn up by Professor Oersted.

Galæna, placed above bismuth by Professor Cumming.	Copper placed here by Professor Cumming.
BISMUTH.	Silver purified by cupellation, and also that produced from the chloride.
Mercury placed here by Professor Cumming, but beside lead by Oersted.	Uranium.
Nickel.	Molybdenium.
Platinum, very variable in its results.	Rhodium.
Palladium.	Iridium.
Cobalt.	Zinc, pure and that occurring in trade.
Uranium.	Wolfram.
Manganese.	Cadmium.
Titanium.	Charcoal.
Tin, English and Bohemian.	Plumbago.
Lead,[3] pure lead and that occurring in trade.	Steel.
Brass, different specimens give different results.	Iron, pure iron and that occurring in trade.
Gold purified by antimony, Oersted, and also that reduced from the oxide.	Arsenic.
	ANTIMONY.
	Tellurium.

Although Dr Seebeck found that most of the metals which stand near each other in the above series produce feeble thermo-electricity, and those more distant a more powerful effect, yet this law did not always hold. *Tellurium*, for example, is less thermo-electric with bismuth, and most of the other metals, than antimony is; and with *silver* it is more effective than most of the metals above it. *Antimony*, too, is more effective with *cadmium* than with mercury; while *iron* is very feebly thermo-electric with most of the other metals, especially *nickel* and *cobalt*.

The effects of the sulphurets Dr Seebeck found to be remarkable. Sulphuret of lead becomes negative even in contact with the bismuth. The sulphurets of iron, arsenic, cobalt and arsenic, and copper, all of which have a *maximum* of sulphur, stand near to bismuth; while all the sulphurets, with a *minimum* of sulphur, have nearly the same power as antimony. The sulphuret of copper, with a minimum of sulphur, occupies a place even below antimony. Concentrated *nitric* and *sulphuric* acids stand above bismuth; while concentrated solutions of *potass* and of *soda* are below antimony and tellurium.

It has been considered probable that the specific heat

[1] See *Lond. and Edin. Phil. Mag.* Jan. 1838, vol. xii. p. 18; Noad's *Lectures*, p. 364; and Dr Golding Bird's *Elements of Nat. Phil.* chap. xvii.

[2] *Lectures*, p. 356.

[3] Professor Daniell places *lead* before *tin*.

Thermo-Electricity.

and the conducting power of the metals perform a part in the thermo-electric phenomena; but this is not established by observations yet made.

The following table, by Professor Cumming, shows the relations of the thermo-electric and voltaic series, and of the series of conductors of heat and electricity. To these we have added two columns on the optical properties of the metals:—

Thermo-Electricity.

Series of Conductors.

Thermo-Electric Series.	Voltaic Series by Acids.	Of Electricity.	Of Heat.	Order of Metals in their Degrees of Elliptical Polarization.[1]	Order of Metals in their Refractive Power.
Galæna.	Potassium.	Silver.	Silver.	Pure silver.	Grain tin.[2]
Bismuth.	Borium.	Copper.	Gold.	Common silver.	Mercury.
Mercury. }	Zinc.	Lead.	Tin.	Fine gold.	Galæna.
Nickel. }	Cadmium.	Gold. }	Copper.	Jeweller's gold.	Iron pyrites.
Platinum.	Tin.	Brass. }	Platinum.	Grain tin.	Grey cobalt.
Palladium.	Iron.	Zinc. }	Iron.	Brass.	Speculum metal.
Cobalt. }	Bismuth.	Tin.	Lead.	Tin plate.	Antimony, melted.
Manganese. }	Antimony.	Platinum.		Copper.	Steel.
Tin.	Lead.	Palladium.		Mercury.	Bismuth.
Lead.	Copper.	Iron.		Platinum.	Pure silver.
Brass.	Silver.			Bismuth.	Zinc.
Rhodium.	Palladium.			Speculum metal.	Iron plate, hammered.
Gold.	Tellurium.			Zinc.	Jeweller's gold.
Copper.	Gold.			Steel.	
Silver.	Charcoal.			Iron pyrites.	
Zinc.	Platinum.			Antimony.	
Cadmium.	Iridium.			Arsenical cobalt.	
Charcoal. }	Rhodium.			Cobalt.	
Plumbago. }				Lead.	
Iron.				Galæna.	
Arsenic.				Specular iron.	
Antimony.					

The structure or the crystalline arrangement of the particles of bodies seems to exercise some influence over their thermo-electric powers. In a thermo-electric combination of *zinc* and *silver*, for example, the electricity increases with the temperature up to about 250° of Fahrenheit, when it ceases altogether, and by increase of temperature the electric current is re-established in an opposite direction.

Binary combinations.

In order to measure the thermo-electric power of different binary combinations of metals, from the same differences of temperature, a compound circuit must be formed of all those which we desire to compare. The junctions of the metals must be kept at the temperature of melting ice, excepting the junction which is to be made active, and which is to be plunged into hot oil. In this way the mere conducting power of the circuit is the same in every experiment, and the results obtained become strictly comparable.

The following table, given by Becquerel,[3] exhibits the quantities of the currents for a difference of temperature of 36°, of pairs of *eight* metals differently arranged. The lengths of the metals were 7·88 inches, and their diameter about the 200th of an inch. The sign + indicates the metal from which the electric current proceeds.

Thermo-Electric Power of Different Metallic Couples.

	Temperature of junction.	Deviation of Needle.	Intensity of Currents.
+ Iron and — tin	68°	36·°50	31·°24
+ Copper and — platinum	68	16· 00	8· 55
+ Iron and — copper	68	34· 50	27· 96
+ Silver and — copper	68	4· 00	2· 00
+ Iron and — silver	68	33· 00	26· 20
+ Iron and — platinum	68	39· 00	36· 07
+ Copper and — tin	68	7· 00	3· 50
+ Zinc and — copper	68	2. 00	1· 00
+ Silver and — gold	68	1· 00	0· 50

If we compare the numbers in the last column, we shall find, as M. Becquerel states, that, for a temperature of 36°, each metal acquires such a degree of thermo-electric *power* that the intensity of the current, produced by the contact of the two metals, is equal to the difference of the quantities which represent each of these actions in each metal. Thus, if we call the *power* of each metal *p*, we shall have, in the case of the iron and copper junction, *p.* iron − *p.* platina = 36·07. Subtracting the first from the second, we have *p.* copper − *p.* platina = 8·11, instead of 8·55, given by experiment. The iron and tin junction gives 31·24, and that of copper and tin 3·50. The difference in that of iron and copper is thus 27·74, in place of 27·96 by experiment. The intensity of the thermo-electric current being, therefore, equal to the difference of the thermo-electric action produced in each metal by the same temperature, we shall obtain the powers of each of these metals as follows:—Calling the *power*, or thermo-electric action of iron at 36° Fahrenheit, *x*, we shall have,—

p. Iron.....*x*	*p.* Copper.....*x* − 27·96
p. Silver.....*x* − 26·20	*p.* Tin.....*x* − 31·24
p. Gold.....*x* − 26·70	*p.* Platina.....*x* − 36·
p. Zinc.....*x* − 26·96	

Hence, if *x* were known, we should obtain *p* upon the supposition that the thermo-electric powers are proportional to the radiating powers of the metals. M. Becquerel has obtained the following numbers;—

Metals.	Thermo-Electric Powers.	Metals.	Thermo-Electric Powers.
Iron	5·	Copper	4·
Silver	4·07	Tin	3·89
Gold	4·052	Platina	3·68
Zinc	4.035		

These values will suit any thermo-electric circuit, and all cases where the thermo-electric power increases with the temperature, that is for all temperatures below 122° Fahr.

Nobili's experiments.

M. Nobili[4] formed similar circuits, with substances whose conducting power was inferior to that of the metals. Having made cylinders of porcelain clay, about 2½ inches long, and 3½ lines in diameter, he coiled round the ends of each of them cotton steeped in a conducting liquid, by which they were made to communicate directly with the galvanometer. One end of the cylinder was brought to a point, and after it was made red-hot by a spirit-lamp, he

[1] See *Phil. Trans.* 1830, p. 294. [2] Id. p. 324. [3] *Traité Exp. de l'Electricité*, tome ii. p. 53.
[4] *Biblioth. Univers.* tome xxxvii. p. 54.

Thermo-Electricity.

pressed it against the cold extremity of the other cylinder, when he found that a current was established from the hot extremity to the cold one. This effect, as M. Becquerel states, arises from the mutual reaction of the two portions of water of different temperatures.

It did not escape the sagacity of Dr Seebeck that the thermo-electric current might be increased, by forming a compound thermo-electric current, and arranging the metallic couples in a series analogous to those in the voltaic circuit. Having met, however, with some obstacles in this part of his inquiry, he discontinued the investigation, which was taken up without their knowing that he had entered upon it by Baron Fourier and Professor Oersted. They first employed a hexagonal combination of three pieces of bismuth and three of antimony soldered together. One side of the hexagon was placed in the magnetic direction, and a compass put below it. *One* of the junctions was then heated, then *two*, not adjacent, then *three*, always leaving one junction not heated between the two heated ones. By heating *one* junction the needle deviated some degrees, still more by heating *two*, and still more by heating *three* junctions. When *three* junctions were cooled with ice, the other three having the ordinary temperature of the atmosphere, effects still more distinct were produced. When *three* alternate junctions were *heated*, and the other *three* cooled with ice, the needle deviated sixty degrees.

Fourier and Oersted's compound circuits.

In a rectangular circuit, with twenty-two bars of antimony and twenty-two of bismuth soldered together, the same effects were obtained. After dissolving one of the junctions, a little mercury cup was soldered to each of the disjoined bars, so that the circuit could be re-established by different means. A copper wire, 4 inches long, and 1-25th of an inch in diameter, nearly re-established the current; and it was completely re-established by two parallel pieces of the same wire. A wire of the same diameter, but *three* feet long, was found a tolerably good conductor; but a platina wire, about 16 inches long, and 1-50th of an inch in diameter, scarcely transmitted a *fortieth* part of the effect. Acids, and solutions of alkalies, and other metallic oxides, though good conductors in the voltaic or hydro-electric circuit, insulated entirely the thermo-electric current. The same effect was produced by two discs of silver, separated by the thinnest blotting-paper moistened with sulphate of copper. In these experiments the intensest current produced no chemical effects, no ignition of the wires, and no electric condensation; but a prepared frog was made to palpitate.

In thermo-electric currents, which differ only in lengths, the shortest is the most powerful, a circuit of double length having little more than half the effect. In order to find the law of increased effect, as depending on the number of junctions, Professor Oersted composed circuits of equal length with different numbers of junctions.

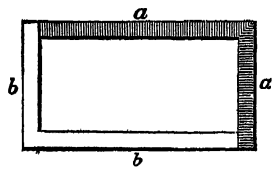


Fig. 100.

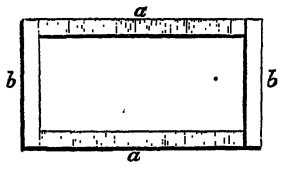


Fig. 101.

In fig. 100 is shown a simple circuit consisting of one bar, *a a*, of antimony, and one, *b b*, of bismuth; and in fig. 101, a complex circuit of the same length and materials, When one of the junctions in fig. 101 was heated or cooled. and two of the junctions at the extremities of the diagonals in fig. 101 heated or cooled to the same degree, the deviation of the needle was 22° in the first case and 30° in the second.

Thermo-Electricity.

In like manner open circuits, as in figs. 102, 103, having

Professor Oersted's experiments.

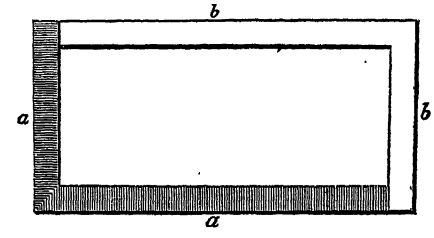
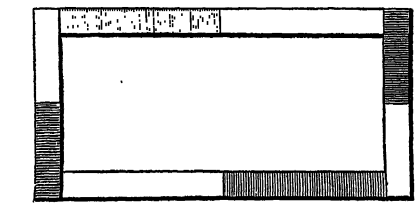


Fig. 102.


Fig. 103.

each the same length, but double that of the preceding two, had the one *one* junction, and the other *three* junctions, heated or cooled equally, the first gave a deviation of about 14°, and the other nearly 32°.

"In several complex circuits," says Professor Oersted,[1] "it is found that the heating or cooling of one junction only produces twice the angular deviations of that added by the addition of one active junction more. The effect of one active junction, when the others are at rest, is, by experiment, found to be twice the effect of all the arrangements divided by the sum of the elements + one. The effect of each addition of a new active junction is only *half* this quantity, and seems even to be in a decreasing ratio when the number of junctions is great."

From these and other observations, it appears that the thermo-electric current produces a prodigious quantity of electricity, but in a state of very feeble intensity, while the voltaic current has a very great intensity. The former is impaired by the resistance opposed to it by a long multiplying wire, while the latter is increased in surmounting this resistance. M. Pouillet has endeavoured to compare the intensity of these two currents, by passing the hydro-electric current through a platinum wire long enough to reduce it to an intensity which will just balance the thermo-electric current. In one case he found that 590 feet of platinum wire, ·006 of an inch in diameter, including the resistance of the battery, reduced a hydro-electric current, produced by twelve pairs of plates with double coppers, to an equilibrium with that of one thermo-electric pair of bismuth and copper, in a circuit of 65·6 feet of copper wire, ·039 of an inch in diameter, with a difference of temperature of 76° Fahrenheit. By computing the rotation between the electro-motive forces and the resistance in these two cases, he found that the hydro-electric current had an intensity 114,000 times greater than that of a single pair of bismuth and copper, produced by a difference of temperature, between the two junctions, of 108° of Fahrenheit.[2]

M. Pouillet's researches.

In order to compare the conductibility of metals for thermo-electro currents, M. Pouillet[3] employed *two* equal thermo-electric currents. The *first* was weakened by making it traverse the metallic wire submitted to experiment; and the *second* was weakened precisely the same

Conductibility of metals for thermo-electricity.

[1] *Edinburgh Encyclopædia*, art. "Thermo-Electricity," vol. xviii. p. 585. Becquerel's *Traité*, tome v. p. 27.
[2] *Elem. Phys. Exp.* liv. v. chap. 5, § 426.

Thermo-Electricity.

quantity, by traversing lengths, more or less great, of another wire, which served as the term of comparison. The following table shows the results of this comparison, the conductibility of pure mercury being reckoned 100.

Conductibility of metals for thermo-electricity.

Names of Substances.	Diameter of wire.	Length of wire submitted to experiment.			Conductibility that of mercury being 100.
	Millim.	Millim.	Millim.	Millim.	
Palladium.....	0·176	1900	1200	500	5791
Silver 963, pure	0·174	2000	1500	200	5152
— 900	0·194	2000	1500	200	4753
— 857	0·178	1200	800	400	4221
— 747	0·179	1200	600		3882
Gold, pure.....	0·176	1000	500		3975
— 951	0·176	600	300		1338
— 751	0·176	400	206		714
Copper, pure...	0·182	2000	1000	500	3838
— unmelted	0·182	2000	1000	500	3842
Platinum.....	0·186	800	600	300	855
Brass.....	0·182	Limits of conductibility.			1260 to 900
Steel, melted....		Ditto	ditto.		800 to 500
Iron		Ditto	ditto.		700 to 650

Hence it appears that *palladium* is the best conductor of thermo-electricity, and *mercury* the worst, having *sixty* times less conductibility than palladium. That which has a slight effect on the conductibility of mercury produces a prodigious variation in that of iron or steel. Even the heat of the hand produces very sensible effects, and what M. Pouillet justly thinks still more wonderful, the heating to redness of some millimètres of the length of a wire of iron or steel, is sufficient to make its conductibility *three* or *four* times less.

Intensity of thermo-electric currents.

When thermo-electric currents are produced by a single element, and the thermo-electric power remains the same, M. Pouillet found that the intensity of the current which it produces is inversely as the length of the circuit, and directly as the conductibility of the wire or rod which forms the current. He found, also, that in a thermo-electric circuit composed of wires of different sections, the elementary force of the current is the same in all powers. If we take equal intervals on these different wires, the direct currents will be found to have different intensities, which are nearly in the inverse ratio of the sections of the wires in the intervals of deviation. M. Pouillet succeeded, also, in establishing the curious fact, which had been recognised by M. Marianini,[1] that several electric currents propagate themselves in the interior of bodies, as if they were alone, like light and heat.

Thermo-electric piles.

The first persons who succeeded in constructing thermo-electric piles were MM. Nobili and Melloni, who employed them successfully in their experiments on radiant heat. This instrument, however, has since been improved by Melloni, and we shall therefore describe it in preference after M. Becquerel. M. Melloni constructed his thermo-electric pile of fifty small bars of bismuth and antimony placed

Melloni's.

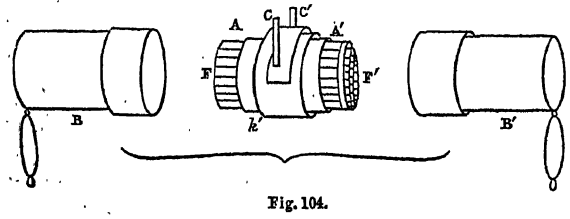


Fig. 104.

in a bundle, as shown at FF' in fig. 104, the length of the bundle being 30 millimètres, and its section 96 centimètres square. The two terminal faces are blackened. The bars of bismuth, which alternate with those of antimony, are soldered at their extremities, and separated throughout their whole lengths by an insulating substance. The first and the last bar have each attached to them a copper wire, abutting against one of the pins C, C' of the same metal, passing through a piece of ivory fixed in the ring AA'. The interval between the interior surface of this ring and the elements of the pile is filled with insulating matter. The free extremities of the two wires communicate with the ends of the wire of a multiplier, the needle of which indicates when the temperature of the anterior face of the pile rises or falls above that of the posterior face. Two metallic tubes, B, B, polished without and blackened within, are fitted to the two ends of the pile, to protect them from lateral radiations. The multiplier is shown in fig. 105,

Thermo-Electricity.

Melloni's thermo-electric pile

and multiplier.

where ABC is the frame enveloped by the copper wire, whose extremities abut against the metallic tubes FF', fig. 106. This frame is fixed on a horizontal stage DE, which can turn in its own plane, and round its centre, by means of a toothed wheel and pinion placed below, and moved by the milled head G. MN is the support of the astatic system of the two magnetic needles, suspended by the silk fibre VL, and the cylinder of glass RS covers the apparatus, and rests on the base KI. Fig. 106 is a section of the apparatus, by a plane passing through the support and one of the tubes of communication. The needles are 53 millimètres long, the diameter of the copper wire is 0·76 millimètres, and it is doubly covered with silk, and makes 150 circumvolutions round the frame, which is 6 millimètres high, having its length a little greater than that of the needles.[2]

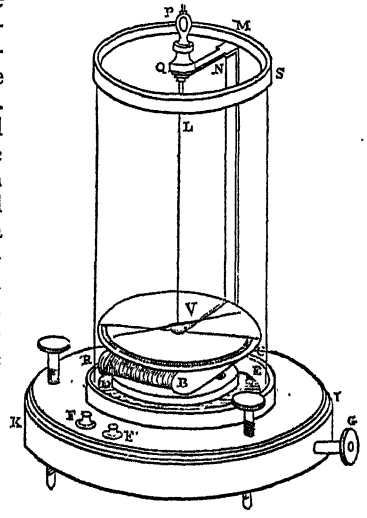


Fig. 105.

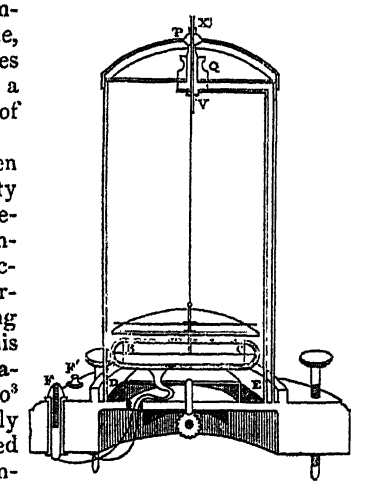


Fig. 106.

We have already seen that thermo-electricity possesses the same general characters as common and voltaic electricity. Although Oersted failed in obtaining chemical action from his thermo-electric combinations, yet Professor Botto[3] of Turin subsequently decomposed acidulated water. His apparatus consisted of a metallic wire or chain, composed of 120 pieces of platinum wire, each an inch long, and $\frac{1}{100}$th of an inch in diameter, alternately with the same number of pieces of soft wire of the same dimensions. This chain was wrapped spirally round a wooden rule 18 inches long, so that the joints were placed alternately at each side of the ruler, receding from the

Chemical effect of thermo-electricity.

[1] *Ann. de Chim.* &c. tome xlii. p. 131.

[2] Becquerel's *Traité*, &c. tome iii. p. 425.

[3] *Bibliothèque Universelle*, Sept. 1832.

Thermo-Electricity.

wood at one side to the distance of four lines. By using a spirit-lamp the same length as the helix, and a Nobili's galvanometer, a very energetic current was shown to exist, and the decomposition of acidulated water was increased, by substituting copper in place of platinum poles, in which case hydrogen only was set free. An increased temperature augmented the current and the decomposition. M. Botto obtained still more powerful effects by a pile of bismuth and antimony, consisting of 140 elements forming a parallelopiped, with a base of $2\frac{1}{4}$ inches, and a height of 1 inch.

Chemical effect of thermo-electricity.

Electric spark from the thermo-electric pile.

A distinct electric spark has also been obtained from the thermo-electric pile, by the Chevalier Antinori of Florence. Professor Linari[1] of Sienna verified this result with a Nobili's pile of 25 elements and temporary magnet, with an electro-dynamic spiral 805 feet long. With this apparatus he obtained a brilliant spark, visible in open day, whenever the contact was broken. With this pile, and temperatures from freezing to boiling water, he readily decomposed water, and also nitrate of silver. The same thermo-electric current magnetised an unmagnetic needle, and produced the phenomenon of the palpitation of mercury. Professor Wheatstone verified these experiments in 1837, by a thermo-electric pile of 33 elements of bismuth and antimony, forming a bundle three-fourths of an inch in diameter, and $1\frac{1}{6}$th long. The poles were connected by two thick wires, with a spiral of copper ribbon 50 feet long and $1\frac{1}{2}$ inch broad, the coils being insulated by brown paper and silk. One face of the pile was heated by red-hot iron brought near it, and the other cooled by ice. Two strong wires connected the poles of the pile and the spiral, and the contact was broken, when necessary, in a mercury cup, between one extremity of the spiral and one of these wires. A distinct spark was seen in open day whenever the contact was broken.[2]

Mr Watkins' thermo-electric pile.

The thermo-electric pile has been greatly improved by Mr Watkins, who employs a flat copper ribbon coil. In piles varying from 15 to 30 pairs of elements, he obtains brilliant sparks, by merely pouring hot water on one end, while the other has the temperature of the air.

Researches of Professor Andrews.

Professor Andrews of Belfast has recently succeeded in developing thermo-electric currents, by simply bringing two metallic wires at different temperatures into contact with a fused salt, between which and the wires no chemical action takes place. This result he first obtained by means of fused borax. He took two similar wires of platina, and connected them with the extremities of the copper wire of one of Gourjon's galvanometers, and fused a small globule of borax in the flame of a spirit-lamp on the free extremity of one of the platina wires, and having introduced the free extremity of the other into the flame, he brought the latter, raised to a higher temperature than the former, into contact with the fused globule. When this was done, the needle of the galvanometer was instantly driven with great violence to the limit of the scale. The direction of the current was always from the hotter platina wire, through the salt, to the colder wire. Professor Andrews obtained a permanent electric current in the same direction by simply fusing the globule between the two wires, and applying the flame of the lamp in such a manner, that the wires, at their points of contact with the fused salt, had different temperatures. Fused carbonate of soda gave similar but more powerful currents than borax. Carbonate of potash, chloride and iodide of potassium, sulphate of soda, chloride of strontium, heated glass, &c., produced similar currents; and even boracic acid, though such an imperfect conductor, deflected the needle 40°.

The currents thus produced have an intensity inferior to that of the hydro-electric currents, and they are capable of decomposing with great facility water and other electrolytes. Thermo-Electricity.

Before the salts were actually fused, Professor Andrews found that electrical currents were generated whose directions no longer followed the simple law, but varied in the most singular and perplexing manner, passing first from the hot to the cold wire, then by more heat from the cold to the hot, and by more heat still from the hot to the cold wire.

Professor Andrews obtained similar currents, by interposing certain minerals between unequally heated platina wires. *Mica*, heated very strongly, caused a deflection in the needle of 7°, and *Stilbite* a deflection of 25°, the current being in both cases from the hot to the cold wire.[3]

Thermo-electric rotations.

Thermo-electric rotations were, we believe, first produced by Professor Cumming, by means of a very simple apparatus. He formed a rectangle of silver and platina, as shown in fig. 107. The three upper sides are formed of silver, and the lower of platina. When suspended, as shown in the figure, and when one of the junctions was heated, it revolved from *left* to *right*, when the pole of a magnet was presented to another junction. When the rectangle was suspended upon the loadstone itself, and heat applied to one of the junctions, the rectangle soon began to turn.

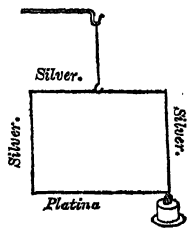
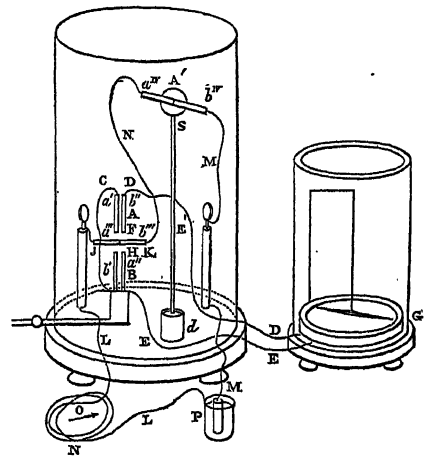


Fig. 107.

When a chain or wire, consisting of alternate links, or pieces of *platinum* and silver, is made part of the voltaic circuit, the links or portions of *platinum* wire will become *red-hot*, while those of *silver* remain *dark*, and comparatively *cold*.

Peltier's researches.

In studying the effects of thermo-electric currents, M. Peltier made the interesting discovery, that *cold*, instead of heat, is produced at the points of junction of certain crystallizable metals. The instrument by which he obtained these interesting results is shown in fig. 108, where A,B are


Fig. 108.

two thermo-electric couples in bismuth and antimony, C a copper wire which unites the antimony a' of the upper couple to the bismuth b of the lower couple. D, E, copper wires communicating with the galvanometer G of 84 coils, and completing the circuit between the upper bismuth b'' and the lower antimony a'. F, H are the free extremities of a'', b'', which form a pair of pincers, which press against each other by a spring. The bar JK is formed by a bar of

[1] *L'Indicatore Sanese*, No. 50, Dec. 1836.

[2] *Lond. and Edin. Phil. Mag.* vol. x. p. 415, May 1836.

[3] *Lond. and Edin. Phil. Mag.* vol. x. p. 433, June 1837.

Thermo-Electricity.

antimony a''', and of bismuth b''', which ought to traverse the electric current. L, M, M′ are conductors of the pile P, N a plate of copper, with a graduated circle and magnetic needle O, for measuring the quantity of electricity which passes through the entire circuit M, M′, N, K, b''', a''', L, P. The galvanometer G indicates the electricity produced by the variations of temperature of the ends F, H, resulting from those of the bars J, K, the closed circuit of this electricity being a', C, a''', E′, c, D, b'', a'. The ball A′ of an air thermometer (with its capillary tube E plunged in a vessel d of coloured alcohol) is crossed by a compound bar a^{iv}, b^{iv}, of bismuth and antimony united at S′. A graduated scale is placed behind the thermometer tube E′. The current of the pile P is received by copper conductors F, G.

Peltier's thermo-electric pincers.

If we place the wires of different metals between the thermo-electric pincers F, H, and vary the intensity of the current, we shall observe a rise of temperature when the conductors are homogeneous, the heat being the same throughout the whole length of the wires, with the exception of their extremities, where it increases or diminishes according as the pincers which retain the wire are worse or better conductors than itself. When copper pincers are used, a depression of temperature is felt at the distance of two or three centimètres, according to the intensity of the current. M. Peltier has found that when the current has double the intensity, or when the section of the conductor is one-half, the temperature is tripled, and that *cold* is produced when the current goes from the bismuth to the antimony, and *heat* when it goes from the antimony to the bismuth. The results which he obtained tend to prove that the two electricities produce heat by their union, however feeble be their intensities.[1]

Peltier's thermo-electric hygrometer.

M. Peltier's thermo-electric hygrometer, for determining by the change of temperature whether a solution or a chemical combination has taken place when two bodies are brought into contact, is shown in fig. 109. M. Becquerel had long ago shown that when a simple solution takes place no electrical effect is produced, but that when two substances chemically combine, positive electricity passes from an alkali to an acid, and negative electricity from an acid to an alkali. The nature of the electric wires therefore determines by means of a multiplier, whether combination or simple solution has taken place. But as a change of temperature also takes place, M. Peltier has employed this as the means of deciding whether solution or combination has taken place, cold being produced in the one case and heat in the other. This hygrometer is shown without the galvanometer in fig. 109, where A is a wooden disc for supporting the thermo-electric couples, being itself supported by a rod and bar; B, B, B, three couples of bismuth or antimony forming the thermoscopic support; W, W, the wires leading to the multiplier; D, a platina capsule filled with distilled water, which is to be placed on the couples; E E, a cylinder of card; and F F, a glass receiver open at top, but surrounded with a paper to prevent radiation. When distilled water is placed in the capsule, its spontaneous evaporation produces a depression of temperature which varies ordinarily from 40° to 60°[2]. As this apparatus is very sensible, the needle of the multiplier arrives rapidly at 90°; but this inconvenience is removed by placing in the circuit supplementary conductors, which diminish the intensity of the current, and bring back the needle to the first 20°. Tables are then formed which give the ratio between the deviations of the needles, the intensities of the current, and the differences. A very extended scale is thus formed, which may begin at 150° above zero, and descend indefinitely. To compare this instrument, we have only to determine the extreme dryness produced with muriate of lime placed in a close vessel. When the saturation of the air produces no evaporation, the capsule remains at the surrounding temperature, and the needle at zero. When we have determined the force corresponding to the number of degrees given by extreme dryness, we divided this force into 100 parts, corresponding to 100 degrees of ordinary hygrometers.

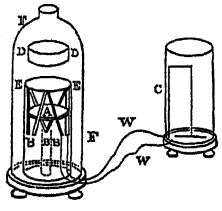


Fig. 109.

Thermo-Electricity.

Dr Locke, professor of chemistry in the medical college of Ohio, has lately constructed a new thermoscopic galvanometer, the peculiarity of which is the massiveness of the coil, which affords a free passage to currents of the most feeble intensity, and enables them to deflect a very heavy needle. The coil is made of a copper fillet about 50 feet long, $\frac{1}{4}$th of an inch wide, $9\frac{1}{8}$ thick, and weighing between four and five pounds. This coil is not made in a pile at the diameter of the circle in which the needle is to revolve, but is opened out, the several turns lying side by side, and covering almost the whole of that circle above and below. It is wound closely, and in parallel turns, on a circular piece of board $11\frac{1}{2}$ inches in diameter, and half an inch thick, covering the whole of it except two small opposite segments of about 90° each. The board being extracted leaves a cavity of its own shape, to be occupied by the needle. The copper fillet is not covered with silk or any other coating, but the turns of it are separated at their ends by veneers of wood just so far as to prevent contact throughout. The coil is supported on a wooden ring with brass feet and levelling screws, and surrounded by a brass hoop with flat glass cover, in the centre of which is inserted a brass tube for suspending by a silk fibre one of Nobili's double astatic needles, each part being about 11 inches long, $\frac{1}{4}$th of an inch wide, and $\frac{1}{60}$th thick. The lower part plays within the coil, and the upper part above it, and the thin white deal placed upon it. This instrument is peculiarly fitted for experiments in a class. It is very sensible to a single pair of thermo-electric metals, to the action of which it seems peculiarly adapted. With a battery of five couples of bismuth and antimony, the radiation of a person 12 feet distant, without any reflector, and when the temperature of the air was 72°, moved the needle sensibly. If a thermo-electric pile, massive in proportion to the coil, is used, this thermoscope would exhibit the experiments of Melloni satisfactorily to a large class. A more detailed account of this instrument will be found in the *London and Edinburgh Philosophical Magazine*, October 1837, vol. xi. p. 378.

Locke's thermoscopic galvanometer.

We shall now conclude this article with a brief notice of some investigations of Dr Draper of New York, on the electromotive power of heat. The apparatus which he employed is shown in fig. 110, where A A is a glass vessel

Dr Draper's researches.

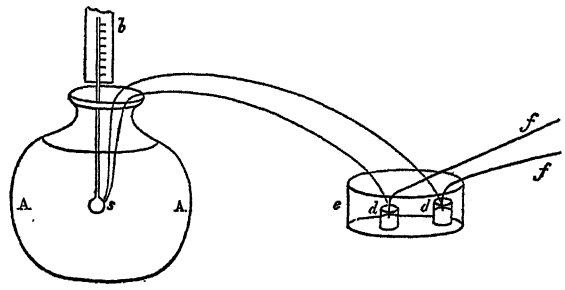


Fig. 110.

[1] M. Becquerel's *Traité*, &c. tome iii. p. 165, and v. p. 286.

[2] The degrees of the galvanometer we presume. M. Becquerel's *Traité*, &c. tome v. p. 243.

Thermo-Electricity.

Dr Draper's researches.

about 3 inches in diameter, with a neck wide enough to receive a mercurial thermometer *b*, and the extremity of a pair of thermo-electric wires about a foot long, and the $\frac{1}{16}$th of an inch in diameter, soldered at *s* with hard solder. The free extremities of these wires dip into the glass cups *d, d*, filled with mercury, and immersed in a trough *e*, containing water and pounded ice. By means of the copper wires *f, f*, $\frac{1}{8}$th of an inch in diameter, the apparatus is connected with the mercury cups of the galvanometer, the coil of which is of copper wire, $\frac{1}{8}$th of an inch thick, and making only twelve turns round the astatic needles, whose deviations are determined by the torsion of a glass thread, as invented by Dr Ritchie. When a copper and iron wire are used, they indicate temperatures with a promptitude and accuracy quite surprising. In using this apparatus, the vessel A A is filled two-thirds with water, the bulb of the thermometer being in the middle of the vessel, and the soldered extremity *s* of the wires in contact with it. The wires *f, f*, are then placed in the cups, and the trough *e* filled with water and pounded ice, and carefully surrounded with flannel. The water in A A is then brought to the boiling point with a spirit-lamp, and kept at that temperature till the astatic needles and thermometer are steady. For temperatures above 212°, Dr Draper substitutes for the glass vessel a tubulated retort containing quicksilver. Dr Draper's experiments were all made with the metals in the form of wires, and he obtained the following general results:—

1. Equal increments of heat do not set in motion equal quantities of electricity.

2. The tension undergoes a slight increase with increase of temperature.

3. The quantity of electricity evolved at any given temperature is independent of the amount of heated surface, a point being as efficacious as an indefinitely extended surface.

4. The quantities of electricity evolved in a pile of pairs is directly proportional to the number of the elements.

Dr Draper has been led to the following forms of construction, which give peculiar advantages to thermo-electric combinations.

In fig. 111, A, let *a* be a bar of antimony, and *b* one of bismuth, soldered at *c d*, and let the temperature be raised at *d*, a current is excited, which does not pass round the bars *a b*, but in a shorter and readier path, through the metals between *c d*, circulating as shown by the arrows. Nor will the whole current pass round the bars till the temperature of the soldered surface has become uniform. The combination A will therefore be improved by giving it the form in fig. B, a part being cut out at the dotted lines. In this form the whole current will be immediately forced to pass along the bars, and in such a pair the temperature will change very quickly. Dr Draper considers the form in fig. C as the best for a thermo-electric couple. In this form *a* is a semi-cylindrical bar of antimony, *b* one of bismuth, united together by the opposite corners of a lozenge-shaped piece of copper *c*. From its extent of surface the copper becomes readily hot and cold, and may be made very thin. With a pair of bars three-fourths of an inch thick, and a circular copper plate *c*, with both surfaces blackened, Dr Draper repeated the greater part of those experiments which M. Melloni made with his multiplier. Dr Draper found that thermo-electric currents, evolved by pairs of different metals, do not differ specifically, like the rays of light and heat.[1]

Thermo-Electricity.

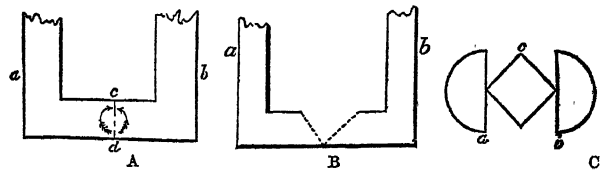


Fig. 111.

Relation between molecular structure and thermo-electricity.

It appears from the experiments of Matteucci, Franz, Mousson, Magnus, and other observers, that the molecular constitution of bodies exercises a powerful influence over thermo-electric phenomena. From the results of these researches, it appears to M. Delarive[2] to be well established, "that in thermo-electric phenomena, the cause of the currents exists not in the fact itself of the propagation of the heat, but in the molecular effects that accompany this propagation. Also, when the two portions of a body are perfectly homogeneous to the left and to the right of the heated point, the molecular effects produced by the heat being identical, two currents are the result, which being called upon to traverse the same circuit, must be equal at the same time that they are contrary; but the slightest difference in the chemical nature, or in the molecular constitution of these two portions, brings about an intensity greater in one of the currents than in the other, and consequently produces an effect which is detected by the galvanometer."

For further information on thermo-electricity, and the other subjects of which this article treats, the reader is referred to M. Becquerel's admirable work, entitled *Traité Expérimentale de L'Electricité et du Magnetisme, et de leur Rapports avec les Phenomènes Naturels.* Five vols., i. and ii. Paris, 1834; iii. 1835; iv. 1836; and v 1837. and Delarive's *Electricity*, vol. ii. part v. chap. i. (D. B.)

[1] See *Lond. and Edin. Phil. Mag.* June 1840, vol. xvi. p. 451.

[2] *Treatise*, &c. vol. ii. p. 563.

VOLTAIRE.

Voltaire. VOLTAIRE (*François Marie Arouet de*), the glory and the shame of French literature, was born at Châteney, near Sceaux, 20th February 1694. His parents were François Arouet, notary at Châtelet, and Marguerite d'Aumart, of a noble family of Poitou. Like Newton, he came into the world with little chance of remaining in it; yet, like Newton, lived to fill it with his fame. There, however, the parallel ends; the pure, steady lustre of Newton's name little resembles the fitful, phosphorescent light of that baleful glory which streams from the name of Voltaire. Could the friends of the sickly infant have cast his horoscope, and foreseen all the misery which that long life, destined to reach the extreme age of man, would endure and inflict, they would have wished that his life might be as frail as it promised to be.

He was baptised 22d November 1694, his godfather being the Abbé de Châteauneuf, one of the most abandoned men even of that corrupt age. As a biographer of Voltaire remarks, "impiety seems to have received him from his very cradle;" certainly from the baptismal font. His godfather proved an apt teacher of a ready pupil. He boasted that, at the age of three, his precocious charge knew by heart an impious poem attributed to J. B. Rousseau, which the prudent Abbé had made his first reading book. Certainly some excuse is to be made for this wretched child; the tendencies to scepticism and impiety, which probably the most careful education could not have eradicated, were assiduously nurtured from his infancy; it was like forcing fruit in the tropics.

Accordingly we are told that, even while a boy at the College of Louis-le-grand, his sallies of blasphemous precocity often astonished his comrades and terrified his masters, though they must, we should imagine, have delighted his godfather. This institution was then under the management of the Jesuits. One of the professors, Father Le Jay, sorrowfully and truly predicted that the young scapegrace would prove a "pillar of Deism in France."

From college his father, who destined him for public life, sent him to study law. Like Hume, he was soon disgusted with jurisprudence, and from that time resolved to give his life to literature. His godfather introduced him to some of that improving "polite society" which reigned in Paris during the closing years of Louis Quatorze. It was a fine school for the next generation, and for the one immediately preceding the Revolution. It is thus described in the article on Voltaire in the *Biographie Universelle*:—"Whilst the superstitious devotion of the old king forced all faces to put on a mask of hypocrisy, or at least of decorum, some men, distinguished by rank or genius, lovers of poetry and pleasure, emancipated from all prejudice and free from all belief, took a piquant delight in secretly insulting all that they seemed to respect in public; that is, religion, government, and good manners. In their elegant orgies they practised refined debauchery, lampooned with gaiety, and blasphemed with a grace." Among them figured no less than the Prince of Conti, the Duke of Vendôme and his brother the Grand Prior, the Duke of Sully, and others equally ennobled by rank and degraded by vice. This was the second stage of Voltaire's curriculum, and surely his pious godfather the Abbé must have watched with transports his rapid graduation in the graces in which he himself excelled. The vivacity and genius of Voltaire made him a favourite in this brilliant society. But it did not make him quite idle; his dramatic taste was already strong, and, youth as he was, he had a tragedy—his subject no less than *Œdipus*—on the anvil. In his eighteenth year (1712) he competed for a poetic prize proposed by the academy, and was defeated by a very inferior competitor. Voltaire. His father, like the merchant in *Rob Roy*, thought his son lost when he heard of his making verses and living in such improving company; and by way of operating a diversion, sent him to Holland in 1713, in the train of the French ambassador. But he had still greater reason for apprehension when he heard that, in his new position, his son was not only making verses but making love, which last he did with great ardour to the daughter of a Madame du Noyer, a Protestant by profession, but an intriguing and profligate woman. She made a complaint to the ambassador, and to back it had the shameless folly to publish the correspondence of Voltaire and her daughter. Voltaire was recalled. With characteristic zeal for the faith, Voltaire would fain have pressed religion into the service of his passion. He persuaded some of the bishops and Jesuits that Mdle. Noyer ought to be forcibly reclaimed and educated in France, to save her soul from heresy! This pious design was not carried into effect, and Voltaire had to mourn the loss of the church—and his own.

Voltaire had considerable trouble, as may be supposed, in making his peace with his father. The old man was as much plagued by an elder son, who had become a Jansenist, as by the literature and the libertinism of the younger. "I have two fools of sons," said he; "the one a fool in verse, the other a fool in prose." Voltaire proposed to exile himself to America, only begging beforehand, as he sentimentally expressed it, "to embrace his father's knees." This was granted, and the old man relented. He placed the young penitent in the office of an attorney; but Voltaire found the practice of the law at least as distasteful as the science of it had been, and he sought solace in very different pursuits. His father now despaired of fixing him to any thing. At length a friend of the family, M. de Caumartin, who held an office under government, offered to take the youth to his estate at Saint. Ange, and pledged himself that his charge should not return till he had made choice of a profession. He fulfilled his promise in one sense, but not in that intended; for it so chanced that Voltaire was confirmed in all his literary predilections. At the chateau lived M. de Caumartin the elder, a very old man, who was full of stories about the court of Henry IV. and the friends of Sully, and of course knew all the intrigues of the court of Louis XIV. Voltaire with characteristic ardour instantly began to meditate his *Henriade* and his *Age of Louis XIV.*

His next step was into the Bastille. Louis XIV. was just dead; and Voltaire, whose satirical humour and malice were already pretty notorious, was unjustly suspected of writing some lines, which reflected on the Grand Monarque. His imprisonment lasted more than a year, which he employed on his *Henriade* and his *Œdipus*. He was at length through the intervention of a courtier relieved by the regent, who, pleased with his genius, consoled the young poet for his captivity with the promise of a sum of money. "I thank your royal highness," said Voltaire, "for the care you have taken of my *board*, but I hope you will never more trouble yourself about my *lodging*." It was at this time that he changed his name from Arouet to Voltaire, saying, "I have done very badly with my first name, I should like to see whether this will succeed better."

In 1718 was acted his play of *Œdipus;* it was received with great applause; and his father, a gratified witness of his triumph, condescended at last to sanction his being a poet. Banished soon after from the capital, for presumed

Voltaire. complicity in some political intrigue, he was permitted to return to Paris in 1720, for the representation of his tragedy of *Artémire;* but he returned to no triumphs,—his tragedy was unmercifully hissed. Two years after he visited Holland, in company with Madame Rupelmonde. In passing through Brussels he saw J. B. Rousseau, and commenced and finished his concise friendship with that eccentric man, "whose genius he admired, and whose misfortunes he pitied." They met with the complimentary raptures with which Frenchmen alone can meet; but the enchantment lasted only a moment. Rousseau read to Voltaire his *Ode to Posterity.* "My friend," said Voltaire, "I am afraid that is a letter which will never reach its address." Voltaire, in his turn, read to Rousseau his *Epistle to Urania;* whereupon Rousseau put on a long face, and severely rebuked him for the impieties of that performance! The scene must have been exquisitely comic. They parted life-long enemies.

On his return to France, Voltaire passed some time in retirement, finishing his *Henriade.* Meantime in 1724 the *Mariamne* of this fertile writer was acted, but with no better success than his *Artémire.* At length, anxious to publish the *Henriade,* he summoned the most fastidious of his friends to a critical rehearsal. It was to be read canto by canto. The ordeal proved a harder one than vanity could bear; and one day, losing patience under the severity of criticism, Voltaire cast his manuscript into the fire. It cost the President Hénault a fine pair of lace ruffles to save it from the flames. While Voltaire delayed the printing of his poem in order to render it more perfect, the infamous Abbé Desfontaines got hold of a copy, impudently interpolated some lines of his own, and surreptitiously printed it for his own profit, under the title of *La Ligue.* Voltaire was, of course, enraged; but the poem, disfigured though it was, made so favourable an impression that he forgot his anger in the intoxication of success. His complacency even overflowed on the unprincipled instrument of that success. He not only forgave Desfontaines, but busied himself sometime after in procuring his release from the Bicêtre; but he was a man whom neither forgiveness nor benefits could bind, and he pursued Voltaire with inextinguishable malevolence.

If the *Henriade* increased his fame, it provoked the zeal of courtiers and priests; the one smelt sedition in his praises of Coligny, and the other discovered that the author was no better than a semi-Pelagian! No doubt it was news to Voltaire to find that he was even thus far on the road to orthodoxy. Liberty to publish was denied him, and the young king refused to accept the dedication.

About this time an adventure befell him, which revealed some of the perils of that brilliant circle of fashion which he still aspired to frequent. For some petulant reply to the chevalier de Rohan-Chabot, at the table of the Duke of Sully, the offended guest, shortly after, ordered his servants to inflict a dastardly personal chastisement on Voltaire. Having complained in vain to the Duke, whom he implored to aid him in his revenge, he is said to have shut himself up in a rage, and to have practised fencing, till he felt himself a match for his opponent; he then sent a challenge, couched in the most contemptuous terms. It was accepted; and the duel was to take place the next day. Meantime the affair got wind, and his base assailants took characteristic measures to prevent it. He was arrested, and a second time immured in the Bastille. There he remained six months; and on recovering his liberty, was ordered to leave the kingdom. He took refuge in England.

How deeply he felt the personal insult we may gather from the fact, that he is said to have covertly visited France, in the hope of confronting his adversary. Failing in this, and afraid of being discovered, he quickly returned to his asylum, where he sojourned more than two years (1726–1728).

He here made himself well acquainted with our language, and read very extensively in our literature. He Voltaire. was especially familiar with those infidel writers who, in the middle of the last century, exercised so malign an influence on our country,—such as Tindal, Chubb, Woolston, Collins, and, above all, Bolingbroke. From these Voltaire borrowed nearly all the arguments he afterwards used against Christianity; nor do we believe that in all his voluminous writings there is a single objection the germ of which may not be found in their pages. He had no occasion to borrow their ribaldry or their sarcasm; he had more than enough of his own. All their weapons he wielded after his own manner, with more wit, with more profanity, with more effrontery, and, if we except Bolingbroke, with more spirit and eloquence. But the weapons are all second-hand; in all the learning really necessary to decide on the claims of the Hebrew and Christian Scriptures, he was a mere sciolist. He was equally disqualified calmly to weigh the evidence by his intense prejudices. But we shall return to this topic by and by.

While in England, he wrote the tragedy of *Brutus,* which added a little, but not much, to his fame; published his first edition of the *Henriade;* collected some authentic materials for his *Life of Charles XII.;* and sketched those *Philosophical Letters* (otherwise called *Lettres Anglaises*) which were not published till some years after, but which, when published, roused against him the most violent resentment.

He at length returned to Paris, and taking lodgings in a remote faubourg, lived for some time an obscure life, occupied alternately with making books and making his fortune—two things very different, in general, but which Voltaire managed to combine. In the latter, he showed himself a very skilful adept, and was not less lucky than skilful; by his speculations in a lottery, in public scrip, and by some other ventures, he made considerable gains, and what he thus realized, he skilfully invested: so that, though some of his great friends sometimes condescended to borrow of him, and even so far honoured him as to forget to pay the interest, and now and then even to restore the principal, he somehow managed to repair these losses; and after "having lost much, given away much, and spent freely," he was at the end of life a rich man, "worth, it is said, 160,000 livres, or about L.7000 a year."

On this subject, Voltaire speaks, in his autobiography, very sensibly. "I was not born rich, and it may be asked how I came to acquire wealth enough to live like a farmer-general; to which I answer, and I would have others make me their example, I had seen so many men of letters poor and despised, that I had long determined not to augment their number."

Involved in another political peril, in consequence of the publication of some bold verses in defence of a deceased comic actress, Madame Lecouvreur, who had been refused the rites of burial, Voltaire had reason to dread a third visit to the Bastille. He concealed himself at Rouen, under an English name, and busied himself in secretly printing his *History of Charles XII.* (of which the last edition had been seized), and the *Philosophical Letters,* for which he did not dare to ask a licence. In 1730, he brought on the stage his *Brutus,* and, shortly after, his *Eriphyle,* neither of which had much success; he was amply compensated, however, by the applauses which waited on *Zaire,* acted soon after. In the two or three following years, his fertile pen produced several other pieces, of which the *Temple du Gout* (1733) was the most remarkable. The severity of its criticism on the principal writers of France seemed little short of literary blasphemy, and literary bigotry carried its resentment so far as to beg the government to punish the author. The *Epistle to Urania,* which even Rousseau had condemned for its impiety, was surreptitiously printed, and gave new umbrage to the government. Voltaire scrupled

Voltaire. not to disavow the piece, and attributed it to the Abbé Chaulieu, who had been dead some years. The falsehood, like most of Voltaire's, deceived nobody. The publisher of the *Philosophical Letters* was imprisoned, the author menaced, and the work itself publicly burned by the hands of the executioner. Under these circumstances, it is not wonderful that Voltaire should have meditated flight, not only from Paris, but from France. From this last, he was deterred by his liaison with Madame du Châtelet, which lasted till the death of that lady. She was a singular woman, or rather man and woman both in one; that is, she united all the strength of a masculine intellect with all the vivacity and passionate sensibility of a woman's nature. She had received an education proper to a man, and profited by it as perhaps no other woman of her time could have done. She understood Latin; she successfully prosecuted geometry and metaphysics, translated Newton, studied Leibnitz, and, on one occasion, only just failed of winning a prize offered by the Academy of Sciences.

It was once supposed that the attachment of Voltaire to this lady, whose husband was living, was purely Platonic; "but," as M. Auger says, "it would be ridiculous now to dissemble that Voltaire and Madame du Châtelet were lovers."

Both were weary of the fashionable circles, where "they lost time, money, and health," and this, together with the dangers which gathered round Voltaire, suggested the thought of retiring to Cirey, an estate situated on the confines of Champagne and Lorraine. In that solitude, they studied together in such constant communion, that they seemed for a time to exchange tastes; Madame du Châtelet, in spite of her geometry and metaphysics, addicted herself to the polite literature of England and Italy, the languages of which she learned from Voltaire, and according to his account, with miraculous facility: while Voltaire, on the other hand, was so inoculated with her love of science, as to beguile himself for a moment, in spite of his very nature, into the notion that he had a genuine penchant for it, and that it was his true vocation. They worked together at the *Eléments de la Philosophie de Newton;* they competed, once conjointly and once as rivals, for prizes proposed by the Academy of Sciences. In the first case, both were compelled to yield to the illustrious Euler; in the second, Voltaire, who defended Newton against Leibnitz, beat his mistress, who defended Leibnitz against Newton.

This excursion into science seems to have satisfied Voltaire, and he returned to literature, which he forsook no more. At Cirey he composed *Alzire, Zulime, Mahomet, Merope*, and *L'Enfant Prodigue;* finished the *Discour sur l'Homme;* commenced *Le Siecle de Louis XIV.;* and collected the materials for his *Essais sur les Mœurs et l'Esprit des Nations.* It was there also, says M. Auger, "that he completed that too famous poem which religion, morals, and patriotism will ever condemn; which could not increase his renown; which tormented his life; which dishonours his memory." It was there, too, that he received the first advances from Prince Frederick of Prussia, which paved the way for that strange episode in the life of these two singular men, which made both of them at once the wonder and the laughingstock of Europe.

About this time, 1738, Voltaire was incessantly harassed by the attacks of Desfontaines, who, in reply to Voltaire's *Preservatif*, an anonymous piece, issued his *Voltairomanie*, likewise anonymous. "No attack," says the writer just cited, "ever moved Voltaire so much. His rage was unbounded, and even his health was affected by the violence of his passions." This miserable controversy was at length terminated by a disavowal obtained from Desfontaines by the intervention of the police,—a sort of rhetoric to which that worthy would yield anything, and such a trifle as truth most readily of all. While Voltaire was involved in these scandalous squabbles, Madame du Châtelet watched over him with the tenderest assiduity, and strove with all a woman's address and affection to mitigate the evils which she could not prevent. But when no foreign quarrel was in hand, they were but too apt to quarrel with one another. So ungovernable were the passions of both, that the repose of Cirey was by no means free from storms; violent altercations often occurred between Voltaire and his "divine Emilie." From the *Letters* of Madame de Graffigny, it sufficiently appears that Cirey was not the serene abode of philosophy which it was sometimes thought to be, and that habit and necessity, still more than affection, continued to link this strange couple together.[1] After many years, it was broken by an event which formed but too natural a termination to such an union. The lady had an intrigue with M. de St Lambert whilst she and Voltaire were visiting at the court of King Stanislas at Luneville. She gave birth to a child, and died a few days after.

Voltaire, in 1746, was admitted a member of the Academy, an honour to which he had long aspired, and for which he had been twice an unsuccessful candidate. His inaugural discourse was much admired.

Shortly after, not to mention other quarrels in which he was incessantly embroiled, began Voltaire's miserable squabble with Crebillon, a competitor for dramatic honours quite unworthy of entering the lists with the author of *Zaire*. Nevertheless, angry at the preference given to this rival by aid of court intrigue, he eagerly engaged in an emulous strife for superiority, and rapidly poured forth a series of tragedies on subjects similar to those treated by Crebillon. Even, if a little better than those of Crebillon, they were, as might be expected from the circumstances under which they were produced, unworthy of Voltaire, and they were received by the public with mortifying coldness.[2]

During the life of Madame du Châtelet, Voltaire refused to listen to the invitations of Frederick to visit his court and become his Mentor. At the lady's death, Voltaire listened, but hesitated; he was now between fifty and sixty, and dreaded the effect of the climate on his health. But Frederick took him on the side of his vanity, and effectually *limed* him. Some indifferent verses, in which his majesty had praised Arnaud as "the rising sun," in contrast with the "setting" Voltaire, were shown to the latter, of course on purpose. He was in bed. He sprang up in a rage, raved, danced about the room in his shirt, and called for post-horses. "Il faut," he said, "que le Roi de Prusse apprenne que je ne me couche pas encore."[3] It was not his first or second interview with Frederick. In 1743, at the instance of the Duchess of Chateauroux, when France

[1] "An ardent, aerial, gracefully predominant, and in the end somewhat *termagant* female figure, the divine Emilie. Her temper, radiant rather than bland, was none of the patientest on occasion; nor was M. de Voltaire the least of a Job if you came athwart him the wrong way." (*Carlyle.*)

[2] In 1745 an amusing incident occurred in connection with the representation of his opera entitled, *Le Temple de la Gloire*, a species of composition in which he never excelled, and in which he here failed completely. But as his vanity seldom let him know when he *had* failed, he had the audacity to approach the royal box after the representation, and to ask, "Is Trojan pleased?" The king, less flattered with the comparison than annoyed with the familiarity, gave him no answer. About the same time he produced his ballet entitled *Princesse de Navarre*, an absurd medley of the heroic and the comic, of pathos and burlesque; and the *Poem of Fontenoy*, written to order, and therefore of course as dull as any laureate ode.

[3] A ludicrous account of this *ruse* of Frederick is given in Marmontel's *Memoirs.*

Voltaire. seemed likely to be threatened by the conjoint hostility of England and Austria, Voltaire was selected to undertake a secret mission to Frederick, the issue of which Lord Macaulay has so amusingly characterised. "Voltaire was received with every mark of respect and friendship, was lodged in the palace, and had a seat daily at the royal table. The negotiation was of an extraordinary description. Nothing can be conceived more whimsical than the conferences which took place between the first literary man and the first practical man of the age, whom a strange weakness had induced to exchange parts. The great poet would talk of nothing but treaties and guarantees, and the great king of nothing but metaphors and rhymes. On one occasion Voltaire put into his majesty's hands a paper on the state of Europe, and received it back with verses scrawled on the margin. In secret, they both laughed at each other. Voltaire did not spare the king's poems, and the king has left on record his opinion of Voltaire's diplomacy. 'He had no credentials,' says Frederick, 'and the whole mission was a joke, a mere farce.'"

It was in 1750 that Voltaire took up his abode at Frederick's court, and his visit extended over three years. Of the scenes, at once most humiliating and most grotesque, to which it gave rise, we have no space to speak in detail. The friendship began in visionary raptures, and ended in real and lasting disgust. Nor could it be otherwise. True friendship was never founded on vanity and heartlessness, and these two great men possessed these faults in perhaps as large a measure as is compatible with human limitations. The flatteries with which Voltaire was received, his sumptuous lodgings, his offices, his titles, and his salary, did not long conceal from him that the position which he was invited to occupy was at best but a splendid slavery. If he indulged the freedom to which he was invited, and exhibited the petulant humour which was inseparable from his nature whether permitted or not, he soon found that he must, and did, give offence; while Frederick, who affected, in the literary coterie of which he was the centre, to lay aside the king, and to dispense with all ceremony, was equally offended whether they took him at his word or not. If they did not, he treated them with insolent sarcasm for their servile bearing; if they did, with equal sarcasm for their presumption. Thus Voltaire, like all the rest, was much in the condition of a monkey playing with a bear. At best it was dangerous sport in which a hug might at any moment be fatal.

Add to all this, the jealousies of the many little minds which envied Voltaire's superiority and the king's favour; Voltaire's irascible temperament, and Frederick's hereditary love of plaguing, and not least, the loss of all mutual esteem which must have followed from seeing each other without a mask, and we cannot wonder that the friendship was soon dissolved. Voltaire.

Some of the incidents of the quarrel, such, for example as Voltaire's squabble with Maupertuis, the president of Frederick's little academy; his most comic squib against that worthy, entitled *Diatribe du Docteur Akakia;* Frederick's hearty laugh over it in private, while he earnestly pleaded for its suppression; Voltaire's pretended compliance, while he reserved a copy, which soon appeared in print, and covered the luckless president with ridicule; the mutual trickeries by which Voltaire sought to get away, and Frederick sought to keep him; above all, when he did get away, the scenes at Frankfort, where the king's messenger demanded the restoration of that volume of the *Royal Poeshie* which Voltaire was charged with having nefariously carried off, and the poet's humiliating detention till it was recovered from Leipsic, where he had left the precious treasure;—these things, as detailed in Voltaire's bitter autobiography, form one of the strangest tragi-comedies in the world; but it is also pitiable to think how much misery the vanity and malevolence of this singular pair must have inflicted on both. In all their correspondence of after years the traces are seen; it is obvious that the wounds with which they then pierced one another never kindly healed.

One alleged insult of Frederick, of course whispered to Voltaire, seems to have especially angered him. Frederick had said to some envious detractor of Voltaire: "Leave him alone. We squeeze an orange, and when we have sucked the juice, throw away the peel." "After this," says Voltaire in his *Memoirs*, which are full of stinging sarcasms against his royal friend, "I resolved to take all possible care of the peel." On the other hand, Voltaire's sayings, reported with an equally punctual kindness, must have stung Frederick to the quick. "See," said he one day, when Frederick had sent him a large quantity of his indifferent verse to be corrected, "see what a quantity of dirty linen he has sent me to wash." Contempt, especially from affected friendship, is the last thing that human nature can forgive; and the king and Voltaire had inflicted on each other contempt enough to insure a lifelong remembrance.

The details, and probably much more than the details, of this strange episode in his life are given in Voltaire's *Memoirs*. A most graphic sketch of the principal incidents will also be found in the *Essay on Frederick the Great* by the late lamented Lord Macaulay.[1]

At length Voltaire was free, and after short visits to

[1] The darker representations of Frederick in Voltaire's *Autobiography* are to be read with distrust, and some of his imputations we would not believe of any man without far better proofs than Voltaire's word.—Enough is authentically known of both, nay, is disclosed in their own characters, as self-delineated in their voluminous correspondence, to prove that the only cordial feeling they could have had must have been admiration of each other's genius, for neither had virtue enough for true friendship. Meantime, it is most significant of Voltaire's character, that at the very time he was penning the most contemptuous satire perhaps ever written, on his "Solomon," as he calls Frederick, he was then, and up to the close of his life, engaged in a correspondence, in which the most ardent expressions of attachment, and the most fulsome adulation, are continually interchanged between the two. It shows Voltaire to be a monster of insincerity. It is true that sometimes the old wounds visibly fester, as when Voltaire says, April 1760, "Vous m'avez fait assez de mal, vous m'avez brouillé pour jamais avec le roi de France; vous m'avez fait perdre mes emplois et mes pensions, vous m'avez maltraité à Frankfort, moi, et une femme innocente, une femme considerée, qui a été trâinée dans la boue, et mise en prison; et ensuite, en m'honorant des vos lettres, vous corrompez la douceur de cette consolation, par des reproches amers." "La femme innocente" is, of course, Madame Denis; and in his letter of the 12th of May, the king replies characteristically enough—"Votre conduite n'eût été tolerée par aucun philosophe. . . . I have pardoned all, and even wish to forget all. But if you had not had to do with a fool in love with your genius, you would not have got off so well. . . . Be sure of *that*, and moreover that I do not intend to speak any more of that niece of yours, of whom I am tired enough (qui m'ennuie), and who, at least, has no such merits as cover her uncle's faults. One speaks of the servant-maid of Molière, but depend upon it no one will speak of the niece of Voltaire." Lord Macaulay, who has condensed, in his lively way, a sentence or two from these letters, says of the early correspondence, that it may be studied with advantage by those who wish to become proficients in the ignoble art of flattery. Sometimes, no doubt, compliments are turned with great elegance, and want nothing but a little truth to recommend them; but in general, it must be confessed that the adulation is so gross and fulsome that nothing but an ostrich stomach could digest it. So it continued to the last. Thus writes Frederick in 1770:—"If ever knowledge should flourish again amongst the Greeks, they will be jealous that a Frenchman, by his *Henriade*, has surpassed Homer, has carried away the bell from Sophocles, has rivalled Thucydides, and has left far behind him Plato, Aristotle, and the whole school of the Porch." Nor is Voltaire a whit behind:—"I have ever," says he, "at my heart the irreparable evil which Maupertuis has done me; I shall ever think of the calumny about 'the dirty linen sent to the washerwoman,' that insipid calumny which was mortal to me, with a sorrow which will poison my last days. But all that D'Alembert tells me of your Majesty's goodness is a balm for my wounds

Voltaire. Strasburg, Colmar, the abbey of Senones, where he met with Calmet, who chivalrously attempted his conversion; to Plombières, where he went to visit M. d'Argental; to Colmar again; he at length, on finding that his presence at Paris would not be agreeable to royalty, decided on living out of France. After residing sometime at Monrion, and sometime at Les Delices, he at length bought the estates of Tourney and Ferney, in Gex. He at first lived alternately at one and the other, but finally settled at Ferney. Here he spent the last twenty years of his life, and in circumstances which strangely contrasted with the previous portion of it. Hitherto he had seldom been long anywhere: a vagabond on the face of the earth, his past life was an image of his restless self. At Ferney he fixed, and his opulence enabled him to sustain the character of a lord of the soil.

In some respects he did credit to his position. Constitutionally good-natured, though his good-nature was capricious and fickle—generous also where he felt no enmities—he sought to promote, and to a considerable extent did promote, the material interests of his tenantry and neighbourhood. He improved the land; he encouraged agriculture; pulled down the wretched cabins of his tenants, and replaced them by pretty houses; he built himself the substantial chateau of Ferney, not forgetting to add to it, among other luxurious appurtenances, a little theatre; if indeed that, to one of his tastes and habits, did not seem rather a necessary than a luxury. Here sometimes actors from Paris came to grace the performance of his own plays. Strangest of all, he even rebuilt the church, at his own expense, and on a larger scale, though not without uttering many sarcasms and performing many pranks in the course of the operation, which gave dire offence to the clergy. But they might have looked for such things from so peculiar a church reformer.

His incessant activity of mind was by no means exhausted by his many new occupations of a practical nature; his study was still the place in which he was most often found, and composition, as it had ever been, his principal employment and delight. Neither did the constant visits he received prevent his devotion to study: very often he did not appear, but left the ladies of his household to do the honours for him; or, if he appeared, stayed only a very short time. In fact, unless he had used this freedom with visitors, they would soon have absorbed his entire time, for Ferney soon became a centre of attraction to all the wandering savans and litterateurs of Europe. It was, as M. Auger says, the holy city of philosophers, something like what Mecca is to Mussulmen; "it was necessary, at least once in one's life, to make a pilgrimage there."

Neither here nor anywhere else could Voltaire have lived without getting embroiled in discreditable quarrels. Amongst these, that which sprang out of his pious zeal for restoring the ruinous church of Ferney was not the least; and, generally, the singular manner in which this curious patron of the parish conducted himself involved him in perpetual broils with his curé, and sometimes even with his bishop. The indecorous liberties which he took, and especially the impiety with which he trifled with an old wooden cross, at length caused the bishop to denounce him to the government. On one occasion he resorted to a strange method of proving his loyalty and devotion. He wished, he said, to fulfil his duties as a Christian, as an officer of the king, and as lord of the parish, and partook of the communion at the church at Ferney. In 1769, learning that the bishop of Annecy had forbidden every priest in his diocese to confess him, to absolve him, or to admit him to the communion, he betook himself to bed, declared himself to be sick and dying, and terrified a capuchin into giving him absolution and administering the Eucharist, threatening. in case of refusal, to complain to the parliament. Having received the communion in his chamber, he caused a notary, on the spot, to draw up a *procès-verbal* of the facts. These acts were regarded by the philosophers of Paris as pusillanimous "compliances," and by religious men as a sacrilegious farce. Both were right. It would be unjust to say that Voltaire wanted courage, for he sometimes gave proofs of the contrary; but no man ever had less of the spirit of a martyr. He never lost any advantage, or robbed himself of any revenge, which such a trifling thing as a lie or an act of hypocrisy could procure for him. Voltaire.

It was at Ferney that his infidelity displayed itself with the greatest virulence—became, in fact, a passion. It was the blind zeal of an iconoclast. "While he was at Paris, or retained the hope of returning thither," says a writer in the *Biographie Universelle*, "his impiety manifested itself only at intervals; he used a little *management*, and put on, sometimes, the veil of pretended doubt, sometimes the mask of a thoughtless pleasantry. When he saw himself, as it were, for ever exiled from the capital, his infidelity became systematic, positive, persevering, and furious."

To this many causes contributed. He felt himself *safer;* he lived on the frontiers of three independent states, into any one of which he might slip if he gave umbrage to either of the others; and with all his infidelity, there was *one* precept of the Gospel which, having no genius for martyrdom, he constantly practised: "If they persecuted him in one city, he fled to another." One of these little states, the republic of Geneva—of which he drolly said, "that if he but shook his wig, the powder would cover its territory"—was not loved by him, and he preferred to live just out of it; but in the event of a hard chase, the fox could, at any rate, take earth there. Thus happily located, his property also was, for the most part, so invested that, wherever he removed, his income was secure. Then, again, his admirers were numerous and ardent almost everywhere, and thousands who hated his sentiments were yet willing to show indulgence to his genius. His old age, too, the privileges of which, it has been well said, he most punctiliously exacted of others, though he paid no respect to it himself, was another protection; which was still strengthened by his own constant parade of his physical sufferings, and perpetual prophecies of his approaching death. For many years before his death, he was, according to his own account, always dying.

Other securities less creditable he did not hesitate to avail himself of whenever it was necessary. His most offensive brochures, which were continually issuing from the press, he did not scruple to palm off under names sometimes fictitious, sometimes real but not his own—sometimes even under those of the dead; nay, he did not scruple to disavow, if need be with solemn oaths, anything which it might be inconvenient to father. It is true, that these artifices deceived no one; and perhaps, says the writer in the *Biographie Universelle*, his vanity would have been vexed if any one had been deceived. Be this as it may, in this sheltered spot, he emptied the full quiver of his bitterness and hatred against religion, in one incessant volley. Nor did he scruple to poison the arrows. "Gross invective," says M. Auger, "cynical buffoonery, garbling and falsification, defamation and calumny, all appeared to

---

so powerful, that I reproach myself for that sorrow which still pursues me. Pardon a man who never had any other ambition than that of living and dying near you, and whose attachment is of more than thirty years' standing." The effrontery of Voltaire in representing the celebrated piece of petulancy as a calumny, whereas it authenticates itself to be Voltaire's, is only equalled by the baseness of his adulation.

Voltaire. him legitimate. . . . His most indulgent friends have agreed to mourn over the shameful excesses into which he was carried against those who essayed to vindicate Revelation or morality, outraged by him in twenty different works." His abhorrence of everything which bore the semblance of Christianity became more intense and undiscriminating every day. All forms of religion at last became identified in his mind with superstition; Christianity was but another name for priestcraft, and was presumed to be inimical to the rights, the freedom, and the reason of mankind. No wonder that, in these transports of an infidel bigotry (for such it really was), the scoffing, mocking tone became more and more bitter.

One may make some excuse for him from the corruptions of the system around him, the flagrant hypocrisies with which men, often as unbelieving as himself, turned Christianity into a gainful superstition; the wrongs and persecutions he had himself endured; and the provocation which he received from controvertists who, shameless as himself, employed against him arts as shameless as his own. Be this as it may, the writings of Voltaire undoubtedly exhibit more intense, bitter, gratuitous mockery of the Bible, and indeed of almost everything held sacred among men, than probably those of any other writer since the Christian era.

In justice, it must be said, that it was at Ferney also that Voltaire exhibited the traits and performed the actions which posterity now contemplates with most pleasure. They show like streaks of light in a dark cloud. It was here that he received under his protection the orphan descendant of the great Corneille, with the graceful welcome —"That he felt as an old soldier who had the child of his general consigned to him." He adopted her, had her carefully educated, married her to a young gentleman of good family, and dowered her, when she married, with the profits of his own editorial labours on her ancestor's works.

It was here, too, that he performed those real services in behalf of religious liberty which it is impossible to record without respect. His first considerable achievement was in aid of the Calvinist family of John Calas, who had just suffered, at Toulouse, the frightful punishment of being broken on the wheel, on the charge of having murdered his son, in order to prevent his conversion to Catholicism. Voltaire refused to believe in the possibility of the crime, and strained all his energies to procure such redress as was still possible. He freely employed his pen, his purse, and his influence in this good cause; he inflamed the zeal of the apathetic public, hired the eloquence of advocates, and, above all, incessantly used his own. The cause was rejudged, the sentence reversed, the memory of Calas vindicated; and his widow and children, whom bigotry had condemned to infamy and their property to confiscation, were reinstated in public opinion, and consoled with marks of the royal favour. Though this was the most remarkable of Voltaire's triumphs in this way, it was by no means a solitary one. His success on this occasion seemed to produce an impression, to employ a metaphor of his biographers, that he was a sort of knight-errant, whose mission it was to champion the oppressed and to redress the wrongs of public justice; its victims everywhere appealed to him, and, it must be allowed, that they did not appeal in vain. Another Protestant, Sirven, had been condemned to the same punishment as Calas, and for a similar crime. His daughter had been shut up in a convent in the hope of her conversion. She escaped, and threw herself into a well; the father was accused of having drowned her, and escaped execution only by flight. Voltaire taxed all his energies in his defence, persevered through many years of resistance or apathy on the part of the authorities, and secured at last Sirven's acquittal. Other instances, equally honourable to him, might be mentioned. It is true, indeed, that the applause which attended his efforts was enormous, and must have given one so sensitive to praise intense gratification; but there is no reason to doubt that he sincerely hated oppression, and loved freedom—almost the only pure and lofty sentiment which he consistently cherished. It is only to be regretted that in his writings on this, as on all other subjects, he confounds religion with superstition, and Christianity with priestcraft. It is profoundly to be deplored that the abominable cruelties which he opposed, as well as the gross corruptions of the system which sanctioned them, should have given his prejudices, exasperated by the long contest, a seeming justification. It must be pleaded as a palliation for the embittered tone which pervades his later writings; but it can form no sufficient apology. He had only to look into the New Testament to see that if Christ's commands are obeyed, persecution is impossible, and that it must be not only a monstrous perversion, but an absolute *boulversement* of the meaning of the Gospel which pretends to sanction it.[1] Voltaire.

The end was approaching. Madame Denis, who, *ennuyée* with the solitude of Ferney, and yearning, as only a Frenchwoman and an ancient coquette could, for the dissipations of Paris and of her vanished youth, strove with all her art to induce Voltaire to pay the capital a visit. She succeeded (1778).

The clergy and the court were by no means so delighted as Madame Denis; they started as at an apparition; but the philosophers and the litterateurs, and plenty of people of rank and fashion, were all in a flutter of delight. The fame of his works, his long exile, the renown of his late retreat, his very age, all made his visit a triumph, which was turned, however, into a veritable funeral procession. It is hardly a figure to say, that he died, stifled with the incense and worn out with the flatteries of that last visit. It is true that, at eighty-four, nothing could have kept the dying flame long alive: when a taper is just expiring, an idle moth's wing can flap it out; and even so, the faint spark of life was extinguished by the gay flutter of his Parisian parasites. The number of visits he received and returned, the hurry and excitement of thus living in a crowd, the exhaustion consequent on his efforts to entertain and be brilliant at eighty-four, brought on a severe hemorrhage and his life was in danger. Some chivalrous ecclesiastics from the first moment of his visit to Paris, had hardily proposed to themselves the achievement of his conversion; among them one or two who, if truth be spoken, gave but indifferent proof of being converted themselves. However, the Abbé Gauthier and the Curé of St Sulpice were

[1] It is the indiscriminate attack of Voltaire upon all sorts of opinions, true and false, good and evil, which perhaps most strikes one in his career. In his case "the half would have been more than the whole." No doubt many of the things he assailed were hideous enough, and deserved to perish; it would have been sad if such a tempest as he helped to raise, and which spent its violence in the next generation, had not killed some noxious insects, and left the atmosphere clearer. The misfortune was, that Voltaire's influence was simply destructive. "No human teacher," says Lord Macaulay, "ever left behind him so vast and terrible a wreck of truths and falsehoods, of things noble and things base, of things useful and things pernicious." Lord Byron has expressed the same trait in Voltaire by a happy metaphor—

> "He multiplied himself among mankind,
> The Proteus of their talents; but his own
> Breathed most in ridicule; which, *as the wind*
> *Blew where it listed, laying all things prone,*—
> Now to o'erthrow a fool, and now to shake a throne."

Voltaire. the principal and among the most respectable. The former, on hearing of Voltaire's illness, hastened to his octogenarian catechumen. The affair was characteristic. Voltaire, thinking himself in danger said, he did not wish his body "to be cast to the vultures," and bargained with the Abbé Gauthier, to whom he committed it, for the rites of sepulture, if nothing else. The preliminaries for duly receiving such a deposit were soon settled; Voltaire had no objection at all to the little ceremonies proper to the occasion. He made a declaration that he wished to die in the Catholic religion in which he had been born, asked pardon of God and the church for the offences he had committed against them, and received absolution. The Curé of St Sulpice complained that he had not been called to so edifying a scene. Voltaire wrote a complimentary letter, full of regard for his ministry and his virtues, and the latter replied in a style equally full of courtesy and charity. But the hemorrhage ceased, Voltaire got better, and the penitent "turned from the church to the theatre." On the day of the sixth representation of his *Irene*, which had been applauded, not for its own sake (for it was the last cracked strain of his aged muse), but in compliment to its author, Voltaire received from crowds, drunk with a grotesque enthusiasm, a tawdry homage, which only vanity like his could at such an age have enjoyed. After having been the admired and admiring spectator of his own play, which he vaingloriously thought was a new triumph of his genius, his bust was placed on the stage and crowned by the actors! Amidst the shouts and in the arms of the people, the decrepit object of this anticipatory apotheosis was borne to his coach; the crowds followed him to his hotel, rending the air with his name and the titles of his principal works, and ending with that of the *Pucelle*. On arriving at his hotel, Voltaire turned to the crowd and exclaimed, "My friends, you will stifle me with roses." Perhaps only vanity in its dotage would have been content to apply so delicate a metaphor to such gross perfume, but there is sober truth in describing the suffocating effects.

> "He begs their flattery with his latest breath,
> And, smothered in't at last, is praised to death."

On the same day on which he passed through this exciting scene, he had sufficiently taxed the strength and spirits of an old man of eighty-four by being present at a long sitting of the academy, where he had received similar, but less tumultuous honours, from the representatives of science and literature. Such scenes as these, combined with some efforts at literary work, and his immoderate recourse to coffee, brought on a fit of dysuria, a complaint from which he had previously suffered. He took opium to relieve his pangs, and, it is said, took too much; it probably hastened his death, which occurred May 30, 1778.

A deep cloud rests on the last hours of Voltaire,—so various and so contradictory are the accounts which enemies and friends have transmitted to us, and so hopeless the imbroglio of doubts which those differences have occasioned. Some say he died in agonies of remorse and terror; some that he made an edifying confession, and died reconciled to the church; some that he persisted in his hardihood of unbelief to the last. We are content to let the cloud rest upon the scene without any attempt to pierce it. Indeed, on any hypothesis, we can learn nothing worth knowing. If he made confession and received absolution and the *viaticum*, what value can be attached to such things when he had already acted a similar part in the very wantonness of profanity, and for purposes the most frivolous? If he persisted in his unbelief, it is only what multitudes of a less confirmed and obdurate scepticism, have done before him. It is certain that such a life could not have yielded, in the retrospect, any solid satisfaction, or any thing that could naturally tend to disarm the terrors of that hour; but it does not follow that Voltaire felt them. In fact, those who would draw omens of the truth of this or that system of belief or unbelief from the phenomena of a death-bed, have often laid on them a stress which is by no means justified. Many an abbé of Voltaire's time, quite as bad as Voltaire, and worse in one respect, that they added hypocrisy to a flagitious life, passed away very calmly; while many a man of exemplary and undoubted goodness—Cowper, for example—has died in frightful agonies of despair. In truth, not only cannot the *death* of an individual justify us in pronouncing confidently for or against any system of opinion, but not even his *life* will. Such argument is in effect two-edged. As to the *general* tendencies of systems, when really acted on, to produce moral effects in life, and peace or dismay in death, we may see enough to justify ample confidence in our conclusions. But a solitary instance here and there may seemingly fail to verify them. That they, for example, who scoff at all notions of a moral government of the world and a future retribution; who believe that conscience is but the voice of self-interest; who avowedly see neither crime nor shame in the unrestrained indulgence of sensual passions, and proclaim that it is superstitious to dread the consequences, are *less* likely to be honest, temperate, or chaste, than those of opposite creeds, we should hold it absurd to deny, and should not care to argue with any one who did. And at certain epochs, as in our own country in the seventeenth, and in France in the eighteenth century, we may see the influence of such a creed exemplified on a sufficient scale to demonstrate its sinister effects on practical morals. But the case of individuals proves little, or rather nothing; for it cuts both ways. There are too many examples of men who have held perfectly orthodox views, who yet have been every whit as bad as those who abjured them; and, on the other hand, some who have denied them, have, under the influence of a cold temperament, prudential motives, and purely secular interests, been, in their *outward* life, so much better than Voltaire that they may well shame many professed Christians. Voltaire.

It was once the fashion to speak of Voltaire as an universal genius; as not only having made incursions into all the realms of science and literature, but as having conquered and appropriated them; as a profound philosopher, an original thinker, a poet worthy to rank with the first names, whether of epic or dramatic renown; as a great historical writer, whose comprehensive knowledge of facts was only equalled by the sagacity with which he philosophized upon them. Such is the vein of exaggeration which pervades his life by Condorcet; in fact, rather an eloge than a life, and (which is saying a great deal) as indiscriminate and absurd in its flatteries as any of the panegyrics ever pronounced before the French Academy. One word will show the infamy of adulation to which he stoops: he condescends to palliate, on the whole, the tendency even of *Pucelle*, on the ground that the victims of the sensuality there so shamelessly pandered to, may possibly be fortified against all superstitious fears of the consequences!

The estimate of such eulogists of Voltaire's genius, as at once "universal and profound" (wonderfully versatile and active it really was), is simply ridiculous. His whole mind must have been projected on a far greater scale really to master the many branches of science and literature which he essayed. "He has not bequeathed to us," says the great critic whom we have already twice cited, "a single doctrine to be called by his name, not a single addition to our stock of knowledge."[1]

[1] Macaulay justly says, that "what Burke said of the Constituent Assembly was true of this its great forerunner; Voltaire could not

Voltaire. It may be added, that none of his books, even in the branches of composition in which he most excelled, are master-pieces, or entitled to be placed in the first rank. It is well remarked by the above critic, when speaking of the youthful Frederick's extravagant admiration of Voltaire, and ascribing it to his defective education, that "had Frederick been able to read Homer and Milton, or even Virgil and Tasso, his admiration of the *Henriade* would prove that he was utterly destitute of the power of discerning what is excellent in art. Had he been familiar with Sophocles or Shakspeare, we should have expected him to appreciate *Zaire* more justly. Had he been able to study Thucydides and Tacitus, in the original Greek and Latin, he would have known that there were heights in the eloquence of history far beyond the reach of the author of the *Life of Charles the Twelfth.*" But though not entitled to the first rank in any of the great branches of composition he attempted, it is certainly wonderful that he should have achieved fame in so many, and that he should have passed with so much versatility from one species of literary labour to another. It is not surprising that he had the usual lot of the pentathlete, and, excelling in many branches, failed of the highest excellence in all. Nor, even had his genius been more specifically fitted for a single sphere, could he have done himself full justice, or attained the excellence of which he was really capable; for he was writing perpetually, and the only wonder is, that he did not much oftener fall below mediocrity. No man ever left, as he did, fourscore volumes behind him, or even half the number, without leaving a great deal of rubbish in them. *Chef d'œuvres*, where there is the genius to produce them, can be the result only of patient toil and prolonged meditation, and they will, therefore, be few. Such voluminous works as Voltaire's must be marked not only by haste and frequent common-place, but by repetitions; Voltaire, in fact, had written all his works long before he had got to the end of his eighty volumes; it is well remarked by Madame Necker, "that he had extracted from his genius everything of which it was susceptible; like a sponge, he had drained it to the last drop."

But without claiming for Voltaire's genius the epithets either of "universal" or "profound," it had qualities, no doubt, which justly challenge our wonder. His wit was enormous; but though this was his predominant faculty, perhaps the qualities which most strike us are his marvellous mobility and versatility. He played in rapid alternation almost all literary parts, some with great eclât, most with more than average success, and passed from one to the other—from verse to prose, from tragedy to burlesque, from history to fiction—with astonishing facility. His restless activity demanded unceasing employment, and his versatility prompted to the most various kinds of it. He himself says that he "was born with the love of labour," and it is true; though, had he not varied his employment as he did, we question whether this would have been so marked a trait of his character. Indeed, such industry has rarely been conjoined with such versatility. Voltaire.

The characteristics of intellect we have indicated, are the very reverse of those which distinguish a great philosopher; and assuredly Voltaire was none. Of depth or subtlety of speculation; of patient or comprehensive thought; of judicial candour or calmness in the survey of evidence; of a *genius* for philosophy, properly so called, there are few traces in Voltaire's writings. He has left little or nothing that can be called original or novel in speculation; his materials, especially in his philosophical and theological writings are, for the most part, second-hand. He knew, however, how to make use of the knowledge he had, as well of his readers' ignorance, and manages to parade sciolism with the airs of erudition. Had he been as accurate and comprehensive as he was lively, his graces of style would have made him, if not a great philosopher, one of the best exponents of the philosophy of others the world ever saw. Knowledge varied and extensive but neither deep nor accurate, brilliant superficiality, a never tiring vivacity of wit and humour, which in him were alone *creative* faculties, chiefly characterise him. These, combined with great felicity of style, make him one of the most vivacious of writers. He has often all the gravest faults with which an author can be chargeable—shallowness, impurity, grossness, disingenuousness, sophistry, scurrility, and contempt of truth; but one fault he has *not*—he is never dull. Open him where we will, he is always vivacious.

His incessant activity of mind, and his extreme love of labour, are both exemplified in the vast variety and voluminousness of his works. Though he led a life of unusual activity for an author—though it was full of movement and incident—he has left behind him no less than fourscore octavo volumes. Computed merely by their solid contents, as so many cubical feet of printed matter, the products of his mind were enormous. His correspondence alone, extending over fourteen or fifteen volumes (with the letters of D'Alembert and Frederick of Prussia to him, it fills eighteen), makes as much as the *opera omnia* of many considered rather voluminous authors.

The vivacity and activity of mind which so eminently distinguished his writings were as eminently displayed, we are told, in his conversation; so that, in fact, his whole life must have been a perpetual play of intellectual pyrotechny; he was a sort of catherine-wheel, whose incessant revolution was continually throwing off a shower of brilliant scintillations.[1]

It is true, that to secure this perennial vivacity, he had, in addition to his great intellectual endowments, some other facilities for which he is more the object of wonder than of

---

build, he could only pull down; he was the very Vitruvius of ruin." It is freely admitted, that in his long war with all that had been previously revered among men, Voltaire often assaulted error as well as truth, superstition as well as religion, which indeed he never took the trouble to distinguish. It was only, perhaps, by such explosive and destructive forces that the dreadful social edifice, reared before Voltaire saw the light, could be destroyed; nor, perhaps, was it inexpedient that men should be taught, by the terrible experiments which a *soi-disant* philosophy was commissioned to make, that genuine freedom is at least as incompatible with unbelief as with superstition. It is curious to see how Voltaire absolutely identifies oppression with religion, and how partial, accordingly, are his views of liberty itself. There is hardly a passage in his writings which shows that he had any true conceptions of, or sympathies with, civil and political liberty; nor is there any proof that he ever actively opposed any of the political abuses of his day, or strove, when he had opportunity, to enlighten in this matter the despotic princes with whom he came in contact. It has been well said by one of his biographers, that with such political views as his, it is by no means impossible that he might have been one of the first victims of that Revolution of which he was the unconscious pioneer.

[1] Many of his repartees were inimitably ready. For example, he was once warmly eulogizing the celebrated Haller before a guest disposed to flatter. "Ah, sir," said the latter, "if M. Haller would but speak of *your* works as you speak of *his*." "Possibly," said Voltaire, "we are both mistaken." Nevertheless, it is said he was once completely discomfited by Young, the author of the *Night Thoughts*. Voltaire—so the story goes—was depreciating the *Paradise Lost*, of which the subject was doubtless as distasteful as the poetry. He was particularly disposed to make game of the celebrated personifications of Death, Sin, and the Devil, as he has also done in his writings. Young, looking him steadily in the face, is said to have said,—

"Thou art so witty, wicked, and so thin,
Thou art at once the Devil, Death, and Sin."

Voltaire. envy. He did not suppress a sarcasm for a trifle, or allow modesty or severe truth to stand in the way of a piquant pleasantry. A brilliant paradox; a jest, though on the most solemn or sacred subject provided it was but clever and pointed; an effective sophism, though founded on the most egregious *suppressio veri* or *perversio recti*, carried the day against all idle scrupulous punctilios of decorum, equity, and charity. As old Thomas Fuller puts it, he would "have washed his hands in the baptismal font," and "drunk healths out of the church chalice." To use the language of the jockey, he rode light.

His powers of acquisition were very great; of his indefatigable industry we have already spoken. Both together unquestionably put him in possession of very multifarious, though, as we have said, by no means accurate knowledge. He easily retained what he had read, and had what many men of great genius have possessed—his English contemporary Johnson in particular—an art of *gutting* books, and appropriating what is best worth remembering, without a slow and equable perusal of every syllable. Such a gift is very valuable; but it is also a very dangerous one, and often leads to inaccuracies from which a more plodding and patient industry is exempt. In general, it may be said, that Voltaire read too many books, and on too many subjects, not to have all the superficiality which must ever attend the effort to acquire a *quasi*-encyclopædic knowledge.

The mobility which characterized Voltaire's intellect characterized equally his moral temperament. His whole nature was restless as his mind. The aspen vibrating at every breath can alone symbolize his sensitiveness to every external impulse; the glancing of shot-silk, or the changes of the chamelion, can alone express the varying aspects of his mind under such impulses. In this respect he was a child all his days; and if he had had the simplicity and innocence of a child, nothing could have been more *riant* or delightful than the social character of Voltaire; and, indeed, these childlike qualities are represented as constituting, in his best moods, one of the great charms of his manner. Unhappily he was not only a child, but a spoiled child, or rather united all the variable humour and *abandon* of a child with all the irascibility and malice of a monkey. In grief or anger he had no more self-control (as has been well said) than a "petted child or an hysterical woman;" or than an untutored savage, who freely gives way to every emotion without check or stint. In anger especially (and he kindled as readily as phosphorus) he gesticulated, made grimaces, cursed, stamped, capered, and poured forth a torrent of words, or even tears, in the effort to express his turbulent emotions. The next moment he was all sunshine and laughter. His placability, however, was by no means uniform. Constitutionally, as we have said, good natured, his resentments were often as deep as they were vivid; against Rousseau, for example, his hatred was both intense and unquenchable.

Of Voltaire's rapid changes of mood we have two or three examples most graphically described in Marmontel's delightful memoirs. They cannot well be omitted in any sketch of this singular man. The first extract thus paints his demeanour after the death of Madame du Châtelet:—

"When I went to condole with him," says Marmontel, "on the death of Madame du Châtelet, his most beloved mistress, 'Come,' said he, on seeing me, 'Come and share my sorrow. I have lost my illustrious friend; I am in despair; I am inconsolable.'—I, to whom he had often said that she was like a fury that hunted his steps, and who knew, that in these disputes, they had more than once been at daggers drawn,—I let him weep, and seemed to sympathise with him. And there he was, exhausting language in the praises of that incomparable woman, and redoubling his tears and his sobs. At this moment arrives the intendant Chauvelin, who tells him some ridiculous story, and with him Voltaire is bursting with laughter. I laughed too, as I went away, to see in this great man the facility of a child, in passing from one extreme to another in the passions that agitated him. One only was fixed in him, and, as it were, inherent in his soul; it was ambition and love of glory."[1] Voltaire.

Thus did this unballasted soul roll and pitch under every wind and wave of life. Another example is given in Marmontel's description of his visit to Ferney:—

"Nothing can be more singular nor more original than the reception Voltaire gave us. He was in bed when we arrived. He extended to us his arms; he wept for joy as he embraced me; he embraced the son of his old friend, M. Gaulard, with the same emotion. 'You find me dying,' said he; 'do you come to restore me to life, or to receive my last sigh?' My companion was alarmed at this preface; but I, who had a hundred times heard Voltaire say that he was dying, gave Gaulard a gentle sign of encouragement; and, indeed, a moment afterwards, the dying man, making us sit down by his bedside, 'My dear friend,' said he, 'how happy I am to see you! particularly at this moment, when I have a man with me whom you will be charmed to hear. It is M. de l'Ecluse, the surgeon-dentist of the late king of Poland, now the lord of an estate near Montargis, and who has been pleased to come to repair the irreparable teeth of Madame Denis. He is a charming man; but don't you know him?' 'The only l'Ecluse that I know,' answered I, 'is an actor of the old comic opera-house.' ''Tis he, my friend, 'tis he himself. If you know him you know the song of the *Grinder*, that he plays and sings so well.' And there was Voltaire instantly imitating l'Ecluse, and with his bare arms and sepulchral voice, playing the *Grinder* and singing the song. . . . . We were bursting with laughter and he quite serious. 'I imitate him very ill,' said he, ''tis l'Ecluse that you must hear, and his song of the *Spinner* and that of the *Postilion*, and the quarrel of the apple-woman with *Vadé*, it is truth itself. Oh you will be delighted! Go and speak to Madame Denis; I, ill as I am, will get up and dine with you. We'll eat some wild-fowl, and listen to M. de l'Ecluse. The pleasure of seeing you has suspended my ills, and I feel myself quite revived.'"[2]

The temper of Voltaire always irritable, and never controlled, became often ungovernable. On the most trivial affront it was apt to break out in demonstrations as ludicrous as they were violent. The incessant incense of flattery, which was ever fuming before him in the latter years of his life, aggravated this irritability by intensifying his vanity and *amour-propre*, and he became at last impatient of the slightest contradiction; all suavity as long as compliments were going, opposition put him into a fury.

Some of his displays of temper, as, for example, the rage in which he broke away from the dinner-table of the Marquis of Villette, at not finding his silver cup in the accustomed place; the sudden wrath with which he danced up to the astonished bookseller, Vanduren (who had sent in what he thought an unjust demand), struck him a blow, and then vanished without one word of explanation; the droll vehemence with which his own greed raved against the greed of Frederick, because that prince had refused to grant 1000 louis, to enable Voltaire to bring his niece Madame Denis with him, drily saying, "that he had not invited the lady;"—these, and many other examples, exhibit our philosopher in a ludicrous light.

The poetry of Voltaire—though, to much of his composition in verse, it is hardly less than profanity to apply the name—is now pretty justly estimated in France itself. His *Henriade* is admitted to be no epic worthy of ranking with the great master-pieces so called. His *Pucelle* deservedly covers his name with infamy. His other light poems, as well as his comedies, are generally allowed to be *mediocre*, to say nothing of the moral blemishes which disfigure them. His tragedies have all the faults of the French drama in general, and some of their own besides. But it is perhaps hardly possible for Englishmen to criticise fairly works conceived in a spirit so utterly antipodal to that which reigns amongst us. He who thought Shakspeare "an inspired barbarian," or "a savage not destitute of imagination," as he elsewhere expresses it, was hardly

[1] *Mémoires de Marmontel*, p. 381.

[2] Ibid., p. 381.

Voltaire. likely to satisfy us in his poetical theory. His rigorous adherence to the so-called *Unities* seems to English tastes pedantic formality. The finest passages are not free from strained sentiment and bombastic rant; rhetorical declamation is substituted for real energy and passion; the very language in which he writes, admirable though it be for prose, is, in English estimate, essentially unpoetical; and the tinkling rhyme and metre seem to transform the severe tragic muse into a dancing girl with castanets. Such compositions, subjected to English critical taste, will receive no better treatment than Voltaire has bestowed upon Shakspeare's, and certainly they cannot meet with worse. We shall, therefore, content ourselves with referring the reader to the discriminating, and, as it appears to us, judicious criticism, of Voltaire's poetic character inserted in the *Biographie Universelle*. On the *Pucelle* we make no remarks. In that loathsome work he has caricatured every truth and sentiment deserving of veneration or invested with dignity. Religion, morals, and patriotism are alike outraged. The soul of Voltaire was incapable of veneration; in this poem it would seem to be equally insusceptible of the sublime and beautiful. The most glorious traditions of his own country—traditions which, even if they had less historic truth in them than they have, every Frenchman with a spark of patriotism would cherish in the deepest feelings of his soul—Voltaire has treated with the same impartial ribaldry with which he has outraged religion and morals. It is, perhaps, well that he has done so; for it is a sufficient answer to his attacks on these last, that they proceed from one who revered nothing in the world when it came in competition with the indulgence of his prurient fancy, or his love of buffoonery. He who could write the *Pucelle* is not likely to prove a formidable opponent to any system of morals or religion, unless mankind should first lose their senses or their shame altogether.

The way in which he has masqueraded Joan of Arc before his countrymen may be faintly, and but faintly, conceived, by imagining an English author to select Alfred the Great as the subject of a burlesque poem like Hudibras. It is in vain that Voltaire pleads that he has imitated Ariosto. The grossness of Ariosto is decency itself compared with the impurities of Voltaire.

The prose of Voltaire in his best moods is admirable. For narrative and didactic purposes it is hardly possible to imagine a more perfect vehicle of thought. He was one of a long series of great French writers who, beginning with Descartes and Pascal, have given to the world inimitable specimens of prose style; concise yet clear; simple and easy, but vivid and elegant; sparing in ornament, but with much grace of diction and harmony of structure. Its charm is, that it seems the natural dress of the thoughts, adapts itself to all its movements with spontaneous flexibility, and is free from all mannerism.

It is not always, indeed, that Voltaire does his very best, and is sometimes careless enough; but in general he abounds in spontaneous grace and unlaboured felicities. Sometimes, and especially in his *Philosophical Dictionary*, there is an affectation of epigrammatic point,—of an oracular brevity designed to suggest more than is expressed, but by no means always suggesting it.[1] Voltaire's manner, in such cases, looks like an unsuccessful imitation of that of Pascal in his *Pensées*. But in Pascal this suggestive manner *is* suggestive; it is no inexpressive mask, but an animated countenance, which speaks though silent.

Of Voltaire's voluminous prose works it is impossible to speak in detail. The life of the heroic madman of Sweden will always be read with interest from the clearness and elegance of the narrative, and the exciting romance of the adventure. The *Life of Peter the Great* is but a sketch. It is not without reason that one of his biographers regrets that Voltaire did not produce a more elaborate work on the reign of the great founder of the Russian empire; a subject of far more intrinsic interest than the brilliant meteoric career of the Swedish conqueror. Yet it may be doubted whether Voltaire's powers were adequate to the true philosophical treatment of such a subject. His *Essais sur les mœurs et l'Esprit des Nations*, and *Le Siecle de Louis XIV. et Louis XV.*, are the principal contributions of Voltaire to history. Though they may be superficial, if measured by the requirements of the modern spirit of severe historical research, first adequately exemplified by Gibbon, Voltaire certainly acquitted himself in this respect better than the generality of the historical writers of his time, while the graces of his style and, not seldom, the originality and comprehensiveness of his views will always secure readers. His philosophical tales are a brilliant reflection of all the powers of his mind, and, it must be added, of all the vices of his heart; of his wit and fancy, his invention, his ease, his elegance, but also of his cynical humour, his buffoonery, and his *grossiereté*. He had powers which eminently fitted him to excel in this species of composition, and he might have produced essays as full of innocent pleasantry as those of Addison. But there is not one which is not tarnished by some offence to modesty and virtue; not one which does not bear witness to the essential impurity of his mind; not one which is not deformed by polluting images. Even that exquisite little tale, *Micromegas*, the purely philosophical character of which would seem to render it impossible to introduce such offensive matter, is not free from it. Though it consists of little more than a couple of sheets, even this little piece must be expurgated before it could be read entire to modest ears. The impurities of many writers appear as blotches and blains, breaking out here and there; in Shakspeare, for example, whose indecency Voltaire modestly reproves. The impurity of Voltaire is a disease of the blood, and infiltrates every vein and artery with its diffusive malignity. Voltaire.

Much superfluous terror for the fate of Christianity was once occasioned by the writings of Voltaire and that host of sceptical writers of whom he was the Coryphœus. It is sufficient to ask, at this distance of time, whether their works or the Bible be nearer oblivion,—whether they or it be most read? Is Christianity less powerful than when they commenced their crusade against it? Have they succeeded in diminishing the world's veneration for the Book they hated? of checking its translation or diffusion? of making the nations who then professed Christianity renounce it? Nothing of the kind: their indiscriminate assaults on the fabric of Christianity have had the effect, indeed, of shaking down some ruinous turrets, of exploding some pernicious superstitions and abuses, and it would have been well if they had destroyed more; but as to Christianity itself—the religion of the Bible—their assaults on it only roused the slumbering zeal of its defenders and champions. Never since the apostolic age has this religion been more energetic than since the reaction against the great sceptical attacks of the middle and close of the last century. The nations that professed Christianity then profess it still, and generally with somewhat more enlightened faith in it and wiser love for it than they cherished then; partly, no doubt, (let us candidly acknowledge it),

[1] Thus he closes one of his articles with the enigmatical words:—"Oh much admired Plato, I fear that thou hast told us nothing but fables, that thou hast spoken only as a sophist. Thou hast done more mischief than thou art aware of. 'How so?' you will ask. I will not tell you."

Voltaire. owing to the hostile criticism of those who would fain have destroyed it altogether. The Bible speaks at this day in a hundred more languages than it spoke then, while cobwebs are already gathering over the greater part of the sceptical literature of the last century. The mass of it is fast being conveyed, like that of preceding sceptical epochs, to the dust of the upper shelf; or if, as in the case of Bolingbroke, Gibbon, and Voltaire, genius still redeems large portions from neglect, it is the portions, for the most part, in which their infidelity does not appear; those which it infests being generally considered as blots and not beauties in their works. But as for supplanting the Bible,—its circulation, the veneration with which it is regarded, and the efforts to make it utter the vernacular of all nations, are incomparably greater than in Voltaire's day. It is even ludicrous now to read in Voltaire's letters his unfulfilled prophecies of the approaching glories of the new dispensation of "Reason," in whose splendour the waning Bible was to be lost. On the contrary, the infidel literature of the day has, for the most part, gone into deep shadow, while *that* shines with a brighter and more diffused light than ever. The talent devoted to its vindication—its illustration—its criticism—and the toil and cost spent in its translation and circulation, have been far greater than at any other equal period since Christianity was first proclaimed to be "the truth of God." This, it may be said, does not prove Christianity true: it is admitted; but it conclusively proves this,—the folly of the vaunting tone ever assumed by every fresh storming party, and the equal folly of the transient panics as constantly felt by those who man the walls.

In truth, however we may lament that minds like those of Voltaire, Hume, or Gibbon, should have been prostituted to the cause of infidelity, or mourn the mischief which their writings may have done, especially during their own time, there is one point of view in which we can hardly regret that Christianity has met with such assailants. The attacks of such men on Christianity furnish most powerful proofs of its indomitable life. Its inherent strength would never have been so conspicuously seen except it had been thus tried; we can now more safely repose in the solidity of a structure on which so many storms have burst in vain. Never since Christianity entered the world have writers of greater talent or wider popularity conspired for its downfall, or under circumstances more favourable to the success of the enterprise, (could anything have made it successful), than during the latter half of the eighteenth century.

Of all these writers, Voltaire was by far the most active, the most witty, the most variously endowed with the gifts of genius; the most voluminous, the most incessant in his attacks, the most widely circulated, the most eagerly read; and yet it is no paradox to say, that he has proved in reality one of the least dangerous. His general character has, in a great degree, destroyed his influence as an assailant of Christianity. Not only is there so much in his general writings which the universal voice of all decent society condemns—not only is the tone in which he speaks of all things reverenced by man, whether human or divine, so impartially profane—not only is his morality so lax, his estimate of human nature so contemptuous, his reputation for mendacity and malice so well established, as to make him a questionable ally of any cause, but it is impossible that a mind imbued with the least particle of candour or love of truth can fail to see all his worst traits conspicuously exemplified when he touches on Christianity. "Per fas aut nefas," seems to be his motto, when the object is to discredit or cast ridicule on the Bible.

The libertine, who has come to a foregone conclusion, and is willing to accept anything which insults the religion he hates and the truths which are unwelcome to him, can alone gloat upon the perpetual ribaldry of Voltaire, or accept his jests and mockery for argument. The bulk of ordinary readers will ever feel, that it is passionate hatred which speaks, that there is no fair or honest attempt to investigate evidence, and that truth, candour, decency, are all perpetually outraged. Voltaire.

As far as *argument* is concerned, perhaps one of the best ways of conveying to the minds of general readers an idea of Voltaire's incompetency to deal with such large subjects as Christianity and the Bible, is to give a slight specimen of his mode of dealing with matters where prejudice and passion were not likely to be half so strong. We may there see, clearly enough, how completely his genius was the reverse of that of a philosopher, how unfitted to investigate evidence; how completely it was the slave of preconception; how incapable of breaking through the little circle of previous theory or presumed experience. His credulous incredulity—we know not what else to call it—is coaxed with strange facility into accepting anything which makes *for* a preconception, and rejecting everything that makes *against* it. Let us consider two striking examples, in one of which science is concerned, and in the other literary taste. In the article "Shells" in the *Philosophical Dictionary*, Voltaire attempts to deal with the puzzling fact, then beginning to excite notice, that true marine fossils are found on the mountains of Switzerland and in other elevated regions. He will not hear of it; no evidence shall establish it; and he resorts to the most ridiculous hypotheses to evade it. The "shells" may be "snails' shells," or they are the "cockle shells" of the multitude of palmers who made their way to Rome over the Alps during the middle ages! It may be thought that this last is one of the jests by which his petulance was accustomed to turn the edge of any inconvenient argument. If it be so, what can be said of such a mode of getting rid of plain facts which imperatively required to be accounted for? But, in truth, he seems to urge it as a really *plausible* solution; and it is not incredible, since he resorts to others hardly less ridiculous. "Lastly," says he, "I deny not that, a hundred miles from the sea we meet with petrified oysters, conches, univalves, productions which perfectly resemble marine ones, but are we sure that *the soil of the earth may not produce these fossils?* The formation of vegetable agate should make us suspend our judgment. A tree has not borne the agate that is like a tree, and the sea may not have produced the fossil shells which seem to be those of little marine animals." Thus does incredulity become as credulous as superstition itself; and all this because Voltaire had resolved that, whatever came of it, the fact which seemed to say that the sea had once flowed over what are now high mountain-ranges, in short, pointed to a "deluge" of some sort, must be ignored or denied! It may be supposed that he had objections to "deluges" of all kind, but from the article entitled "Deluge" in the same work, one may shrewdly infer that it was chiefly the thought of the "Noachian deluge" that made him resolve that there should be no fossil marine shells in such inconvenient places. At any rate a genuine philosopher, whether he accepted the Noachian deluge or not, would have accepted the *facts*; hypothesis might come after. It was of a piece with the same credulous incredulity to declare, as he so frankly does in one of his letters to D'Alembert, that no evidence should make him believe a miracle; though to suppose it false, in the case he supposes, would certainly involve a greater mystery. "If a hundred thousand men," says he, "were to assure me that they all with their own eyes saw a dead man raised, I should say that they were all dazzled." That is, to avoid believing a great improbability, he would believe one that would amount to an impossibility.

Now, let us look at him when prejudices of another kind are concerned,—those of his narrow poetic, and especially

Voltaire. dramatic theory,—and see how he speaks of Shakspeare. Thus he writes to La Harpe, August 15, 1776:—"M. D'Alembert and your other friends are doing a patriotic work, it seems to me, in daring to defend, in full academy, Sophocles, Corneille, Euripides, and Racine, against *Gilles Shakspeare* and Pierrot le Tourneur.[1] *It will be needful to wash your hands after that battle, for you will combat against scavengers* (*contre des gadouards*)." In the same letter, the author of *Pucelle* complains vehemently of the *indecencies* of Shakspeare, and shows how impossible it would be to translate him literally without shocking the delicacy of a Parisian audience! It is likely; but it is certainly droll to hear such a man lecturing on the claims of decency; and equally so to think that his timid modesty is in alarm for the delicacy of a social condition, of which the refinement was so exquisite as to speech, and the grossness so great as regards conduct.[2] After some similar compliments to Shakspeare, Voltaire concludes his letter thus:—"I know very well that Corneille has great faults; I have said only too much on that point; but they are the faults of a great man; and Rimer had very good reason to say that Shakspeare is but an ugly ape (*n'etait q'un vilain singe*)." In 1765, he writes, "Shakspeare is a savage, who had some imagination. He has many happy lines, but his plays can only please in London and Canada! It is no good sign of the taste of a nation when what it admires, is admired nowhere else." (*A. M. Saurin.*)

It was not from ignorance of the language that Voltaire did not appreciate Shakspeare, for there have been few Frenchmen better acquainted with English than himself. Indeed, it appears that he early translated some scenes of *Julius Cæsar*, selecting as he politely expresses it, "a few pearls from Shakspeare's enormous dunghill (*enorme fumier*)."[3] So early as 1735 we find him, in a letter to M. de Cideville, speaking of his translations of the above scenes thus,—"It is a sufficiently faithful translation from an English author who lived a hundred and fifty years ago; it is Shakspeare—the Corneille of London—a great fool elsewhere (*grand fou d'ailleur*)."

One whose prejudices are so strong, tastes so narrow, and criticism so conventional, all whose notions, once impressed, seem stereotyped, can hardly be expected, when far deeper antipathies were involved, to weigh evidence calmly or judge fairly. He who wrote such articles as that on "Shells" might be expected to deal summarily with the evidences for the Bible; and he who thus appraised the merits of Shakspeare, might well despise its sublimity and beauty.

The extraordinary liberties which he took both with truth and his antagonists, whenever passion was involved, are but too obvious in many a literary squabble of his life. It was not to be expected that Christianity should fare any better than his literary enemies.

If a difficulty stands in the way he escapes by any road; venturing upon the most hardy assertions, even when in utter ignorance of the subject on which he is writing. He often asserts only what the shallowest sciolism could have risked; or which, if we do not attribute it to sciolism, we can only account for by supposing his effrontery yet more astounding than his ignorance. Thus, to give a slight example; when impugning the authenticity of the Pentateuch, he employs the almost incredible argument, that the names of the books—Genesis, Exodus, Numbers, Leviticus, and Deuteronomy—are Greek; that there are none such in the Hebrew; and that, therefore, the books probably had an origin far later than the alleged age of Moses. It may be thought but decent, that persons writing against the authenticity of a book should at least know as much as its *title* in the language in which it was originally written. Some may say that a man of Voltaire's information could not have been ignorant that the above are but the names assigned to these books by the Septuagint translators, and that the books, in Hebrew, are known by their own Hebrew titles. Voltaire has given us in his writings so many examples of haste and ignorance, that it is hazardous to say that even this may not be amongst them. But supposing it is not so, we leave it to the reader to say whether it makes the matter any better. For if he knew the utter absurdity of the argument he was using, how can we absolve him from the vilest *tracasserie* in resorting to it?

Voltaire.

His flagrant faults as a controvertist are strikingly exemplified in the articles on religious topics, inserted in his *Philosophical Dictionary*. It is everywhere evident that, so far from being a philosopher, he is writing as a passionate advocate, and for the sake of effect; his method corresponds; nothing can better answer his purpose than the rambling and disjointed manner in which he has treated the various subjects, giving only just what it was convenient to give, mingling history with fable and legend; while banter, ludicrous apologue, sneer, sarcasm, irony, and the whole rhetoric of malignant scorn, are perpetually appealed to. It is in this random work,—in part, a collection of the articles which he contributed to the celebrated *Encyclopédie*,—that he has vented, perhaps as freely as anywhere, his spleen against Christianity. It is not possible to look into it without seeing how completely justice and candour are forgotten in every page. Retailing every cavil he had got second-hand from the English deists, he ignores altogether the replies of the great writers, such as Butler or Lardner, on the other side. Every difficulty in Scripture history is exaggerated, and for the most part the solutions ignored. If there be a perfectly legitimate choice of a less difficulty, it is seldom hinted at; and if there are two equally plausible interpretations, as far as the *letter* is concerned—one sensible, the other foolish—he is sure to take that which gives the foolish meaning, and to

[1] This writer had, much to his own honour, and the horror of Voltaire, maintained the supremacy of Shakspeare as a dramatist.

[2] If Voltaire is not precisely the person to reprove Shakspere for indecency, one would imagine he is still less entitled to lecture Pascal about profanity; yet he does so in one place with edifying solemnity. In his annotations on that celebrated portion of the *Pensées*, in which Parcal reasons with the atheist, he says:—"Cet article parait *un peu indecent* et pueril; cette idée de jeu, de perte, et de gain, ne convient point à la gravité du sujet." This is, indeed, "the devil reproving sin!"

[3] From this amusing letter, in which he gives expression to his indignation against Tourneur, and regrets that himself, by an early translation of a scene or two of Shakspeare, should have paved the way for such sacrilege, we give an extract:—"Auriez-vous lu deux volumes de ce miserable Tourneur, dans lesquels il veut nous faire regarder Shakspeare comme le seul modèle de la veritable tragédie? Il l'appelle le dieu du théâtre. Il sacrifie tous les Français sans exception à son idole, comme on sacrifiait autrefois des cochons à Cérés. Il ne daigne pas même nommer Corneille et Racine. Ces deux grands hommes sont seulement enveloppés dans la proscription générale, sans que leurs noms soient prononcés. Il y à deja deux tomes imprimés de ce Shakspeare, qu'on prendrait pour des pièces de la foire, faites il y a deux cents ans.

"Ce barbouilleur a trouvé le secret de faire engager le roi, la reine, et toute la famille royale, à souscrire à son ouvrage. Avez-vous lu son abominable grimoire, dont il y aura encore cinq volumes? Avez-vous une haine assez vigoureuse contre cet impudent imbecille? Souffrirez-vous l'affront qu'il fait à la France? Vous et M. de Thibouville, vous êtes trop doux. Il n'y a point en France assez de camouflets, assez de bonnets d'âne, assez de piloris pour un parcil faquin. Le sang petille dans mes vieilles veines, en vous parlant de lui. S'il ne vous a pas mis en colère, je vous tiens pour un homme impassible. Ce qu'il y a d'affreux, c'est que le monstre a un parti en France, et pour comble de calamité et d'horreur, c'est moi qui autrefois parlai le premier de ce Shakspeare; c'est moi qui le premier montrai aux Français, quelques perles que j'avais trouvées dans son énorme fumier. Je ne m' attendais pas que je servirais un jour à fouler aux pieds les couronnes de Racine et de Corneille, pour en orner le front d'un histrion barbare."

Voltaire. insist upon it, as if there were no doubt of its being the true interpretation. Take, as a trifling example, one very short section in the article on "Christianity," in which he is dealing with the old but shallow objection, that we find the profane historians so silent as to the facts of the evangelical history. He says that "Josephus says nothing of Christ" (he of course summarily rejects the disputed passage), "and yet Josephus' father must have witnessed all the miracles of Christ,"—a gratuitous assumption, for we know not one syllable about Josephus' father. If the profane historians are silent, Voltaire, it seems, can make them speak when it answers his purpose. If Christians were to use the same licence, they could doubtless make them speak too.

Similarly, on the statement that, at the crucifixion, there was "darkness over the whole *land* for three hours," Voltaire chooses to pass by, without mentioning, the more natural interpretation, and will have it that the whole "*earth*" is meant, and that since Rome must have been in utter darkness three hours, it is unaccountable that no historian should have mentioned the phenomenon. Speaking in the same article of the massacre of Bethlehem, he, by way of exaggerating the horrors of the deed, and rendering it more strange that nothing has been said about it by Josephus, reminds us that the traditions of the Greek Church (for which, in any other case, he would have had as much respect as for *Baron Munchausen's Travels*) make the number of the victims about 14,000,[1] though the size of the village of Bethlehem at once shows the statement to be a lying legend of the most enormous dimensions. This, by the by, is an example of his constant habit of infusing a deceitful colouring-matter into the narrative. When dealing with the sacred history, he perpetually throws in (for the purpose no doubt of increasing the effect of ridicule, and confounding things that differ *toto cœlo*) copious references to the apocryphal books both of the Old and New Testaments, to the wildest follies of the early heresies, and to the idlest legends, whether of rabbinical or Romish origin, as if the Bible were implicated with them or responsible for them!

Many of his statements certainly astonish us for their temerity, whether we attribute them to ignorance or effrontery. Thus, for example, he says, in the article "Gospel"—"It is a decided truth, whatever Abbadie may say to the contrary, that none of the first Fathers of the Church, *down to Irenæus inclusive*, have quoted any passage from the four gospels with which we are acquainted;" and under the article "Christianity" he affirms, with still more marvellous assurance, that "Fifty-four societies had fifty-four different gospels, all secret, like their mysteries, all unknown to the Gentiles, who never saw *our four canonical gospels until the end of two hundred and fifty years.*"

The above are comparatively venial specimens of his ordinary manner; the worst, for obvious reasons, we purposely refrain from giving. Suffice it to say, that so transparent is the *animus* with which he writes, so unscrupulous the way in which he trifles with evidence, so arbitrary both his credulity and his incredulity, that for this, as well as for the other serious reasons we have stated, he can never be a very formidable propagandist of infidelity. Gibbon and Hume were far more plausible assailants.

In one respect Voltaire is almost unique among infidels, and we trust will ever remain so; we mean in the entire absence, as of all veneration for what his fellow-men deem sacred, so of all courtesy and forbearance towards his fellow-men in the expression of his contempt for it. Things which, in their esteem, are most sacred mysteries, he contemptuously uses as a butt for his ribald wit. Over the most solemn and touching narratives of Holy Writ he chatters and hops about, and voids his dirt, with as little sense Voltaire. of indecorum as a jackdaw would feel in doing the like on the towers of Notre Dame.

We do not of course demand that he who does not believe the Bible to be true should approach its contents, or argue against its evidence, with the veneration of a man who does. But no one with the slightest tincture of right feeling; still more, no one who at all sincerely desires to convince his fellows of what he deems their error, will make their most sacred convictions the theme of obscene jest and revolting witticisms. This, nevertheless, Voltaire has done; and it is this chiefly which makes us say that Voltaire will never do much mischief as an apostle of infidelity. Those must be already infidels, and infidels of a very coarse stamp, who will tolerate him when he gets on such subjects. The generality of people will simply be disgusted with him; and while they wonder at his wit, will wonder as much at his abuse of it. He can here receive applause only from those who, being lost to shame, can receive no injury from him; who have prepared themselves to be initiated in his mysteries by first stripping themselves naked.

In dealing with the doctrines of Revelation, Voltaire constantly employs arguments equally applicable to some of the principal doctrines of Natural Religion; his objections against the one are equally valid, if valid at all, against the other, and are fairly met, if the objector still holds the latter, by the irrefragable reasoning of Butler. But for Voltaire, the "Analogy" might as well never have been written. Provided he can get a plausible argument against a doctrine of the Bible, he does not mind though his reasoning involve the moral administration of the world, and the complementary doctrine of a future state of retribution, in the same dilemma. And perhaps, as regards his own views, there was no reason why he *should* care; for it is pretty certain that he did not hold the above doctrines, or, at all events, with any firmness. Assuredly his faith does not prevent his often making himself very merry with them. The only theological doctrine which he seems to have retained with a firm grasp, and to have constantly defended, is, that the universe is certainly the product of Power and Intelligence adequate to the phenomena. He seems to have had a sincere contempt for all the ordinary theories by which atheism vainly strives to account for the *indications* of design in the universe, without supposing any design at all. His plain, strong, natural sagacity recoiled in undissembled disgust from the metaphysical systems by which it studies to sophiscate the plain deductions of human reason on this subject. Nor is there, in all his *Philosophical Dictionary*, a more characteristic specimen of his genius than the 3d, 4th, and 5th sections of the article entitled "Dieu—Dieux," in which he touches on the theories of the author of the *Système de la Nature* and other atheists, and vindicates the natural logic of common sense in the argument from design. That article will give the reader an amusing and, what cannot be readily found in the theological portions of the work, an instructive specimen of Voltaire's manner.

But beyond this one point, the barren acknowledgment of a Being whose creative power and wisdom originally called this universe into being, Voltaire leaves everything in doubt. Whether the universal parent takes any special care of the children he has made, or any cognisance of their conduct; whether he exercises any moral government over the world; whether there is any future state in which that government will be consummated and vindicated, is all left in darkness. His general mood would seem, however, to be much the same as that of Bolingbroke—denying all

[1] Divide the 14,000 by 1000, and we get at the number which Michælis very justly conjectures to be about the truth. He thinks that 14 will be an ample allowance.

Voltaire. Providence but that of general laws, and questioning the doctrine of a future retribution. In his *Condide* and other tales, he sedulously inculcates principles which imply that the doctrines of what is called "natural religion" (with the single exception that there is an architect of the world, whether we know anything else about him or not), are quite as doubtful, and involve principles quite as repugnant to the human intellect, as those of Revelation itself. It is not surprising, therefore, that he should often have used arguments against Christianity, the issues of which, in relation to theism, he did not trouble his head about. But it is of importance that the *reader* should remember it; for to any men who still maintain the ordinary doctrines of natural religion, the *favourite* arguments of Voltaire against Christianity become *telum imbelle*, unless they be willing to go further, and apply Voltaire's arguments as far as Voltaire did himself. It must also be confessed, that in touching on subjects connected with "natural religion," as in the celebrated tale of *Condide*, he indulges just the same reckless tone, the same disregard of counter-evidence, the same ribald jests on solemn themes, as in his criticisms on the Bible.

We have conceded that it is some *palliation* of Voltaire's injustice to Christianity, that he had chiefly before his eyes the caricature of it which the spectacle of the corruptions, profligacy, hypocrisy, and cruelty of the Roman Church of his day presented; the persecution he had himself suffered at its hands still further inflamed and embittered his feelings. That there is much in all this to explain the acrimony of Voltaire, and of many other philosophers of his day, against the church, there can be no doubt, and we would exercise no niggard charity towards them on this account; but it will not avail for the effectual defence of such men as Voltaire. It is of far greater force as urged on behalf of some whose ignorance of history was greater, while, to their credit, their virulence was less—of D'Alembert for example. But it is plain that Voltaire did not content himself with hating and ridiculing the vices of the actual system he saw before his eyes, and which made many a man an infidel, because in his ignorance of what Christianity was, he thought *that* to be it. Voltaire's *Philosophical Dictionary* and other writings show plainly enough that he had diligently ransacked not only the voluminous writings of the English deists, but the Scriptures both of the Old and New Testaments, in search of objections and difficulties, though he troubles himself not at all about the answers.

The habitual profanity of Voltaire has led to one charge against him which, it is due to justice to say, is very doubtful. He has often been accused of applying the well-known expression "ecrasez l'infame" (usually in his printed letters contracted into "*ecrasez l'inf.*," or more briefly still, *ecr. l'inf.*) to the Saviour. There is, however, reason to believe that this offensive application was not designed. The first, so far as we are aware, who undertook to defend him from this charge was Professor De Morgan, in his interesting sketch of D'Alembert, inserted some years ago in a *Biographical Dictionary*,[1] which, unfortunately for literature, was discontinued after the publication of a few volumes. The phrase occurs in Voltaire's letters to D'Alembert, and also in D'Alembert's letters to him. De Morgan urges that the feminine forms of the articles and pronouns with which it is construed, the nature of the context, and Voltaire's known abhorrence of the ecclesiastical system of his times, justify the supposition that it was to the actually existing church of France as seen before his eyes, with all its cruelties, hypocrisy, and corruption, that he applies this opprobrious expression. The interpretation seems to us the most probable, and is certainly the most charitable, one. Professor De Morgan only adduces three instances of the phrase, all occurring in the correspondence between Voltaire and D'Alembert. The phrase is, however, of very frequent occurrence, not only there but in the correspondence with Frederick of Prussia and others, and especially in the letters to M. Damilaville. We have examined very many more instances, and in all, the examination of the context and the grammatical construction tends to bear out Professor De Morgan's interpretation, or at least elicits nothing that contradicts it. The feminine forms of articles, pronouns, and adjectives, are constantly construed with it; as *cette*, *inconnue*, &c. Voltaire.

It is also observable, that the phrase occurs principally, if not exclusively, in the letters written *after* the proceedings in connection with Calas and other victims of ecclesiastical oppression had so inflamed the ire of Voltaire. This synchronism is not insignificant. Though Voltaire principally meant the church of France, it is very obvious, from numberless passages, that he would not have been at all sorry if the "destruction" he so passionately desires had extended to the Christian church in general. He evidently was not particular; nor at all inclined to divorce what his imagination had married—the Christian religion and superstition. Still one would willingly absolve him from the opprobrium of using the above words in the gratuitously offensive sense so often imputed to them.

The *form* of the ribaldry in which Voltaire very generally indulges, as, for example, in the articles in his *Philosophical Dictionary*, is not more offensive than it is clumsy and stupid. He often begins by a solemn asseveration of his entire belief, on the ground of their being revealed, of the things he is about to deride. His opening sentence in the article "*Deluge*" may afford a brief specimen. "We commence with the observation that we are believers in the universal deluge because it is recorded in the Holy Scriptures transmitted to Christians." In like manner he is constantly in the habit of prefacing his scoffs at miracle and mystery, by such declarations as these:—"He implicitly receives them as matter of faith, though wholly inscrutable to the human understanding;"—"If Holy Writ had *not* revealed them, they must have been rejected, from the contradictions and impossibilities they involve;"—"That it is natural and inevitable for man to disbelieve these things; but we must submit our reason to our faith—God's ways are not as our ways." The last text is cited to point this profane jest a score of times; he seems never tired of it.

Now what surprises one is, not that, considering his general character, he should have indulged in this style, but that he should have thought this poor feint of believing docility, instantly followed by scoff and profanity, to be such superlative wit as to bear perpetual repetition. Ironical agreement with an opponent's views may be very effective if consistently carried into the whole argumentation, in order to give zest and piquancy to a *reductio ad absurdum*. Admirable specimens are to be found in *Pascal's Provincial Letters*, where the matter of the pleasantry is as innocent as the manner. But Pascal's exquisite taste would have thought it a clumsy artifice to affect an implicit belief in what he was just about to denounce as an incredible absurdity. As employed by Voltaire in the articles now referred to, the raillery enters not into the argument at all; it is a mere insulated sneer, which becomes disgusting from its repetition, as it is offensive from its profanity. Even those who would not be scandalized at the profanity would be disposed to ask, "Why should the author be always affirming this gratuitous lie, or think that we can never be wearied of this stale jest?" It is as absurd as if a man, refuting the opinions of Voltaire, were to preface

[1] *Biographical Dictionary of the Society for the Diffusion of Useful Knowledge*, vol. i., p. 812.

Volterra. argument against each by saying, 'This strange paradox, or this flagrant sophistry, we implicitly receive without question because it comes from so superlative a genius; if any other human being had said it, we should have felt some faint scruples, but in the present case it becomes us to submit without a murmur;" then, dropping the momentary irony, proceed to open invective and abuse. The reader, we suppose, would soon get heartily sick of such a frigid style.

The little sympathy which Voltaire evinced in the cause of political and civil liberty; the indulgence he showed for absolute kings compared with his bitter hatred of priests, have sometimes led his advocates to say that he had but little to do with the excesses of the French Revolution, and that the odium often cast on his name, as one who had sown the seed which sprang up in such a portentous harvest, has been undeserved.[1] To a certain extent, the statement is just. He no doubt would never have abetted those wild Utopian theories of government, those anarchical principles, which the Revolution developed and consecrated. Rousseau, with inferior talents and reputation, and influencing fewer readers, had far more to do with the visionary hopes of the political doctrinaires of the Revolution. His *Contrat Social* and other works had unquestionably a very extensive and pernicious effect in awakening fanatical expectations of a political millennium, founded on impossible conditions of an absolute equality. The cant of sentimental philanthropy which pervades these theories gave them a plausible air, and for a time lulled multitudes in dreams of a coming social Elysium, from which the storm of the Revolution rudely awoke them.

But it would be a fallacy to suppose that because Voltaire would never have pleaded for such wild political schemes as those of the Revolution, that therefore he was not in a very great degree responsible for the *character* of the Revolution itself. He and his contemporary *litterateurs*, of similar irreligious character and sentiments, contributed much to give the Revolution its peculiar moral complexion, its character of unprecedented atrocity. By the levity and contempt with which they had treated, not only religion, but morals; by their lenience towards vices which never were, and never can be, found alone, and of which they were not only the apologists but too often conspicuous examples; by their incessant scoffs at the doctrines of a moral government of the world and a future retribution, they destroyed the checks which usually operate on human passions, without replacing them by any other. Impressions of religious and moral obligation will usually do much to keep society together, even in the worst political revolutions. These were cast off in the French Revolution to an extent never before witnessed, and the consequences were such as might be expected. Practical and to a great extent speculative atheism widely prevailed; and large masses of the people gave themselves up to do as they listed without compunction, remorse, or fear of the future. We defy any one to account for the peculiar character of the French Revolution without taking the influence of the irreligious literature of the preceding years into account. It has often been said, and most probably with truth, that the political abuses of France were such that nothing but a revolution could remedy them, and that, therefore, a revolution was inevitable. This does not solve the phenomena. It does not account for *such* a revolution. Other nations have suffered from abuses even greater than those of the old French *régime*, and have sought the same remedy; but no nation has ever suffered from a revolution so appalling, so replete with horrors, so fruitful in crimes. These we may, in great measure, attribute to the fact, that while the wild theories and mad hopes of a coming political golden age relieved the "organic molecules of a disbanded nation" (to use an expression of Burke) from all the bonds of custom and habit, the bonds of religion and morality were simultaneously relaxed also; and thus the community at one and the same time became bereft of both its sheet-anchors. For the moral, if not the political, enormities of the Revolution, we believe that the influence of Voltaire was in a very high degree responsible.

Of the immense mass of literature evoked by the life, character, and writings of this author of nearly a hundred volumes, it is of course impossible, in this essay, to give an account. We must content ourselves with referring the reader to the article in the *Biographie Universelle*, where the bibliography of the subject is given with tolerable fulness. To that article we have been frequently indebted in compiling the sketch of the chief incidents of Voltaire's life. The reader will also find in the same article some acute criticism on the literary merits of Voltaire. A catalogue of the principal memoirs, and essays on his genius and writings, are also given. (H. R.)

VOLTERRA, a town of Central Italy, Tuscany, province of Pisa, and 35 miles S.W. of Florence. It occupies the site of the ancient *Volaterræ*, one of the most important and powerful of all the Etruscan cities. Very large portions of the ancient walls are still visible, and are among the finest existing specimens of Etruscan structure. Two of the ancient gates are still preserved; but it is a disputed point whether they belong to the Etruscan or Roman period. The modern town occupies only a small portion of the ancient city. It stands on a commanding eminence, about 1870 feet above the level of the sea, and is surrounded by walls. The streets are narrow, and the houses generally old. It has a citadel, now converted into a house of industry; a cathedral and several other churches, theatre, hospital, and orphan asylum. The museum in the *palazzo pubblico*, or town-hall, is one of the most extraordinary collections in Italy, comprising cinerary sarcophagi, statues, vases, coins, bronzes, gold ornaments, &c., obtained in the numerous ancient sepulchral chambers in the neighbourhood of the town. The inhabitants are chiefly employed in the manufacture of alabaster vases and other ornamental works. Pop. about 4500.

Volturno ‖ Voronej.

VOLTURNO (the ancient *Volturnus*), a small river of Southern Italy, kingdom of Naples, rises among the Samnitic Apennines, 5 miles S. of Alfidena; flows S.E. till it is joined by the Calore, and afterwards W.S.W., passing Capua, and falling into the Mediterranean near the village of Castel Volturno, 20 miles S.E. of Gaeta. It is about 100 miles in length, and is a deep, rapid, and turbid stream, subject to frequent overflowings. It gives name to a victory gained by the forces of Garibaldi over the troops of the King of Naples on 1st October 1860.

VOLUME. See Book.

VOLUTE. See *Glossary to* Architecture.

VONDET. See Holland.

VORONEJ, Voronetz, or Woronesh, a government of European Russia, bounded on the N. by those of Orlov and Tambov, E. by that of Saratov and the country of the Don Cossacks, S. by that of Ekaterinoslav, and W. by those of Charkov and Koursk. Length from N. to S., 285 miles;

[1] His "Erastian Compliances," as douce Davie Deans would have said, his tolerance of political abuses, and his little hope of political improvement, naturally enough connected with his cynical contempt of man himself, are sufficiently indicated in the articles of the *Philosophical Dictionary*, headed "Government" and "Democracy."

Voronej || Vorst.

breadth, 150; area, 25,691 square miles. The surface is undulating, with a general slope to the S.E., in which direction the Don, the principal river, flows. There are no mountains, and only a few low hills and ridges rise above the general level. The largest river is the Don, which receives all the drainage of the government. The principal tributaries that join it within the limits of Voronej are the Sosna from the right, and the Voronej and Bitjug from the left. The Donetz, which joins the Don after it leaves the government, forms for some distance the southern boundary of Voronej, and its affluent, the Oskot, waters the extreme W. of it; while, in the extreme N.E., the Choper, another affluent of the Don, flows. Iron and saltpetre are the most important minerals; limestone and freestone are also obtained. The climate is agreeable and favourable to longevity, and most of the productions of temperate countries flourish; but the winters are severe, and the rivers are generally frozen for three months. The soil consists of clay or sand, covered with a rich vegetable mould, and produces the most luxuriant crops. The government is consequently one of the great agricultural regions of the empire, and yields a surplus of corn above what is required for domestic use, amounting, when there is a good harvest, to more than 2,000,000 quarters. The principal crops are wheat, barley, oats, buckwheat, hemp, flax, and tobacco. Vines are grown in some places, and hops to a small extent. Much attention is paid to gardening, and various kinds of fruit, especially cherries and plums, are produced. The extent of arable land in the government in 1849 was 6,724,196 acres; of meadow land, 5,951,473 acres; and of wood, 1,013,232 acres. The forests are comparatively small in extent, but valuable, as there are among them many fine oak woods. The extensive pastures are very rich, especially along the banks of the rivers; and a large number of the inhabitants are occupied in pastoral pursuits. The government contained, in 1849, 815,350 horses, 444,832 horned cattle, 1,132,678 sheep, 227,007 swine, and 10,484 goats. The horses are for the most part of good breed, and many small studs are kept, as hunting is here a favourite amusement. Large numbers of bees are reared, and honey is an important production of the country. Manufactures have made considerable progress here, but they have not yet attained to much importance. Coarse woollen cloth, soap, tallow, and sugar are the chief articles made. The exports consist of corn, cattle, hides, honey, wax, fruits, and hardware. Besides Russians, the government contains Cossacks, some gipsies, and a small colony of Germans. Pop. (1856) 1,840,146.

VORONEJ, the capital of the above government, on the river of that name, near its confluence with the Don, 130 miles E. of Koursk. It occupies a strong position on a steep hill, and consists of an upper and a lower town, with extensive suburbs. It is very ancient, and some parts of it are gloomy and meanly built; but the principal street is lined with substantial and noble buildings, and some of the other streets are nearly equally handsome. There are here a town-hall, exchange, cathedral and many other churches, episcopal palace, convents, hospitals, gymnasium, and other schools. Manufactures of soap, tallow, leather, and vitriol, are carried on here; and there is a considerable trade, partly with the Black Sea, and partly with Orenburg and Siberia. Peter the Great established a palace and extensive dockyards and arsenals here; but since then most of the naval establishments have been removed to Rostov, Tavrov, and other places; and nearly all traces of the palace have been destroyed by the frequent fires that have taken place here. Pop. (1856) 37,664.

VÖRÖSMARTY. See HUNGARY.

VORST, or VORSTIUS CONRAD, born at Cologne on the 19th of July 1569, was the son of a dyer who had secretly adopted the Protestant faith. Having received a good preliminary education, he in 1587 entered the College of St Lawrence at Cologne. After lecturing at Geneva, he was appointed professor of theology at Steinfurt, where he continued till 1610, when he succeeded Arminius in the professorship of theology at Leyden. Here he composed his *Tractatus Theologicus de Deo, sive de Natura et Attributis Dei*. This brought on him the accusation of heresy, and engaged both individuals and universities in the controversy. James the First drew up a large catalogue of the heresies which it contained, and caused the work to be burned in London. He moreover informed the States, that if they did not dismiss Vorstius, none of his subjects would be permitted to visit Leyden; and such was the odium raised against him from other quarters, that he was ultimately dismissed from his office, and banished by the States of Holland from their territory. After spending two years in concealment, he received an asylum from the Duke of Holstein, who had assigned to the dispersed followers of Arminius a piece of ground to build a town. Vorst was an active, industrious, honest man, who thought more of independence than he did of place. He died shortly after at Toningen, on the 29th of September 1622, at the age of fifty-three.

VOS, MARTIN DE, one of the most eminent historical painters of his time, was born at Antwerp in 1531. After studying for some time in the school of Francis Floris, he proceeded to Italy, where he gave great attention to the painters of the Roman school. Proceeding to Venice, he made the acquaintance of Tintoretto, who instructed him in the principles of colouring, and employed him to paint the landscapes to his pictures. He improved greatly under the tuition of Tintoret; and before his return to Antwerp he painted the portraits of several of the family of the Medici. The heads of Martin de Vos are unequalled, for truth and naturalness, by any painter of his time. On reaching the Netherlands, after an absence of eight years, he was commissioned to paint numerous altar-pieces for churches. He was made a member of the Academy in 1559, and died in 1603, after amassing a considerable fortune.

VOS, *Simon de*, a painter of portraits and history, and a pupil of Rubens, was born at Antwerp in 1603, and died about 1662. More than one of his Scriptural pieces have been mistaken for those of his master, Rubens. Of his portraits Sir Joshua Reynolds speaks in the highest terms, comparing him even to Correggio.

VOSGES, a department of the N.E. of France, formed out of the S. part of the old province of Lorraine, bounded on the N. by the departments of Meuse and Meurthe, E. by those of Bas and Haut Rhin, S. by that of Haute Saone, and W. by that of Haute Marne. Length, from E. to W., 76 miles; mean breadth, 38; area, 2304 square miles. It derives its name from the Vosges mountains, a chain which forms the W. boundary of the valley of the Rhine, running northwards along the borders of Haut and Bas Rhin on the E., and of Haute Saone, Vosges, and Meurthe, on the W.; and extending beyond the boundaries of France into Rhenish Bavaria, where it terminates at Mont Tonnerre, on the left bank of the Rhine. These mountains are connected by various ramifications with the Jura range in the S., with the mountains of the Cote d'Or in the S.W., and with the Ardennes in the N.W. Their average height is from 3000 to 4000 feet; and some of the summits, which from their rounded forms are called *ballons*, are covered with snow for several months in the year. The two loftiest peaks in the chain are the Ballon de Guebwiller, 4650 feet, and the Ballon d'Alsace, 4116 feet, both in the S.E. border of the department of Vosges. Another range, called the Faucilles, diverges from the Vosges towards the W., and traverses in that direction the S. of the department. The rest of the department is hilly, and is known by the name of the *Plain*. Vosges

Vosges.

Voss. belongs almost entirely to the basin of the Rhine, and it gives rise to the Moselle, one of the principal affluents of that river. The Moselle rises in the S.E. of the department, about the point where the Faucilles diverge from the Vosges, and flows in an irregular course generally towards the N.W. Its principal affluents here are the Vologne and the Mosellette from the right. The Meurthe, which joins the Moselle from the right, and the Madon from the left, beyond the limits of this department, both have the upper part of their course in Vosges. A small portion in the extreme N.E. is watered by the Bryche, which flows into the Ill near Strasburg; the Saone rises in the Faucilles, in the S. of the department; and the Ornain, an affluent of the Seine, in the N.W. Vone of the rivers in Vosges are navigable; but many of them are highly useful for irrigation, and for affording water-power to manufactories. The geological structure of the Vosges and of the eastern part of the Faucilles is granitic; but further west, sandstone, limestone, marl, and oolite rocks occur. The mineral riches of the country are considerable, consisting of excellent iron, coal, marble, manganese, granite, millstones, and potter's clay; and there are some highly esteemed mineral and thermal springs. The soil of the less elevated portions is fertile, and much attention is paid to agriculture; but the produce is hardly sufficient to supply the wants of the dense population. Wheat, maize, hemp, flax, and potatoes, are the principal crops raised. Vines are cultivated; but the wine made is insufficient in quantity and poor in quality. Extensive cherry plantations are kept up for the making of *kirsch-wasser*, for which this country has obtained a great name. Upwards of a third of the whole area is occupied by arable land. Another source of wealth is the forests, which are very extensive, especially on the slopes of the mountains. From them abundance of timber is obtained, and upwards of 300 saw-mills worked by water are kept in employment. The rearing of live stock is also an important branch of industry. Horses and cattle are numerous, but both of small size; sheep are comparatively few; but swine form an important article of exportation. The department holds a high place among the manufacturing districts of France; and among the articles produced are wrought iron, steel, nails, cutlery, musical instruments, lace, embroidery, cotton cloth, paper, glass, and pottery. All these goods, as well as timber, cheese, butter, &c., are the objects of an extensive trade. The department has for its capital Epinal, and it is divided into five arrondissements as follows:—

Arrondissements.	Cantons.	Communes.	Pop. (1856.)
Epinal	6	126	96,338
Mirecourt	6	142	67,973
Neufchâteau	5	132	59,038
Remiremont	4	37	70,356
Saint-Dié	9	109	112,003
Total	30	546	405,708

VOSS, JOHANN HEINRICH, a highly distinguished German scholar, was born in 1751 at Sommersdorf, near Mecklenburg His early education was received at the petty town of Penzlin, where he exhibited such a propensity for learning, that his father, though ill able to afford the expense, sent him to the public school of New Brandenburg. Here he distinguished himself by several very successful attempts at cultivating German poetry, and by the indomitable perseverance with which he applied himself to the study of Greek. He was, of course, anxious to complete the training on which he had entered by going to a university, but his poverty interposed an insurmountable obstacle. Unable in any other way to procure the necessary funds, he accepted the post of tutor in a private family, where he found time, in spite of six hours daily labour, and amid much insulting treatment, to continue his application to poetry and Greek. At length, in 1772, through the kindness of a literary gentleman who had seen some of his poems, he was enabled to enter the University of Göttingen. At first he intended to study theology, but he subsequently altered his aims, and applied himself to philology. Heyne, the celebrated critic, was then professor at Göttingen, and it was expected that his assistance might have materially aided the progress of Voss. At first Heyne received him with kindness; but the king of critics, like more vulgar monarchs, could bear no rival near his throne, and Voss was obstinate in defending his opinions when they differed from Heyne's. Their intimacy subsided, and a quarrel ensued, which broke out on various subsequent occasions with unseemly violence. Voss was now well known as a scholar of rare ability, and in 1778 he received the appointment of rector of the public school at Otterndorf. It was while he occupied this post that he gave to the world his first great work, his translation of the *Odyssey*, into German hexameters. This appeared in 1781, and all the great critics at once recognised it as a work of sterling merit. It has never been superseded in Germany, and has remained ever since the grand source from which his countrymen have become familiarized with the works of the Greek bard. The next year, the climate of Otterndorf having been found unhealthy, he removed to Eutin, as rector of the gymnasium there. He still continued to prosecute his favourite pursuits. In 1789 he published an edition of the *Georgics*, with a German translation, and commentaries, of which Niebuhr has said they leave nothing for future commentators to effect. A few years later he completed his version of the works of Homer by the publication of the *Iliad;* and this was followed by a revised edition of the *Odyssey*, embodying an extensive alteration of its character, as to the merits of which critics are divided in opinion. His poetical labours were varied by investigations in classical geography and mythology, on the latter of which subjects he published his *Mythologische Briefe* (Letters on Mythology), mainly in opposition to the views maintained by Heyne. A version of the *Eclogues*, and shortly afterwards of the *Æneid*, was followed by a collection of original poetry, with an accompanying essay on *German Prosody*. His health had been undermined by his incessant labours, and he became unable for the duties of his office; but, through the kindness of the Duke of Holstein, he was allowed to retire to Jena with a considerable pension. At Jena he composed his famous review of Heyne's *Homer*. In 1805, the Elector of Baden invited him to settle at Heidelberg, to assist in remodelling the university there. The proposal was made in an extremely liberal manner, and Voss accordingly complied with it. The climate of Heidelberg restored his health, and he resumed his literary labours. He produced, in rapid succession, translations of Horace, Hesiod, Theocritus, Bion, Tibullus, and Aristophanes. At the age of sixty-eight, still indefatigable in his labours, he commenced a translation of Shakspeare, which, however, was not very successful. A work on the ancient mythology, and some pamphlets against the Roman Catholics, produced by the conversion of one of his friends to that faith, completed the labours of Voss. He died at Heidelberg in 1830. His merits have found a universal acknowledgment: in criticism he ranks with Lessing and Wolf; as a translator, few Germans can be compared with him; and he is entitled to a high rank as a poet. Accounts of his life and writings have been printed by Paulus and Schmid.

Vossius.

VOSSIUS, GERARD JOHN, a writer of great and varied erudition, was the son of a clergyman, and was born near Heidelberg in the year 1577. He received his early education at Dordrecht, and, at the age of eighteen, was sent to the University of Leyden, where he studied Greek under Vul-

Vossius.

canius, and mathematics under Snell. At the age of twenty, he published a Latin panegyric on Maurice prince of Nassau. After having taken the degrees of master of arts and doctor of philosophy, he applied himself to the study of divinity and Hebrew. From his father he inherited a library well stored with books of divinity and ecclesiastical history; and at an early period of his life he acquired a very extensive knowledge in both departments. At the age of twenty-two he was appointed director of the College of Dordrecht. In 1614 he was appointed director of the theological college established at Leyden; but in 1618 he relinquished this office for the professorship of eloquence and of chronology. Vossius, whose sentiments were moderate and peaceful, was anxious to shun the theological strife which at that time agitated the Dutch republic. But his *Historia Pelagiana*, published in 1618, involved him in some difficulties. In that elaborate work, he discussed the doctrine of predestination and grace in a strain which the Calvinists considered as much too favourable to the tenets of Arminius. In 1620 the synod of Tergou deprived him of his professorship; but another synod, held at Rotterdam in the following year, permitted him to be reinstated, under the condition of his retracting the errors contained in his history, and promising neither to do nor say anything in opposition to the decrees of the synod of Dordrecht. These he doubtless considered as very hard terms, and for some years he declined to comply with them. In the meantime he was prohibited from teaching either in public or in private; and in one of his letters he estimates his pecuniary loss at 6000 livres a year. In 1624 he made such concessions or explanations as led to his reinstatement. What exposed him to persecution at home recommended him to favour abroad. Archbishop Laud, a very zealous patron of Arminianism, was so highly satisfied with his work that he procured him a prebend at Canterbury, which he was permitted to hold as a mere sinecure. He visited England in 1629, and was installed. On paying a visit to Oxford, he was created LL.D. Here he discovered and encouraged the talents of Dr Pocock, who became so eminent as an orientalist. A college or Athenæum having been founded at Amsterdam, Vossius was appointed professor of history in the year 1633. Here he continued his learned labours till the time of his death, and produced a variety of works, distinguished by the extent and solidity of their erudition. He died on the 19th of March 1649, at the age of seventy-two. He was highly esteemed by his contemporaries for his worth, his talents, and his learning. He was not only an able grammarian and critic, but was likewise skilled in history and theology. He has written treatises on history, poetry, rhetoric, logic, and the mathematical sciences. His work entitled, *Aristarchus, sive de Arte Grammatica*, is not only very elaborate, but likewise very able and judicious. He likewise wrote the *Etymologicon Linguæ Latinæ; De Vitiis Sermonis; Institutiones Oratoriæ; Ars Historiea; De Historicis Græcis; De Historicis Latinis; De Veterum Poetarum Temporibus; De Logices et Rhetoricæ Naturâ et Constitutione;* and *De Philosophorum Sectis*, which are still held in much esteem. In the nine books, *De Idololatria*, he displays the same unlimited research that characterizes all his larger works. Of his theological learning he has erected an excellent monument in his *Historiæ de Controversiis quas Pelagius ejusque Reliquiæ moverunt, libri septem.* Of the entire works of Vossius, a complete collection was published at Amsterdam in 1701, in six volumes folio. Vossius had five sons, who all predeceased him except Isaac the subject of the following notice.

Vossius, *Isaac*, tho son of Gerard Vossius, was born at Leyden in the year 1618. He was trained under the domestic superintendence of his father, and became one of the most learned men of his age. In 1639, when he had only reached his twenty-first year, he distinguished himself by an edition of the *Periplus* of Scylax. In 1642 he made a journey to Italy, and visited Rome. He became one of the literary correspondents of the Queen of Sweden, and, like some other scholars of eminence, was invited to her court. It appears from his letters that he was at Stockholm in 1649, 1650, and 1651. His misunderstanding with Salmasius, however, exposed him to the queen's displeasure; and, in 1652, when he returned from Holland, accompanied by Bochart and Huet, he was not admitted to her presence. But she soon renewed her correspondence with Vossius, and saw him during her visit to Holland. On the death of his father, he was offered the professorship of history at Amsterdam; but he preferred a life of studious retirement, and he appears to have been sufficiently independent to follow the bent of his own inclination. In 1663 he received a handsome present from Louis XIV. In 1670 he came to England; and having visited Oxford during the same year, he was created LL.D., and, as Wood states, was "with great humanity and friendship entertained by some of the chief heads of houses, as his father had been before in 1629." He had now acquired a high reputation; and in 1673 the king bestowed upon him a canonry of Windsor. Both he and his father must have held their preferments as lay-sinecures. He died in Windsor Castle on the 10th of February 1689, in the seventy-first year of his age." King Charles sometimes observed, that there was nothing which he refused to believe except the Bible. Some of his works indeed display sufficient credulity. Of this we find abundant evidence in his *Variarum Observationum Liber*, in which he avers that ancient Rome was twenty times as large as Paris and London together, and estimates its population at fourteen millions. Of the population of China he has given an account still more extravagant. His judgment is on most occasions greatly inferior to his learning, and the spirit of paradox very seldom deserts him. In his usual strain he wrote various tracts on the Septuagint, and was opposed by Father Simon and Dr Hody. On the age of the world he maintained with Hornius a controversy which involved the chronology of this version. Another curious work he published, *De Sibyllinis Aliisque quæ Christi Natalem Præcessere Oraculis*, Oxon. 1680, 8vo. This is the second edition. One of his most able and pleasing works is entitled, *De Poematum Cantu, et Viribus Rythmi*, Oxon 1683, 8vo. Among other ancient authors, he published editions of Catullus and Pomponius Mela, which, if he had produced no original work, would have been sufficient to recommend him to the notice of posterity as a man of uncommon erudition.

Vulcan ‖ Vulgate.

VULCAN (Ἥφαιστος), in pagan worship, the god of subterranean fire and metals, was the son of Jupiter and Juno, and was said to be so remarkably deformed that his father threw him down from heaven to the Isle of Lemnos, in which fall he broke his leg, and there he set up his forge, and taught men how to soften and polish brass and iron. Thence he removed to the Lipari isles, near Sicily, where, by the assistance of the Cyclops, he made Jupiter's thunderbolts, and armour for the other gods. Notwithstanding the deformity of his person, he had a passion for Minerva, and by Jupiter's consent paid his addresses to her, but without success. He was, however, more fortunate in his suit to Venus; but after their marriage she chose Mars for her gallant, and Vulcan exposed them to the ridicule of the other gods, by taking them in a net. The stories of Vulcan and Hephæstus have become so closely interwoven that they defy human skill to disentangle them.

VULCANO, one of the Lipari islands. See Lipari.

VULGATE. See Bible.

W.

W
||
Wadstroem

W, or w, is the twenty-third letter of our alphabet; and is composed, as its name implies, of two v's, this letter being identical with u in the Latin and in the more early form of the English language. It was not in use among the Hebrews, Greeks, or Romans, but chiefly among the northern nations, the Teutones, Saxons, Britons, &c. It is not employed by the French, Italians, Spaniards, or Portuguese, except in proper names, and other terms borrowed from languages in which it is originally used, and even then it is sounded like the single v. This letter is of an ambiguous nature; being a consonant at the beginning of syllables, and a vowel in all other positions. It may stand before all the vowels except *u*, as *water, wedge, winter, wonder:* it may also follow the vowels *a, e, o*, and unites with them into a kind of double vowel, or diphthong; as in *saw, few, cow.* It also goes before *r*, and follows *s* and *th;* as in *wrath, swear, thwart:* it goes before *h* also, though in reality it is sounded after it; as in *when, what.* In some words it is obscure, as in *shadow, widow.*

WACE, Robert, an Anglo-Norman poet who flourished in the twelfth century. His name is written in a great variety of forms; and seems to have been a corruption of Eustace. He was born in Jersey about 1112, and received most of his education at Caen in Normandy. After spending some time in the French dominions, he returned to Caen, where Henry I. of England usually held his court. He was patronised by this monarch and by Henry II.; and was raised by the latter to the rank of a canon in Bayeux. He is supposed to have been also private chaplain to Henry II.; and to have died in England in 1184. His principal work is called *Roman du Rou et des Ducs de Normandie,* consisting of a history of the dukes of Normandy from the conquest of the country by Rollo to the eighth year of Henry I. He also wrote *Le Brut d'Angleterre,* narrating the adventures of a certain Brutus, a great-grandson of Æneas the Trojan, supposed to have reigned over Britain. An edition of the *Roman du Rou* was published at Rouen in 1827.

WADDING, Luke, a learned Roman Catholic priest, was born at Waterford, October 16, 1588. At the age of fifteen he was sent abroad to be educated for the church, and he studied first at the Jesuit seminary at Lisbon, and after entering the Franciscan order in 1605, at their convents at Liriæ, Coimbra, and Lisbon. Having taken orders, he proceeded to Salamanca, and was appointed lecturer in theology at that university. In 1618, he accompanied the bishop of Cartagena, who went to Rome as a legate to settle the controversy on the Immaculate Conception; and on this subject he wrote several pamphlets as well as a history of the legation. Wadding also found time to edit the great Hebrew Concordance of Calasio, who had died before his work could be printed, and to publish an edition of some writings of St Francis, and of the whole works of Duns Scotus, with a life of the "subtle doctor," in 12 vols. fol., 1639. His most important original work is the *Annals of the Franciscan Order,* in 8 vols. folio, 1659. The greater part of his life was spent at Rome, where he died in 1657. Wadding was one of the councillors appointed in the case of the celebrated Jansen, and had pronounced an opinion in favour of his doctrines; but when the papal bull condemned them, he unhesitatingly retracted his former statements.

WADSTROEM, Carl Berns, a Swedish philanthropist, was born at Stockholm in 1746. He rose to eminence as an engineer; and was employed by the Swedish government in several important public works and offices. Meanwhile he found leisure at various intervals to visit different parts of Europe; and in 1787 he undertook a journey into the interior of Africa. Along with the naturalists Sparrman and Arrhenius, he sailed in a French vessel to Senegal, but being unable either from this place or from Sierra Leone to penetrate into the interior, he proceeded to England about the end of 1788. As the question of the slave-trade was then agitating the country, the travellers, who had just come from Africa, were called on to give evidence before the privy council and a committee of the lower house, and Wadstroem being thus led to study the subject, became a strong supporter of the abolitionists. His pamphlet entitled *Observations on the Slave Trade,* contained the first suggestion of colonisation as a means of checking slavery; and he afterwards pursued the subject in a larger work, an *Essay on Colonisation, particularly applied to the West Coast of Africa.* The devastation of Sierra Leone by the French in 1794, led Wadstroem to proceed to Paris, in hopes of inducing the French government to recognise the African settlements as neutral territory. In this he was never successful, but he remained at Paris till his death in 1799.

Wages.

WAGES, (*in Political Economy*), constitute the reward or compensation paid to labourers by those who employ them, in return for their services.

Taken in its widest sense, the term labourers is very comprehensive. In addition to the myriads who are engaged in agricultural, commercial, and manufacturing pursuits, it comprises all sorts of public functionaries, from the prime minister downwards, with those who crowd the ranks of what are called the learned and liberal professions. These parties, how widely soever they may differ in everything else, agree in this, that they exchange their services for valuable considerations of one sort or other. Their entire subsistence, in so far at least as they depend on their employment, is derived from wages; and they are as evidently labourers as if they handled a shuttle or a spade, or held a plough. Even those to whom ample fortunes have descended are not exempted from the necessity of exertion. The duties and obligations which property brings along with it are not a little onerous. The judicious management of a large estate, or other property, requires much care and circumspection. Without this, it may probably be wasted or dissipated; and, at all events, it cannot be applied to its legitimate ends, that is, to advance the interests and the honour of its possessors, and the well-being of their tenants, dependants, and neighbours. Though the contrary be sometimes affirmed, the rich have little in common with the gods of Epicurus. Idleness is hardly less injurious to them than to the poor. Notwithstanding the influence which justly belongs to rank and wealth, everyone is aware that "It is the hand of the diligent which bears rule." We may therefore say with Paley, that "Every man has his work. The kind of work varies, and that is all the difference there is. A great deal of labour exists besides that of the hands; many species of industry beside bodily operation, requiring equal assiduity, more attention, more anxiety. It is not true, therefore, that men of elevated stations are exempted from work; it is only true that there is assigned to them work of a different kind; whether more easy or more pleasant may be questioned; but certainly not less wanted, not less essential to the common good."[1]

In this article the term labourers is taken in its popular

[1] Paley's *Works,* v. 98, ed. 1819.

Wages. and more confined sense; that is, we refer to those only who labour with the hand, as contradistinguished from those who labour with the head. Manual labourers form, however, by far the most numerous class in all nations, and though ranking lower in public estimation than the others, their functions are of paramount importance. Our fleets and armies depend on them for recruits; their expenditure furnishes the largest portion of the public revenue; and their industry and ingenuity supply most part of the conveniences and enjoyments which raise civilized man above the savage. An inquiry into the circumstances which determine the wages and condition of those to whom the other classes are so deeply indebted, and who, at the same time, form so large a portion of all societies, must possess a superior degree of interest.

Like everything else which is bought and sold, the labour or service of man may vary in its price. Those who at one time exchange the labour of a day, a week, a month, or other period, for a given sum of money, or a given quantity of necessaries and conveniences, may, at another time, exchange it for a different sum or quantity. Our first object will therefore be, to appreciate the circumstances on which these fluctuations depend, and the limits within which they are confined.

1. *Wages depend on the Magnitude of the Capital or Fund appropriated to their payment, compared to the number of Labourers.*—The different articles or products belonging to a country that either are or may be employed to support its inhabitants, or to facilitate production, have been termed its capital. It consequently comprises, in advanced countries like England, an all but infinite variety of articles, including buildings, ships, and machinery of all sorts, the lower animals in a state of domestication, with food, clothes, &c. But it is unnecessary, in an inquiry of this sort, to refer to capital in general; for we have only to deal with that portion of it which embraces the various articles intended for "the use and accommodation of the labouring class." This portion forms the fund out of which their wages are wholly paid. We should err if we supposed that the capacity of a country to feed and employ labourers, is to be measured by the advantageousness of its situation, the richness of its soil, or the extent of its territory. These, undoubtedly, are circumstances of very great importance, and have a powerful influence over the rate at which a people advance, or may advance, in numbers and civilisation. But it is obviously not by them, but by the amount of the capital applicable to the payment of wages belonging to a country, that its power of supporting and employing labourers is to be measured. Holland is less fertile than Poland or Hungary, and Lancashire is less fertile than Kent; but, owing to their greater command of capital, the population of the former is comparatively dense. A fertile soil may be made a means of rapidly increasing capital; but that is all. Before it can be cultivated, capital must be provided for the support of the labourers employed upon it, in like manner as it must be provided for the support of those engaged in manufactures, or other branches of industry.

It is a necessary consequence of what is now stated, that the average amount of subsistence falling to each labourer, or the rate of wages, wholly depends on the proportion between capital and population. On the one hand is a quantity of necessaries and conveniences, and, on the other, the work-people among whom these are to be divided. If, therefore, the amount of the former be increased, without an equal increase taking place in the number of the latter, the share of each, or his wages, will be increased; while, if the number of work-people be increased more than the mass of necessaries and conveniences to be distributed amongst them, each will get a smaller share, or a reduced rate of wages. Wages.

This principle is so very plain as hardly to require or admit of illustration. Suppose, however, that a country with *two* millions of labourers, has a capital of L.30,000,000 sterling, annually appropriated to the payment of wages, it is evident that the wages of each, reducing them all to the same common standard, will be L.15; and it is further evident that no addition can be made to this rate unless capital be increased in a greater degree than the number of labourers, or the number of labourers be diminished in a greater degree than the amount of capital. Now this case is not peculiar to this or that country, but is of universal application. Labourers are everywhere the divisor, capital the dividend. And hence the fundamental principle, that there are no means by which wages can be raised, other than by accelerating the increase of capital as compared with population, or by retarding the increase of population as compared with capital. And every scheme for raising wages, which is not bottomed on this principle, or which has not an increase of the ratio of capital to population for its object, must be completely nugatory and ineffectual.

Wages being most commonly paid and estimated in money, it may perhaps be thought that their amount will, in consequence, depend more on the supply of money in circulation, than on the magnitude of capital. But a little reflection will serve to show that the amount of money paid to the labourers is immaterial. They always receive such a sum as is equivalent to the portion of the national capital falling to their share. Men do not live on coin or paper. Work-people carry the money paid them direct to the retail dealers, and expend it on necessaries and conveniences. And it is by the amount of these which comes into their possession that their wages are really to be measured. Were the money in Great Britain suddenly doubled, money wages would, in no long time, be also doubled. But if no corresponding change took place in the supplies of food, clothes, and such like articles, their price would equally rise, and the condition of the labourers be precisely the same as before. They would carry twice the number of sovereigns and shillings to market that they did previously to the increase in the quantity of money; but for these they would obtain only the same quantity of commodities.

Whatever, therefore, be the changes in the rate of money wages—whether they vary from 2s. to 3s., or 5s. a-day—if the capital applicable to the support of labourers, and their number continue the same, or increase or diminish in the same proportion, no variation will take place in the rate of real wages. These do not rise, except when the proportion of capital to population is enlarged; and they do not fall, except when that proportion is diminished.

But, though the principle now stated admit of no dispute, several unfounded inferences have been deduced from it. And, to prevent misconception, it may be right to state at the outset, that the condition or well-being of the labouring classes cannot in any case be correctly measured by, or inferred from, the wages they receive. It depends to a great extent on their conduct and habits, more especially on the description and cost of the articles used by them, and on their frugality and forethought. The same amount of wages that would suffice to maintain a workman who lived principally on corn and butcher meat, would probably maintain two or more if they lived principally on potatoes. And, whatever may be the articles of subsistence used by a people, they will, it is obvious, be powerfully affected by variations in their supply and price,[1] by the skill with which they are applied to their respective purposes, and the eco-

[1] A rise in their price being in most cases nearly equivalent to a corresponding fall of wages, and a fall in their price to a corresponding rise of wages.

Wages. nomy with which they are used or saved for future occasions. The expenditure even of the poorest individuals is spread, in a country like this, over a great variety of articles, some of which conduce but little, while others are not unfrequently adverse, to their comfort and respectability. And, therefore, though the rate of wages, whether estimated in money or in commodities, depends on the proportion between capital and labour, the condition of the labourers is not determined by that rate only, but partly by it, and partly also, and perhaps principally, by the mode in which they expend their wages; that is, by their peculiar tastes and habits in regard to necessaries, conveniences, and amusements. Every one, indeed, is aware that work-people with 18s., 20s., and 24s. a-week, are frequently much better off than others with 28s., 30s., and 36s. per do., though the families of the former be quite as large as those of the latter.

Numerous examples of the truth of what is now stated must at once occur to every individual, however limited his acquaintance with the poor. It is a curious fact, as showing how provident habits may be conjoined with low wages, that at present (1860) the average deposits in the savings banks of Dorsetshire amount to about L.2, 12s. per head of the population; whereas they do not amount in Lancashire to above L.1, 12s. per head of the population, though wages in the latter, owing to the greater demand for skilled labour, are more than double their amount in the former.[1] This singular result is mainly, we believe, ascribable to the greater aggregation of the population of Lancashire into towns and villages, and the greater influx of Irish. But in whatever way anomalies of this sort may be explained, it is at all events certain that provident and economical habits are of the utmost importance to all classes. To the poor in particular they are altogether indispensable. If they want these habits, nothing else can avail them.

2. *Comparative Increase of Capital and Population.*—It would be necessary, were we to attempt to enter fully into a description of the many interesting questions connected with the demand for labour and the rate of wages, that we should inquire into the comparative increase of capital and population. But the very narrow limits within which this article must be confined, preclude our engaging in such inquiries; and, after all, they are important in a theoretical rather than a practical point of view. The increase or diminution of national capital depends on so many varying conditions and circumstances, which can neither be foreseen nor appreciated beforehand, that no certain conclusions can ever be drawn as to its amount, or the ratio of its progress at any future period. But how favourably or unfavourably soever a country may be situated, and whatever may be its increase in wealth, the condition of the bulk of the people will always depend much more upon their own conduct than on that of their rulers or of anyone else. Not that we mean to insinuate that the influence of governments over their subjects is not great and powerful, or that the latter should not be governed in the best possible manner. A people who have the misfortune to be subjected to arbitrary and intolerant rulers, though otherwise possessed of all the powers and capacities necessary for the production of wealth, will, from the want of security and freedom, be most probably sunk in poverty and wretchedness. But wherever property is secure, industry free, and the public burdens moderate, the happiness or misery of the labouring classes depends almost wholly on themselves. Government has there done for them all that it should, and all in truth that it can do. It has given them security and freedom. But the use or abuse of these inestimable advantages is their own affair. They may be either provident or improvident, industrious or idle; and being free to choose, they are alone responsible for the consequences of their choice. Wages.

It is indeed foolish to expect, as some theorists have done, that the progress of population should ever be exactly adjusted to the increase or diminution of capital, or that the conduct of the mass of any people should be perceptibly influenced by public and remote considerations. The theories of philosophers, and the measures of statesmen and legislators, have reference to the interests and well-being of nations; but those of ordinary men embrace a comparatively narrow range. Their views seldom, indeed, extend even to the class to which they belong. They include only themselves, their families, and near connexions; and they are satisfied if they succeed in promoting their interests, without thinking or caring about those of others. Luckily, however, the two coincide. The industry, the frugality, and the forethought, without which no individual can either hope to improve his condition if he have little or nothing, or to keep his own, and avoid falling a sacrifice to poverty, if he have anything, are virtues indispensable to the well-being of individuals, and consequently of the community. And it is so ordered, that no sort of combination or co-operation is required to secure these advantages. They are realized in the fullest extent by every one by whom they are practised; and they can be realized by none else.

It is fortunate that those principles, a knowledge of which is of most importance to the interests of mankind, lie on the surface, and are easily understood, and may be practised by all. Every man, if he have any reflection, who proposes entering into a matrimonial engagement, must feel that he is about to undertake a serious responsibility. The wages or resources which may be able to support himself comfortably, may be insufficient for the support of two, or three, or four individuals, and if he have no provision made beforehand, and cannot increase his means by greater economy or greater exertion, what can he expect from his marriage but that he should be reduced to comparative poverty, and be forced, perhaps, to take refuge in a workhouse? There is no denying this conclusion; and a conviction of its truth will not tend to obstruct any really desirable union. It will only tend to lessen the number of those that are improvidently made, and which seldom fail to be ruinous alike to the parties and the public.

It is not unusual, indeed, for those who have brought themselves into difficulties by their improvidence or misconduct, to throw the blame on the government or the institutions of the country in which they live. But a pretence of this sort cannot impose on anyone possessed of the smallest discernment. It is the merest delusion to imagine that it is in the power of any administration to protect those from suffering and degradation who do not exercise a reasonable degree of industry and forethought. And though it were in its power, its interference in their behalf would be inconsistent with the most obvious dictates of justice and common sense. The lazy, the unskilful, and the improvident workman, whether he belong to Australia or China, England or Russia, will always be poor and miserable. No man can devolve on government, or on others, any portion of that self-responsibility which at once dignifies and constitutes an essential part of human nature. They are not the friends, but the worst enemies of the poor, who seek to conceal or disguise this great truth; and who endeavour to make it be believed that it is possible, by dint of legislation, to provide for the welfare of those who will not use the means which Providence has given them of maintaining themselves in their present position, or of rising to a higher. Such persons are to the poor what a treacherous guide is to a traveller in a strange country. They

[1] *Quarterly Review*, p. 93, No. 215.

 lead them from the only path that can conduct to comfort and respectability, to one which is sure to terminate in disappointment and disgrace.

It will, we presume, be universally admitted, that practically it is impossible to increase the supplies of food and other articles necessary for the support of a family, so rapidly in Great Britain and France as they may be, and in fact are, increased in the United States and Australia. But how can those who admit this proposition deny its inevitable consequence, that were our people to marry as early and universally as the Americans and Australians, we should have, first a great increase of poverty, and then of mortality? Capital, indeed, or the means of supporting and employing labour, will, supposing other things to be equal, increase most under a just and liberal government. But experience sufficiently proves, that the power which men possess of increasing their numbers is sufficiently strong to make population keep pace with the progress of capital, in nations possessed of boundless tracts of fertile and unoccupied land, and of the most liberal institutions. And as this power does not fluctuate with the fluctuating circumstances of society, but remains constant, it evidently follows, if it be not controlled by their good sense and prudence, that it will necessarily in the end sink the inhabitants of densely peopled countries into the most abject poverty.

3. *Inefficiency of Government Interference to increase Capital; Encouragement of Emigration.*—It is needless to dwell, after what has been previously stated, on the paramount importance, with a view to the public well-being of capital increasing faster than population. But when such is the case, it may probably be inquired whether government may not assist in bringing about this wished-for result. In truth and reality, however, this is a matter in which legislation can do comparatively little. When government has secured the property and the rights of individuals, and has given that freedom to industry which is essential, it has done nearly all it can do to promote the increase of capital. If it interfere in industrial undertakings, its proceedings will be productive only of injury. The reliance of individuals on their own efforts, and their desire to advance themselves, are the only principles on which any dependence can be safely placed. When government engages in any department of industry, it is obliged, inasmuch as it has no means of its own, to obtain the necessary funds from its subjects, either by loans or taxes. It is obvious, therefore, that its interference adds nothing to the capital of the country. At best it merely substitutes one sort of superintendence for another: a salaried officer, with but little if any interest in the success of the undertaking, for the unwearied vigilance of an individual trading on his own account, and dependent, perhaps, for his subsistence on the issue of his labours. To suppose that undertakings carried on by such different agencies should be equally prosperous, is to suppose what is evidently contradictory. This is a matter in regard to which there is no longer any difference of opinion. It is now universally acknowledged, that every branch of industry that may be carried on by private parties, will be more successfully and economically prosecuted by them than by the servants of government; and that any advantage that may seem to arise in any particular case, from employing the latter, will be found on examination to be altogether illusory. By interfering in production, government is sure, in so far as the influence of its measures extends, to weaken the industry and enterprise of its subjects, occasioning at one and the same time a misapplication and waste of capital, and a diminution of its produce.

It is nugatory, therefore, to expect any advantageous results from the efforts of government directly to increase capital or the demand for labour. It may, however, promote its increase indirectly, by relieving industry from oppressive burdens and shackles, negotiating with foreign powers for the removal of impediments to trade, and endeavouring, in short, to give greater facilities to production. But beyond this, the presumption is, that its interference will be productive of mischief rather than of good. And, if it attempt to set up national workshops for the employment of the poor, it will increase the poverty it seeks to relieve, disturb all the usual channels of industry, and become a potent instrument of evil.

It may, perhaps, farther be asked, Though government be thus incapable of contributing to increase wages by increasing capital, may it not effect the same end by promoting emigration, and relieving the market of the surplus hands thrown upon it? This question should, we think, be answered in the affirmative. An extensive voluntary emigration has been going on for a lengthened period from Great Britain, to which, as everybody knows, an extraordinary stimulus was given by the discovery of the gold-fields of California and Australia. And no one can doubt that this emigration has been signally advantageous not only to the emigrants themselves, but to all classes of the community. Wages have been raised, and the condition of the labourers materially improved. And at the same time that this was being done, the shipping interest was enriched by the demand for vessels to carry away the emigrants; and a new and rapidly increasing demand was created for all sorts of manufactured products. Hence the unprecedented increase of manufactures and commerce; and the unexampled success that has latterly attended most sorts of industrial undertakings.

But in ordinary times, and in some degree even at present, voluntary emigrants do not always consist of those that might be most advantageously spared. They are in most cases active, enterprising, and industrious; and sometimes their emigration rather serves to make room for an inferior class, than to improve the condition of the labouring class in general. The poorest classes, however desirous they may be, are unable to emigrate; and these are the very parties who might be advantageously assisted by the public. It is difficult, indeed, to see how the money of the latter could be more profitably laid out than in helping forward emigration. Poor families in towns, or poor cottiers on estates in Britain or Ireland, for whose services there is little or no demand, were they conveyed to America or Australia, would most likely become industrious and thriving. And they might be conveyed to either of these continents, and some provision made for their temporary subsistence in them, for less than a year's cost of their miserable maintenance in England. And though, as a general rule, it might be wrong for a state to undertake the charge of emigration, still a great deal might be done by assisting parishes or landlords in removing paupers and other poor parties wishing to emigrate. So long as there is an extraordinary demand for labour in Australia and America, and anything like a surplus supply in any part of Britain or Ireland, so long will it be for the interest of all classes, but especially the poor, that labour should, like other things, be carried to the best market.

We shall be told, perhaps, that emigration may be carried to excess, and that the country may be deprived of an adequate supply of labour. But there is no real foundation for any such apprehension. That rise of wages which is the necessary consequence of every considerable emigration, progressively lessens the temptation to emigrate, and is an insuperable obstacle to its being carried to anything like an injurious extent. Previously to 1846, labour in Ireland was a mere drug; and, low as wages were, the peasantry were not half employed. Even at present (1860), the towns are crowded, with people driven from the country, for

Wages. whom there is no effectual demand; and till they have pretty generally disappeared, there can be nothing like an excess of emigration. Ireland is not, in fact, a country which, were its social economy in a sound state, would have a large population. The want of coal renders her unsuitable to most descriptions of manufactures. And the humidity of her climate, while it makes her ill suited for the growth of most varieties of corn, renders her admirably well fitted for pastoral purposes. Her herbage is the finest and most luxuriant in Europe. And under the free commercial system which is now established, the presumption is, that the land of Ireland will be found to be much more productively employed in grazing than in tillage. This, at all events, is the conviction of some of those best acquainted with the circumstances, and best qualified to form a sound opinion upon them. And supposing it to be realized, population may yet be very greatly reduced, not only without any injury, but with much advantage to her future well-being.

But without farther speculating on such contingent and uncertain events, it is true, and should never be forgotten, that legislation, when most successful, merely improves, to a greater or less extent, the condition of the labourers generally. It does nothing peculiar for individuals. It leaves them where they should and must always be left, to depend on their own conduct and exertions: to be comfortable, if they practise thrift and industry; and wretched, if they indulge in waste and idleness.

The improved condition of the labouring classes of this country during the last twenty years, arising partly out of the gold-discoveries already alluded to, and partly, also, and in a still greater degree, from the liberal economical policy introduced by Sir Robert Peel, is evident to every one at all familiar with the subject. Money-wages have been considerably increased; and owing to the fall that has taken place in the prices of most articles used by the labourers, the same amount of money goes much farther now than formerly in the purchase of necessaries and conveniences. But notwithstanding the improvement in the condition of the mass, it must be admitted that many individuals and families continue in a very depressed condition. Except, however, in a few peculiar cases, that is owing far more to their own improvidence and misconduct than to anything else; and there is really no reason to think that their condition will be materially improved unless their habits be previously amended.

4. *Equality of Wages in different Employments.*—We have shown in the article Political Economy in this work, that though the rate of wages differs very widely in different employments, yet, when the circumstances peculiar to each are taken into consideration, and when labour may be moved freely from one employment to another, it is nearly the same in them all. The intensity of the labour in different occupations, the degree of skill and training required to carry them on, their healthiness, continuity, and the estimation in which they are held by the public, differ exceedingly. And wages are equal, not when each workman receives the same number of shillings or of pence by the hour, day, or week, but when they are adjusted so as to compensate, or countervail the above and other varying circumstances peculiar to the businesses in which they engage. Wherever, indeed, the principle of competition is allowed to operate without restraint, and individuals may employ themselves as they please, we may be assured that the higgling of the market will always adjust the rate of wages in different employments, on the principle now stated, and that they will be, all things considered, nearly equal. If wages in one employment be depressed below the common level, labourers will leave it to go to others; and if they be raised above that level, labourers will be attracted to it from the departments in which wages are lower, until their increased competition has sunk them to their average standard. We do not, however, mean to affirm, that this equalisation is in all cases immediately or speedily brought about. On the contrary, it often happens that, owing to an attachment to the trade, or the locality in which they have been bred, or the difficulty of learning other trades, individuals will continue, for a lengthened period, to practise their peculiar trades, or will remain in the same district, when other trades in that district, and the same trades in other districts, yield better wages to those engaged in them. But, how slowly soever, wages, taking everything into account, are sure to be equalized in the end. And the extraordinary facilities that are now afforded for becoming minutely acquainted with the various branches of industry carried on in all parts of the country, and of travelling from one point to another, will no doubt hasten the adjustment of wages, according to the advantages and disadvantages incident to different businesses and localities. Without, however, insisting on these considerations, it is enough to state, that all inquiries, like those in which we are now engaged, that have the establishment of genera. principles for their object, should be founded on periods of average duration; and whenever such is the case, it may always, without occasioning any material error, be assumed that the wages earned in different employments are, all things taken into account, about equal. Wages.

It may farther be observed, in reference to these principles, that wherever industry is unfettered, and knowledge generally diffused, the talents of all are turned to the best account. Indeed, it may be safely affirmed, that of the myriads of individuals engaged in industrial undertakings in Great Britain, as conductors, overseers, or workmen, the situation occupied by each is, in the vast majority of cases, that which is best suited to his capacity, and his salary or wages such as he is fairly entitled to by his services. Agriculturists, manufacturers, and merchants, whether their businesses be large or small, are always most anxious to give the greatest efficacy to their establishments, to adapt their means properly to their ends, and to select the parties that are, all things considered, the most suitable for their purposes. The prosperity of all industrial undertakings principally depends on the skill with which this selection is made, on the proper parties being placed in the proper situations, and their wages adjusted according to their merits and the confidence reposed in them. Mistakes in a matter of such primary importance as the proper distribution of the labour employed, in any considerable undertaking, would be so very fatal to its success, that we may be sure they will be carefully guarded against. The principle of *detur digniori* is the only one on which their managers can act with safety or advantage to themselves. And it is quite as much for the interest of the employed as of the employers that this distribution should be fairly made; for otherwise trickery, ignorance, and sloth, might carry off the rewards due to integrity, skill, and diligence. The society in which we live has its disadvantages and drawbacks; but, at all events, it must be said of masters and capitalists engaged in business, that they never willingly fail duly to appreciate and reward the superior talents and industry of the lower classes; and never suffer, or, if ever, only through error and for a moment, that the fund which should feed and support labour should be misemployed to support idleness.

5. *Hiring by Time and by Piece Work—Advantages of the latter, &c.*—Wages are sometimes paid by the day, week, month, year, or other term, and sometimes by the piece or job, that is, by the quantity of work done. Domestic servants are usually hired in the former mode or by

Wages. time; but large amounts of manufacturing, agricultural, and other labour are performed by the piece, and wherever it can be adopted, this is the preferable mode of hiring work-people. Their strength, skill, and assiduity are widely different. And when they are hired by time, it is often impracticable, and is always a difficult, troublesome, and invidious task, to arrange them in classes, and adjust the wages of each according to their real deserts. Hiring by the piece or job does away with these difficulties; and, by exactly apportioning the reward to the amount of labour, not only takes away all temptation to idleness, but prompts workmen to put forth all their energies. It makes their own immediate interest, and not their duty to their employers, the mainspring of their exertions. Laborious and skilful workmen are no longer underpaid, as compared with those who are slothful and ignorant. The system admits of no partiality on the part of the masters, and of no pretence or shirking on the part of the employed. It is thoroughly honest and equitable. The wages earned under it may be low or high; but whatever may be their amount, they are distributed in the exact ratio of the services that have been performed. The labourer who executes twice the work that is executed by another receives double wages, and so in proportion.

The stimulus which this plan of hiring gives to exertion is so very powerful, that in some cases it has been thought necessary, in the view of preventing the labourers from overworking themselves, to limit the sums which they could earn in a given time. But this ultra zeal is not manifested, except in the case of parties engaged for a short period only, or when they first begin to work under this system. Regular task-work labourers, though distinguished by their industry and perseverance, do not overwork themselves. They are also much more their own masters than those engaged for certain terms. They are, in truth, at once contractors and labourers. And provided they execute their work within the term stipulated (if such stipulation be made), they may choose their own time for working, and begin and leave off when they please.

Piece-work is also by far the most likely, if it be not the only means by which the mere labourer can expect to advance himself to a higher station. A man undertakes to cut down corn at so much an acre, to make roads and drains at so much a rood, to weave cloth at so much a yard, in short, to execute a certain amount of work for a certain price. Sometimes he restricts his undertaking to what he thinks he can execute himself, with perhaps the assistance of his family. But whether he do this, or employ others (sometimes in the way of sub-contractors) to assist him, it is his object to finish his task as expeditiously as possible, and to employ his profits as a means of extending his business. In this way he gradually rises in the scale of society, till, having ceased to work with his own hands, he becomes a contractor on a large scale, or engages in some other occupation. And it is plain that the training and experience he has had, and the habits he has formed, must make him at once a vigilant and a discerning master. The foundations of thousands of middling and of very many large fortunes have been laid in the way now stated. It is, in truth, the broadest, the easiest, and the safest of the various channels by which diligent, sagacious, and frugal individuals emerge from poverty, and attain to respectability and opulence. Those who thus rise to distinction may be emphatically said to be the architects of their own fortunes. They owe nothing to interest, to favour, or to any unworthy means. They stood originally on the same level with their fellow-workmen, and they owe their elevation to the judicious exercise of talents common to them all.

There cannot, therefore, as it appears to us, be any reasonable doubt that the introduction of the practice of piece-work, or of hiring by the job, has been, and that its further extension would be, a great advantage to all classes, but especially to the labourers. It appears to be the only plan by which a man's earnings are not only made to depend upon, but are exactly proportioned to, his labour, skill, and ingenuity; while it has the further advantage of enabling prudent and enterprising individuals to advance themselves, by comparatively easy steps, to a superior condition, and, in the end, to merge the character of labourer in that of employer. Wages.

It has sometimes been said, that it would be good policy to endeavour to interest labourers in the zealous prosecution of the task in which they may be engaged, by making their wages depend, in part at least, on the result of their exertions. But, except in a few limited and peculiar cases, this could not be done. The wages of sailors may be, and indeed usually are, made to depend on the successful termination of the voyage. But how could the wages of the work-people employed on a farm, in a foundry, or in a cotton mill, be made to depend on the result of such speculative undertakings? Very frequently, however, the work-people now referred to are paid by the piece; and, when such is the case, they have a plain and tangible motive, level to their capacities, and not depending on anything remote or contingent, to make every exertion.

But though the practical difficulties in the way of making the wages of labourers dependent on the results of the employments in which they are engaged were less formidable than they appear to be, we should not, in the great majority of cases, anticipate any advantages from the scheme being adopted. On the contrary, the presumption is, that it would be injurious. If labourers are to participate in the advantages of successful enterprises, they must also participate in the losses resulting from those of a contrary description; and must, consequently, in cases of failure, be deprived of their accustomed and necessary means of subsistence. The hazard to which they would thus be exposed might, it is true, be lessened by making a part only of their remuneration depend on the issue of the enterprise. But if it were really an advantage to be allowed to participate in a chance of this sort, the fixed portion of their wages would be proportionally diminished, and at every failure of an enterprise, the labourers engaged in it would be thrown upon the workhouse, or on the contributions of the benevolent. It is nugatory to suppose that the condition of the poor should be improved by their engaging in such uncertain projects. Security, and a reward proportioned to their deserts, conduce most to their wellbeing. And these, we have seen, are enjoyed in the highest degree by the piece-work labourers. They are nowise dependent on the seasons, or on any one of the thousand unforeseen contingencies that may occur to defeat the most carefully conducted industrial speculation. They depend on themselves only; and being sure of a commensurate return, they invariably put forth all their energies.

It is further obvious, that if work-people are to be interested in the result of an undertaking, they must have some control over its conduct, and be authorized to inquire into the accounts and proceedings of those by whom the undertaking is managed. All the advantages of individual enterprise and responsibility would, in consequence, be lost, and the most necessary and judicious steps, in the conduct of a business, might be objected to or censured by those most incompetent to form a judgment upon such matters. At present, when a capitalist engages in any undertaking, he knows beforehand that he will reap all the advantage if it be successful, and that, if otherwise, he will have to bear all the loss. He is consequently determined, by the most powerful motives, to act discreetly, to proscribe all useless expense, and to avail himself of every means or incident

Waifs || Wakefield.

that may present itself, to facilitate his projects. Except in a very few cases, all industrial undertakings are sure to be carried on most efficiently and economically by individuals. But of all sorts of interference, that of the workmen would be most objectionable. It would hardly, indeed, be more absurd for a general to take the opinion of the privates of his army on questions of strategy, than it would be for a capitalist to call his labourers to his councils, and mould them according to their opinions.

6. *Influence of Taxation, &c., over Wages.*—The inquiry into the influence of taxation over the rate of wages and the condition of the poor involves the consideration of sundry difficult and delicate questions, and has given rise to a great deal of discussion. Our limits will not, however, allow of our entering upon the subject; and it is, indeed, unnecessary, as we have already treated it at considerable length in the article TAXATION in this volume, to which we beg to refer. Here we shall merely observe, that the influence of taxes over the labourer, provided they be judiciously selected and assessed, is by no means so injurious as is commonly supposed, and that it is frequently even beneficial. (See article referred to).

Poor-laws, savings-banks, public education, and so forth, have each their peculiar influence over the poor, depending, of course, in a considerable degree, on the way in which they are respectively organised or administered. But having been already pretty fully treated of under the heads referred to, the consideration of that influence needs not be resumed in this place.

It might in some respects have been desirable to annex to this article tables of the rate of wages in different businesses and at different periods. But these have been omitted, because to make them really useful, they would require to be accompanied with various collateral tables and discussions, exhibiting the prices of provisions, clothes, and other accommodations, the habits of the population, and so forth. These, however, would require far more space than can be allowed to them in this work; and we must therefore content ourselves with referring the reader for information on these subjects to the statements and tables embodied in or annexed to the great work of Sir F. M. Eden on the *Poor*, and to those in Tooke's *History of Prices*, and other publications. A tract has lately been published by Mr David Chadwick of Salford, which gives authentic information in regard to the rate of wages in about "200 trades and branches of labour" in Lancashire during the twenty years from 1839 to 1859. It is an instructive and a valuable publication, and does great credit to the industry and bility of the writer.

Some of the previous paragraphs have been taken from the *Essay on the Circumstances which determine the Wages of Labour, &c.*, by the author of this article. (J. R. M.)

WAIFS, are goods stolen, and *waived* or thrown away by the thief in his flight, for fear of being apprehended. These by the law are given to the king, as a punishment upon the owner for not himself pursuing the felon, and taking away his goods from him. And therefore if the party robbed do his diligence immediately to follow and apprehend the thief (which is called "making fresh suit"), or convict him afterwards, or procure evidence to convict him, he shall have his goods again.

WAKEFIELD, a parliamentary borough in the West Riding of Yorkshire, sending one member to Parliament, and containing, according to the last census, 22,065 inhabitants. The town is well built, and excellently situated on a gentle slope rising from the river Calder, which is navigable. Wakefield was in the days of the Saxons a very important place, and during the middle ages ranked as the most populous and thriving town in the West Riding. Many scenes of stirring events in English history occurred here; for instance, the battle of Wakefield in 1460. The soil around is rich and very productive, and, no doubt, entitled it to the name of "Merry Wakefield," which it bore in former days. From the time of Henry VII. to the middle of last century, the town was much engaged in the manufacture of woollen cloths, but about the latter period, that of worsted stuffs began to flourish, and towards the end of the last century, and in the early part of the present, it became a great emporium for them. For the last thirty years the worsted stuff-trade has declined here, and has for some years been nearly supplanted by the spinning of hosiery yarns for the Nottingham and Leicester trades, for which purpose numerous factories are employed. There is a most extensive trade in corn transacted at Wakefield, and a large portion of that consumed in the West Riding is purchased at the weekly market on Friday. Numerous very capacious corn warehouses are ranged on the banks of the Calder, and by means of its navigation corn is brought by water from the south of England and abroad. A very handsome and commodious Corn Exchange was a few years since erected in the town. Wool also is an article of considerable trade at Wakefield, but not so much so as in years past, when it was the wool-market for the whole of the Riding. Vast numbers of cattle from the middle and northern parts of the kingdom are brought here for sale at the fortnightly fairs held on the Wednesday. In the year 1847, the town was incorporated by charter. The various public buildings connected with the business of the Riding are located at Wakefield, and give considerable importance to the place, viz: the clerk of the peace's office, the office for the registration of deeds, and the House of Correction for the Riding,—the last is a very extensive building formed upon an excellent plan: also the West Riding Pauper Asylum, and a court of quarter sessions. Anciently the grammar school of Wakefield, founded in the reign of Elizabeth, enjoyed a great reputation, and among other famous men educated within its walls, may be particularly mentioned Dr Richard Bentley, Dr Radcliffe, and Archbishop Potter. The parish church of Wakefield is a noble structure, and its conspicuous spire a great ornament to the town. The living is a vicarage. There are also several district churches, besides Roman Catholic and dissenters' chapels. Of late years Wakefield has again begun to prosper, many improvements have taken place, and owing to its corn and cattle market, to which great numbers resort, is now a thriving, and on market-days a bustling town.

Wakefield.

WAKEFIELD, *Gilbert*, a commentator and critic of some celebrity, born at Nottingham on the 22d of February 1756, was the son of the Rev. George Wakefield, rector of the parish of St Nicolas. He was observed in his earliest infancy to be of a serious turn of mind, and he made a rapid progress in the first elements of literature. At the age of seven, he was sent to a free school at Nottingham, and remained there two years, chiefly under the tuition of Mr Beardmore, afterwards master of the Charter House; he was then sent to a school kept by the Rev. S. Pickthall, at Wilfred, an institution which seems to have been only distinguished by the regular imprisonment of the boys for no less than eleven hours a day. After this, when his father obtained the vicarage of Kingston in Surrey, with the chapelry of Richmond, he was placed under the care of his curate, who kept a school at Richmond. He was, however, removed in 1769 to a better conducted establishment in the same neighbourhood, kept by the Rev. R. Wooddeson, of whom he speaks in his *Memoirs* with high approbation.

At sixteen he went to Jesus College, Cambridge, where his classical studies still continued to be the principal object of his attention, although he was so fortunate as to obtain the rank of second wrangler at the termination of his academical studies in 1776. He has indeed the candour to observe, that the year was below mediocrity with regard

Wakefield. to the performances of the candidates in general; and that, when he obtained the second classical medal, on the Duke of Newcastle's foundation, he had only one competitor. Still it must not be denied, that to be both second wrangler and second medallist in any year implies no ordinary portion of application, as well as some considerable talent. Wakefield was however distinguished, throughout his life, by a singular mixture of opposite habits; and, in the midst of his studies, he confesses that "he sometimes felt himself almost incapable of reading a single page for months together;" and in summer especially, he could only wander about the fields in a state of perfect inactivity. On the other hand, he says that, "for five years he rose almost without exception, by five o'clock, winter and summer, but never breakfasted, drank tea, or *supt* [supped]," or of course dined, "alone half a dozen times during all that space, enjoying society, from the first, beyond measure."

He became a fellow of Jesus College in 1776, and he gained, in two successive years, the second bachelor's prizes given by the chancellor. In 1778 he was ordained by the Bishop of Peterborough, though he did not subscribe the articles without great reluctance. He obtained a curacy first at Stockport in Cheshire, and then at Liverpool. The year after, he married Miss Watson, a niece of the rector of Stockport, and thus vacated his fellowship. His domestic life appears to have been happy and harmonious, though the only merit of his wife, that he has left upon record, is the singular hereditary qualification, that her great-grandfather and great-grandmother had lived together as man and wife for seventy-five years. Soon after his marriage, he became classical tutor in the dissenting academy at Warrington, though he did not professedly unite with any specific community of dissenters as adopting all their opinions; but he soon began openly to attack those of the Established Church, in a multitude of controversial writings, and especially in the notes accompanying his new translations of some parts of the Scripture; a work for which he had diligently laboured to prepare himself by the study of various dialects of the oriental languages. After the dissolution of the academy of Warrington, he lived at Bramcote in Nottinghamshire, at Richmond, and at Nottingham; partly occupied in the instruction of a few pupils, and partly in pursuing his own studies and illustrations of antiquity. In 1786, and for two or three years after, he suffered greatly from acute pain in his shoulder, which interfered materially with the prosecution of his theological investigations.

In the year 1790, he accepted the classical professorship at Hackney. Here his lectures and instructions were generally approved and admired, but he carried his dissent from the articles of faith of any established society of Christians so much farther than any of his colleagues, that he was thought too independent to continue in his situation; and he consequently left the institution in 1791; and for a similar reason he failed of obtaining the charge of two private pupils whom he expected to have been placed with him. He continued to reside at Hackney, employing himself partly as an author and editor, and partly in the education of his own children. Among his original productions were several polemical and political pamphlets, relating to the war with France, and to the various controversies of the day. Of these the most remarkable for its consequences to himself was his *Reply to the Bishop of Landaff's Address*, which occasioned a prosecution to be brought by the attorney-general, against his publisher first, and then against himself; and he was sentenced to be confined for two years in Dorchester jail; a punishment which was probably intended to be somewhat severe, but which was most fortunate in its operation on his subsequent comfort, since it was the cause of his obtaining, by the exertions of his friends and his partisans at large, a subscription of about L.5000; a sum which not only alleviated the rigour of his imprisonment, but also enabled him to leave his family in a state of comparative affluence. Wakefield.

He was principally occupied during his confinement in continuing his literary labours for the press, and in preparing a series of classical lectures, beginning with the illustration of the second book of Virgil's *Æneid*, the first course of which he delivered in London immediately after his liberation in May 1801. The effect of unusual exertions of body and mind, after so long a cessation of exercise, and in hot summer weather, appears to have predisposed his constitution to typhus fever, of which he died, after a fortnight's illness, on the 9th of September 1801, leaving a widow and six children, four sons and two daughters. His brother, the Rev. Thomas Wakefield of Richmond, also survived him, and died in 1806. The catalogue of his literary offspring is so multitudinous, that it partly tells its own story by its length, and admits of very few particular remarks.

Poemata; quibus accedunt quædam in Horatium Observationes, Cantab. 1776, 4to. *A plain and short Account of the Nature of Baptism*, Warrington, 1781, 12mo. *An Essay on Inspiration*, Warr. 1781, 8vo. *A new Translation of the First Epistle to the Thessalonians*. Warr. 1781, 8vo. *A new Translation of the Gospel of St Matthew*, Warr. 1782, 4to. *Directions for the Student in Theology*, Lond. 1784, 12mo. *A Sermon preached at Richmond on the Peace*, Lond. 1784, 8vo. *An Inquiry concerning the Person of Jesus Christ*, Lond. 1784, 8vo. *On the Origin of Alphabetical Characters*, Manchester, Mem. i. 1785. Life, ii., attempting to cut the knot of their invention by referring their origin to inspiration. Several Letters signed Nepiodidascalos, in the *Theological Repository*, Lond. 1785. *The Poems of Mr Gray, with Notes*, Lond. 1786, 8vo. *Virgilii Georgica*, Cantab. 1788, 8vo. *Remarks on Dr Horsley's Ordination Sermon*, Lond. 1788, 12mo. *Four Marks of Antichrist*, Lond. 1788, 8vo. *A new Translation of Parts of the New Testament wrongly translated*, Lond. 1789, 8vo. *An Address to the Inhabitants of Nottingham*, Lond. 1789, 8vo. *Remarks on the Internal Evidence of the Christian Religion*, Lond. 1789, 8vo. *Silva Critica*, i. 8vo, Cantab. 1789. ii. 1790. iii. 1792. iv. Lond. 1793, v. 1795; intended for the illustration of the Scriptures from the Greek and Roman writers. The last two parts were printed at the expense of the Rev. Robert Tyrrwhit. *An Address to the Bishop of St David's*, Birm. 1790, 8vo. *On the Liturgy. Cursory Reflections*, Birm. 1790, 8vo. *On the Corporation and Test Acts. An Inquiry into the Expediency and Propriety of Public or Social Worship*, Lond. 1791, 8vo. Ed. 3, 1792. *Memoirs of his Life*, Lond. 1792, 8vo. Ed. 1804, 2 vols. 8vo. Continued by Mr Rutt and Mr Wainewright. *A Translation of the New Testament*, Lond. 1792, 3 vols. 8vo. 2d edit. 1795, 2 vols. 8vo. *Strictures on Dr Priestley's Letter concerning Public Worship*, Lond. 1792, 8vo. *Reply to the Arguments against the Inquiry*, Lond. 1792, 8vo. *Evidences of Christianity*, Lond. 1793, 8vo. *The Spirit of Christianity compared with the Spirit of the Times*, Lond. 1794, 8vo, two editions. *An Examination of the Age of Reason*, Lond. 1794, 8vo, two editions. *Remarks on the General Orders of the Duke of York*, Lond. 1794, 8vo. *Horatii quæ supersunt*, Lond. 1794, 12mo. *Tragœdiarum Græcarum Delectus*, Lond. 1794, 2 vols. 8vo. *The Eumenides, Trachiniæ, Philoctetes, Hercules, Alcestis, and Ion. Pope's Works, with Remarks and Illustrations*, vol. i., Warr. 1794, 8vo. *A Reply to Paine's Second Part of the Age of Reason*, Lond. 1795, 8vo. *Poetical Translations*, Lond. 1795, 12mo; especially from Horace and Juvenal. *Bionis et Moschi quæ supersunt*, Lond. 1795, 12mo. *Virgilii Opera*, Lond. 1796, 12mo. *Observations on Pope*, Lond. 1796, 8vo. *A Reply to the Letter of Edmund Burke, Esq.*, Lond. 1796, 8vo, twice reprinted. *Homer's Iliad, by Pope, with Notes*, Lond. 1796, 11 vols. 8vo. *Lucretius de Rerum Natura*, Lond. 1796–7, 3 vols. 4to. and 8vo. A splendid book, with some collations of manuscripts, and some notes of Bentley. But the collations are said to be inaccurate, and the commentary more prolix than judicious. See Porson in *Br. Critic*, 1801, xvii. p. 452, and Elmsley in the *Classical Journal*. He received, however, many grateful panegyrical acknowledgments from his German correspondents. The edition is dedicated to Mr Fox, with whom he commenced an acquaintance on the occasion. *In Euripidis Hecubam Diatribe*, Lond. 1797, 8vo. *On Porson's Hecuba. A Letter to Jacob Bryant, Esq. on the War of Troy*, Lond. 1797, 4to. *A Letter to William Wilberforce, Esq.*, Lond. 1797, 8vo, reprinted. *A Reply to some parts of the Bishop of Landaff's Address to the People of Great Britain*, Lond. 1798, 8vo, twice reprinted. *A Letter to Sir John Scott, his Majesty's Attorney-General, on the subject of a late Trial*, Lond. 1798, 8vo. *Defence delivered in the Court of King's Bench. Address to the Judges in April. Address to the Judges in May*, printed but not published. *The first Satire of Juvenal Imitated*, 1800, 12mo. Life, vol. ii. *Correspondence with the late Right Hon.*

Wakes. *C. J. Fox*, Lond. 1813, 8vo; chiefly on subjects of classical literature.

But few of the characters that have ever employed the pen of a biographer have exhibited more remarkable contrasts, either in a moral or a literary point of view, than that of Gilbert Wakefield; and he has accordingly been depicted, by critics and historians of various sentiments, in colours the most opposite and the most discordant. "Of his particular modes of thinking on religious and political subjects," says Dr Lindsay, "different men will form different opinions: concerning the integrity of his heart, and the consistency of his character, there can be but one opinion amongst those who enjoyed the happiness of his acquaintance." It would indeed be difficult to find a more splendid example of high honour and self-denial, and of magnificent liberality, even under actual pecuniary embarrassment, than Mr Wakefield displayed, at a time when he had to support himself, with a wife and six or seven children, on about L.150 a year, in voluntarily paying the expenses of Mr Cuthell on his prosecution for publishing the *Reply to the Bishop of Landaff's Address*, which exceeded the whole yearly amount of his income. "His devotedness to study," says his friend Dr Aikin, "was by no means attended with a reserved or unsocial disposition; for no one could delight more in free conversation, or bear his part in it with a more truly social spirit; and if, in controversial and critical writings, he was apt to indulge in the contemptuous and severe expressions which he found too much sanctioned by polemical use, in disputation by word of mouth he was singularly calm and gentle, patient in hearing, and placid in replying. To conclude the topic of [his] moral character, it was marked by an openness, a simplicity, a good faith, an affectionate ardour, a noble elevation of soul, which made way to the hearts of all who nearly approached him, and rendered him the object of their warmest attachment." But "he wanted time or patience," says Dr Parr very justly, "for that discrimination which would have made his conjectures fewer, indeed, but more probable, and his principles more exact: [yet] I shall ever think of him as one of the best scholars produced by my own country in my own age." The compliments of Heyne, and of his pupil Jacobs, are still more elaborate; but it is well known, that when Porson was one day asked for a toast, with a sentiment from Shakspeare, he gave "Gilbert Wakefield, *What's Hecuba to him, or he to Hecuba?*" and there was quite as much of truth as there was of neatness in the application. A reviewer of his *Life* in the *British Critic*, by no means favourably disposed towards him, readily admits that "he was strictly and enthusiastically honest, and seems to have acquired even a passion for privations: these feelings, added to his pride of independent thinking, led him, we doubt not," he says, "to abstain from wine; to have relinquished in part, and to be tending entirely to give up, the use of animal food, with various other instances of peculiarity. Knowing his own assiduity, and giving himself ample credit for sagacity, he thought that he was equal to the decision of every possible question: and thus he became bigoted to almost every paradox which had once possessed his very eccentric understanding. He was as violent against Greek accents as he was against the Trinity, and anathematized the final N as strongly as episcopacy. Whatever coincided not with his ideas of rectitude, justice, elegance, or whatever else it might be, was to give way at once, and to be rescinded at his pleasure, on pain of the most violent reprehension to all opponents: whether it were an article of faith, a principle of policy, a doctrine of morality, or a reading in an ancient author, away it must go, *κύνεσσιν οἰωνοισί τε πᾶσι*, to the dogs and the vultures. These exterminating sentences were also given with such precipitancy as not to allow even a minute for consideration. To the paper, to the press, to the [public], all was given at once, frequently to the incurring of the most palpable absurdity. Thus the simple elegance of *O beatĕ Sexti*, in Horace, was proposed, in an edition of that author, to be changed to *O bea Tē Sexti*, though the alteration, besides being most bald and tasteless, produced a blunder in quantity so gross, that no boy, even in the middle part of a public school, would have been thought pardonable in committing it. By faults [either] original or habitual, his sincerity became offensive, his honesty haughty and uncharitable, his intrepidity factious, his acuteness delusive, and his memory, assisted by much diligence, a vast weapon which his judgment was totally unable to wield." (T. Y.)

WAKES, certain holiday festivals or vigils, once very popular all over England. On the first introduction of Christianity into Britain, Christian festivals were instituted in the room of the idolatrous entertainments in which the heathen indulged, and the suffering day of the martyr whose relics were deposited in the building set apart for such objects, or the day on which the church was actually dedicated, formed the established feast of the parish. At first these feasts were clearly distinguished among the Saxons, as appears from the laws of the Confessor, where the *dies dedicationis*, or *dedicatio*, is repeatedly discriminated from the *propria festivitas sancti*, or *celebratio sancti*. In 1536 the dedication-day was ordered for the future to be kept on the first Sunday in October, and the festival of the patron saint to be celebrated no longer. The latter was, by way of pre-eminence, denominated the *church's holiday*, or its peculiar festival. And the evening before every saint's day, in the Jewish method of reckoning the hours, being an actual hour of the day, and therefore, like that, appropriated to the duties of public religion, as they reckoned Sunday from the first to commence at the sunset of Saturday, the evening preceding the church's holiday would be observed with all the devotion of the festival. The people actually repaired to the church, and joined in the services of it; and they thus spent the evening of their greater festivities, in the monasteries of the north, as early as the conclusion of the seventh century. Walachia.

These services were naturally denominated, from their late hours, *wœcan* or *wakes*, and *vigils* or *eves*. That of the anniversary at Ripon, as early as the commencement of the eighth century, is expressly denominated the *vigil*. But that of the church's holiday was named *cyric wœcan*, or church-wake, the church-vigil, or church-eve. And it was this commencement of both with a wake which has now caused the days to be generally preceded with vigils, and the church-holiday particularly to be denominated the *church-wake*. So religiously were the eve and festival of the patron saint observed for many ages by the Saxons, even as late as the reign of Edgar, the former being spent in the church, and employed in prayer. And the wakes, and all the other holidays in the year, were put upon the same footing with the octaves of Christmas, Easter, and of Pentecost. In every parish, on the returning anniversary of the saint, little pavilions were constructed of boughs, and the people in them indulged in hospitality and mirth. The feasting of the saint's day, however, was soon abused: and even in the body of the church, when the people were assembled for devotion, they began to mind diversions, and to introduce drinking. The growing intemperance gradually stained the service of the vigil, till the festivity of it was converted into the rigour of a fast.

The "late-wake" of the Highlanders, the "lake-wake" of the Anglo-Saxons, the "lyke-wake" of the early English, and the "wake" of the Irish, all point to a custom once very common in the north of Europe, and not yet quite discontinued. This consisted of the waking or watching of the body of a deceased friend before burial. (See Brand's *Popular Antiquities*, by Ellis.)

WALACHIA, or WALLACHIA, one of the Danubian Principalities, lying between N. Lat. 43. 40. and 45. 42., E. Long. 22. 25. and 28. 5.; bounded on the N. by the Austrian province of Transylvania and by Moldavia, E. and S. by Bulgaria, and W. by Servia and Hungary. Length, from E. to W., 260 miles; greatest breadth, 120; area, 27,500 square miles. It is enclosed by natural boundaries on all sides; for the Carpathians separate it from Hungary and Transylvania, the Danube divides it from Servia and Bulgaria, and the Sereth from Moldavia. It is divided by the Aluta, the largest affluent of the Danube here, into two portions, Eastern or Great, and Western or Little Walachia. The portion of the Carpathians which forms the boundary of Walachia has an average height of between 3000 and 4000 feet, but some of its summits rise as high as 7000 or 8000 feet. It is crossed by several passes into Transylvania and Hungary. From this range, mountains of less elevation project towards the Danube; and between them are beautiful and fruitful vales, containing soil capable of producing most abundant crops. At the termination of these spurs of the mountain, there is a level district declining gradually to the great stream, and

Walachia. on its border becoming marshes and morasses. In the extreme W. of the country, the branches of the Carpathians come down quite close to the banks of the Danube. Walachia is entirely watered by the tributaries of that stream, flowing down the valley in a S. or S.E. direction. Besides the Aluta, already mentioned, the most important of them are the Schyl, the Teliorman with its affluent the Vede, the Argish, the Jalonitzka, and the Buzeo, the last a tributary of the Sereth. All these rivers are navigable for barges; but little has been done to remove the obstructions caused by rocks, shoals, &c. In the marshy region along the banks of the Danube there are some considerable lakes, and occasionally that river overflows its banks and inundates the adjacent country. The geological formation of the hills is for the most part gneiss and mica schist, while in the lower parts of the country cretaceous and tertiary strata occur. The most valuable mineral found here is salt, of which there are almost inexhaustible mines. Copper, gold, sulphur, asphalt, &c., also exist in the country; but except those of salt, few mines are wrought. With the exception of the marshy region, Walachia enjoys a healthy climate, though it is extreme both in summer and in winter. The rivers are usually frozen for about six weeks. The soil is so fertile, that if the inhabitants were industrious, and the resources of the country properly developed, few parts of Europe would produce so much of all that contributes to life and comfort. Even with its present ignorant and inactive population, the land yields great crops of maize, wheat, and barley, which are exported to a large extent. Hemp, flax, hops, and tobacco, are also among the products of the country. Fruit of many various kinds is plentiful; the sides of the hills are covered with vines, and the wine made from them is equal to that of Hungary. The meadows afford excellent pasture for cattle, and large numbers of them, as well as of horses, sheep, and goats, are raised. The extensive forests afford abundance of excellent timber, but very little use is made of it. Very few manufactures are carried on, and most of the articles required are imported from foreign countries. The only port is Ibraila on the Danube, in the extreme E. of the country, and it has a considerable trade with Constantinople, Venice, Trieste, and England. The number of vessels that cleared here in 1857 was 960, and in 1858 1291. The total value of the exports of Walachia in 1856 was L.1,145,927, and that of the imports L.1,074,131. The exports consist chiefly of maize, barley, wheat, and wool; and the imports of coffee, sugar, wines, furs, and manufactured goods. The population of Walachia, like that of the adjoining province of Moldavia, is of a mixed character. The majority of them are Walachians, a people who seem to be descended from the Vlachi, a people who anciently lived in Thrace and Macedonia, but migrated N. of the Danube to escape the oppressions of the Greek emperors and the inroads of the Turks. They call themselves *Romani*, or Romans, and the name Walachians is supposed to be derived from the Slavonic word for Italian, the Vlachi having been originally Roman colonists, settled in these parts by Trajan. Mingled with these people there are numbers of Greeks, Armenians, Jews, and gypsies. These mixed races have formed a common language called Walachian, which is also extensively spoken in the adjacent countries. It is mainly derived from the Latin, but has also Greek, Gothic, and Turkish elements. The most of the people belong to the Greek Church, but there are among them a few Roman Catholics. The people are divided into four ranks or classes, —the boyars or nobility, who enjoy many privileges; the clergy; the peasants; and the gypsies, who are the most despised and oppressed of all. Education has made some progress in Walachia of late years, and schools of various kinds have been established. There are 2358 primary schools, attended by 52,140 scholars; normal schools in the capitals of all the circles, attended by about 4000; and gymnasiums at Bucharest and Krajora. There is also a college at Bucharest, where a literary and legal education is given, and theological studies are pursued at four episcopal seminaries in the principality. Walachia is divided into 18 circles, of which Great Walachia contains 12, and Little Walachia 6. The capital is Bucharest. Walachia.

The country was in the time of the Romans a part of Dacia, and was invaded, but never permanently subdued, by the imperial forces. It was at one time governed by princes tributary to the Eastern Empire, and for a long period was subject in succession to the Bulgarians, Hungarians, and other neighbouring nations. At length Hungary became the most powerful neighbour of Walachia, and the contests with that state for independence were continued for a long time with varying fortune. The princes or *woiwodes* as they were then called, for a time recognised the supremacy of Hungary; but after the battle of Mohacz in 1526 transferred their allegiance to Turkey. But even after this Walachia was long a bone of contention between the Turks and the Poles, until the latter, at the peace of Carlowitz in 1699, gave up their claim.

In 1716 the first Greek was appointed hospodar, as the princes were now called; his name was Nicholas Maurocordatus. When he attained the sovereign power the country was in the most depressed condition, the larger portion of the land uncultivated, and the people almost in a state of savage ignorance. Though no degree of freedom was introduced by the accession of a Greek prince, yet many improvements were introduced which advanced civilisation. Under his brother and successor Constantine, the peasants were lightened of a great part of their heavy burdens, and much was done for the improvement of the country. The hospodars, Alexander Ypsilante, Ghika, Kallimachi, and Karadza, attended to education, or affected to do so, and during their rule books embodying the ancient laws were printed and generally circulated. As the rulers, however, had unlimited power, subject only to the payment of an annual sum to the Porte, great oppression, and frequently great cruelty, were exercised towards all under their authority. These hospodars were sometimes suddenly deposed, and in some cases suffered violent deaths, under charges of treachery, which commonly consisted of negotiations, real or pretended, with Russia or with Austria. The country was invaded by the Russians in 1807, and again in 1809, when they occupied it till the peace of Bucharest in 1812. In 1818, the hospodar Prince Karadza, under apprehension of being deposed, or perhaps of being executed, withdrew himself with his family and his treasure, and, passing through Hungary, took refuge in Geneva and Genoa. In January 1819, the Porte nominated as his successor Prince Alexander Suzzo, who died two years after. His death seemed to be the signal of a general insurrection, which, though it broke out first in Walachia and Moldavia, speedily extended to the whole of European Greece, as well as to the islands, and produced those transactions which more properly belong to the history of that country than of Walachia. The insurrection in Walachia was first commenced by a native boyar, Theodore Wladimirsko, who had in the Russian service acquired the reputation of a brave and skilful officer. The interregnum appeared a favourable moment, and he at first collected 50 adherents in Little Walachia, where he was soon joined by more than 1000 peasants. In the meantime the Porte had nominated a new hospodar, Kallimachi, who sought to form an alliance with Wladimirsko, by means of which he expected to be enabled to raise the sum necessary to be paid at Constantinople as the purchase of his dignity. The negotiation was proceeding, and might have been concluded, if not to the honour to the advantage of the two

Walch.

aspirants; but Alexander Ypsilante, a general in the Russian army, appeared on the scene with a body of Greeks, and took possession of Jassy. This caused a most bloody civil war, by which Walachia and Moldavia were dreadfully ravaged and wasted by alternate victors. The Turks at length sent an army sufficiently strong to suppress the several contending parties, and submission was thus enforced. The sultan in 1822 placed Gregory Ghika on the throne, who, surrounded by Turkish guards, had little or no power, and felt that his dignity was of very uncertain duration. He continued to hold it, such as it was, till 1828, when a new war between Russia and Turkey broke out, and the former took possession of both the principalities, and established in Bucharest a plan of Russian civil organization.

By the treaty of Adrianople in 1829, the Russians evacuated the principalities; but these were thenceforward placed under the protection of the czar, who thus gained a pretext for further interference in their affairs. The hospodars were now elected for life by the boyars, subject to the approval of the Porte, to whom they had to pay a certain sum on their accession, besides an annual tribute. The subsequent events that took place in Walachia and Moldavia up to the peace of Paris in 1856, are narrated in the article MOLDAVIA. In conformity with the terms of that peace, divans were held in the separate principalities in October 1857, to give expression to the wishes of the people as to the future administration of the country; and the unanimous decision, with the exception of two votes in Moldavia, was in favour of the union of the principalities under a foreign prince. Upon this the plenipotentiaries of the European powers, at a conference at Paris, 19th August 1858, decided that the principalities should thenceforth be called the United Principalities of Moldavia and Walachia, and should have in common a central commission and court of appeal, but be governed by different hospodars, to be elected by the people, and confirmed by the Porte. The deputies of the people had now to meet in the several provinces to elect hospodars: and the choice in both fell upon the same man, Alexander Couza, whose election was at first opposed by the Porte, but in September 1859 confirmed by the plenipotentiaries of the great powers. He was subsequently invested by the Porte in both principalities. The military forces of Walachia amount to 18,200 men. The public revenue for 1857 was L.561,436, and the expenditure L.618,531; and there was a public debt of about L.200,000. Pop. estimated at 2,600,000.

WALCH, JOHANN GEORG, an eminent German divine, was born at Meiningen in 1693. He studied divinity and philology at Jena, where he was subsequently appointed extraordinary professor of divinity in 1724, and ordinary professor of divinity in 1726. He died in 1775.

The works of J. G. Walch are alike numerous and excellent. His *Philosophisches Lexicon*, 1726; his *Historia Critica Latinae Linguae* 1716; his *Historische und Theologische Einleitung*, 5 vols. 1724–36, and 5 vols. 1730–39; his *Bibliotheca Patristica*, 1720; his *Bibliotheca Theologica selecta*, 4 vols., 1757–65; and his *Dr Martin Luther's Sammtliche Schriften*, in 24 vols., Halle, 1740–50; all contain unmistakable traces of vigour, zeal, and uncommon industry. The following three sons were almost as distinguished as their father.

WALCH, *Johann Ernst Immanuel*, the eldest son of the celebrated J. G. Walch, was born at Jena on the 29th of August 1725, where he completed his studies, and where he was appointed professor of divinity in 1759. Natural history divided his studies with ecclesiastical history, and he has left behind him a great number of works in both of these departments of learning. He died December 1, 1778.

The principal works of J. E. I. Walch are as follows:—*De Christianorum sub Diocletiano in Hispania Persecutione*, 1751; *Marmor Hispaniae*, 1750; *Acta Societatis Latinæ Jenensis*, 4 vols., 1752–55; *Dissertationes in Acta Apostolorum*, 3 vols., 1756–61; *De Arte Critica Veterum Romanorum Literaria*, 1771; *Das Steinreich systematisch entworfen*, 2 vols., 1769; and his celebrated *Georg Wolfgang Knorr's Sammlung von Merkwürdigkeiten der Natur*, &c., 3 vols., 1768–73. This work has been translated into French in 1775, and into Dutch in 1779.

Walch ‖ Waldeck.

WALCH, *Christian Wilhelm Franz*, one of the greatest divines of Germany, and the second son of J. G. Walch, was born at Jena in 1726, studied at the university there, and subsequently travelled with his brother Immanuel into France and Italy. In 1750 he was chosen extraordinary professor of philosophy at Jena; in 1753 he was made president of the Latin Society of that town; in 1754 he was appointed extraordinary professor of divinity in Göttingen, of which he was appointed ordinary professor three years afterwards. He died suddenly in 1784.

C. W. F. Walch wrote numerous works on classics, divinity, and church history. They all bear the marks of a very superior mind, and of very extensive learning.

The following are his principal works:—*Antiquitates Pallii Philosophici Veterum Christianorum*, 1746; *Oratio de Eloquentia Latina Veterum Germanorum*, 1750; *Historia Patriarcharum Judaeorum*, 1751; *Compendium Historiae Ecclesiasticae recentissimae*, 1757; *Entwurf Einer vollständigen Historie der Kirchen-Versammlungen*, 1759; *Monimenta Medii Ævi*, 2 vols., 1758; *Grundsätze der Kirchengeschichte des Neuen Testaments*, 4 vols., 1772–74; *Grundsätze der Naturlichen Gottesgelehrsamkeit*, 1775; *Krit. Untersuch. vom Gebrauch der Heiligen Schrift.*, 1779; *Neueste Religions Geschichte*, 9 vols., 1771–83; *Bibliotheca Symbolica*, 1770; *Bibliotheca Philologica*, 3 vols., 1770–77; and *Entwurf Einer vollstandigen Historie*, 11 vols., 1762–85. The latter work gained for its author the title of "Heretic Walch."

WALCH, *Karl Friedrich*, the youngest son of J. G. Walch, was born at Jena in 1734, was chosen professor of law at Göttingen, and subsequently at Jena, where he died in 1799. He is the author of many valuable works on jurisprudence.

WALCHEREN, an island of Holland, province of Zeeland, the most westerly of those lying between the East and West Scheldt. It is about 11 miles in length by 10 in breadth, and being below the level of the sea, is protected by immense dunes and dykes. It is fertile, but unhealthy for foreigners. The chief towns are Middleburg and Vlissingen or Flushing. It was occupied by the English under the Earl of Chatham in 1809, when 7000 soldiers perished from ague. Pop. about 50,000.

WALDECK, a small principality of the north of Germany, lying between Westphalia on the N. and E., and Hesse Cassel on the S. and W. The chief part of the territory lies between 51. 4. and 51. 31. of N. Lat., and between 8. 30. and 9. 11. E. Long.; but a small portion of it, the Graschaft, or county of Pyrmont, is detached therefrom, and lies between the Prussian and Hanoverian dominions. The entire extent is 461 square miles, or about 295,040 English acres. The whole of Waldeck is a mountainous and woody district; the soil generally is poor and stony, but the industry of the people is such, that enough of corn and potatoes is raised to supply the home consumption. Potatoes form a large portion of the food of the labourers. It has no large rivers, but many small streams, which ultimately fall into the river Weser. In some parts there are large flocks of sheep, which have been improved by mixing with Spanish and Saxon rams, and now produce fine wool. The horned cattle yield abundance of butter and some cheese, which are the only agricultural products that are sent out of the country in exchange for the few foreign luxuries that are needed. The forests abound with game of all kinds, and some of the wild animals, especially the wild hogs, are a great annoyance to the cultivators. The mountain streams abound in fish, and the trout in them are reported to be of excellent flavour. There are mines of iron and of copper worked, and the proceeds manufactured on the

Waldenses || Wales.

spots where they are obtained. The annual quantity of raw iron is about 200 tons, that of iron in bars about 400 tons. There are salt-springs, which provide the quantity needed of culinary salt; and there are some quarries of good marble. The county of Pyrmont consists only of a single valley, surrounded on all sides with lofty hills, through which the river Emmer runs, and on its banks are some rich meadows and a few corn-fields. The mineral spring is the great attraction; and accommodations are well provided for the numerous guests that repair to it in search of health. The executive power of Waldeck is vested in the prince alone; but there is also a diet of 15, forming a single chamber, which meets at Arolsen for legislative purposes. Korbach, the capital of the principality, is a town of 2250 inhabitants. The other towns are Pyrmont, with 1323, and Arolsen, with 1900. The whole population amounted in 1858 to 57,550. In religion, most of the people belong to the Lutheran Church, which since 1821 has been united with the Reformed under the name of the Evangelical Church. There are also about 1000 Roman Catholics and 500 Jews in the country. The annual public revenue for the years 1857–59, was L.53,850; and the annual expenditure, L.56,063; but the state is loaded with a heavy debt. Waldeck has, along with several other small states, a vote in the German Confederation, and is bound to furnish a military contingent of 866 men.

WALDENSES. See VALDENSES.

WALDO. See VALDO.

WALES, a country situated in the south-west part of Britain, into which the ancient Britons retired from the persecution of the Saxons. It is bounded on all sides by the sea and the Severn, except on the east, where it adjoins to the counties of Chester, Salop, Hereford, and Monmouth. Its length, from the southernmost part of Glamorganshire to the northern extremity of Flintshire, is about 140 miles; and its breadth, from the river Wye east to St David's in Pembrokeshire west, is about 90 miles.

Anciently it was of greater extent than it is at present, and comprehended all the country beyond the Severn; that is, besides the twelve counties included in it at present, those of Herefordshire and Monmouthshire, which are now reckoned a part of England, but which were then inhabited by three tribes of the Britons, namely, the Silures, the Dimetæ, and the Ordovices. The Romans were never able to subdue them till the reign of Vespasian, when they were reduced by Julius Frontinus, who placed garrisons in their country to keep them in awe. Though the Saxons made themselves masters of all England, they never could get possession of Wales, except the counties of Monmouth and Hereford. About the year 870, Roderic, king of Wales, divided his territories among his three sons; and the names of these divisions were, Demetia, or South Wales; Provesia, or Powis-Land; and Venedotia, or North Wales. Another division is afterwards mentioned in the records, viz., North Wales, South Wales, and West Wales; the last comprehending the counties of Monmouth and Hereford. The country derived the name of *Wales*, and the inhabitants that of *Welsh*, from the Saxons, who by those terms denote a country and people to which they are strangers; for the Welsh in their own language call their country *Cymri*, and their language *Cymraeg*. They continued under their own princes and laws from the above-mentioned period, and were never entirely subjected to the crown of England till the reign of Edward I., when Llewellin ap Gryffith, prince of Wales, lost both his life and dominions. Edward, the better to secure his conquest, and to reconcile the Welsh to a foreign yoke, sent his queen to lie in at Caernarvon, where she was delivered of a prince, to whom the Welsh, on that account, the more readily submitted. Ever since that time, the eldest sons of the kings of England have commonly been created princes of Wales, and as such enjoy certain revenues from that country.

Wales, New South || Wallace.

After the conquest of Wales by Edward I. very material alterations were made in their laws, so as to reduce them nearer to the English standard, especially in the forms of their judicial proceedings; but they still retained very much of their original polity, particularly their rule of inheritance, viz., that their lands were equally divided among all the issue male, and did not descend to the eldest son alone. By other subsequent statutes, their provincial immunities were still further abridged: but the finishing stroke to their dependency was given by the statute 27 Henry VIII. c. 26, which at the same time gave the utmost advancement to their civil prosperity, by admitting them to a thorough communication of laws with the subjects of England. Thus were this brave people gradually conquered into the enjoyment of true liberty; being insensibly put upon the same footing and made fellow-citizens with their conquerors.

It is enacted by 27 Hen. VIII.—1. That the dominions of Wales shall be for ever united to the kingdom of England. 2. That all Welshmen born shall have the same liberties as other king's subjects. 3. That lands in Wales shall be inheritable according to the English tenures and rules of descent. 4. That the laws of England, and no other, shall be used in Wales; besides many other regulations of the police of this principality. And the 34th and 35th Hen. VIII. c. 26, confirms the same, adds further regulations, divides it into twelve shires, and in short reduces it to the same order in which it stands at this day; differing from the kingdom of England in only a few particulars. See ENGLAND.

WALES, *New South*. See AUSTRALIA.

WALLACE, SIR WILLIAM, the heroic defender of Scottish independence against the aggressions of Edward I. of England, was the second of three sons of Sir Malcolm Wallace (or Walays) of Elderslie and Auchinbothie, properties near the town of Paisley, in the county of Renfrew, and was born probably about 1270. The earlier years of Wallace appear to have been spent at Dunipace, in Stirlingshire, in the society of his uncle, a wealthy priest, who gave him an education far above what was usual in those times, and whose strong love of liberty fostered his nephew's youthful enmity against the English. The rudiments of education thus acquired were afterwards strengthened by the instruction which he received at Dundee. At this period of life he also acquired those hardy and warlike accomplishments which inured his frame to fatigue, and gave him the ready command of weapons of war. His early hatred of the English led him into many brawls and adventures;[1] but it was not till after the battle of Dunbar, in 1296, when Scotland was completely subdued, that he first came prominently before his countrymen. Early in 1297, in a skirmish or quarrel which took place in the town of Lanark, in which several were killed, Wallace slew with his dagger the son of the sheriff of Clydesdale. For this deed he was proclaimed a traitor, outlawed, and compelled to leave home for the wilds and fastnesses of the country, where he joined himself to men whose fortunes were as desperate as his own, and who, in consequence of his courage and higher rank, chose him for their chief. From this time he was constantly engaged against the English with various results, but ultimately, as his adherents increased, and his plans became more matured, with decided advantage. This guerilla warfare was of the utmost importance in his future proceedings.

[1] See Henry's ("Blind Harry's") *Wallace*, by Dr Jamieson; Carrick's *Life of Wallace*; and the first volume of Tytler's *History of Scotland*.

Wallace. By it he became acquainted with the strongest passes and the best positions for defence in the country; his men were inured to a life of fatigue and privation, to feel the benefits of discipline and obedience, and to rest with the most perfect confidence in the abilities, courage, and great strength of their intrepid commander.

The success which attended these desultory efforts induced him to undertake an enterprise of greater importance. By a forced march he surprised Ormesby, the English justiciary, at Scone, defeated his troops, nearly captured him, and took a rich booty. This exploit led the younger Bruce (afterwards king) and a number of the nobility to join him with their vassals; and their united forces, led by Wallace, in a few months cleared the country of the English. This intelligence reached Edward when about to embark for Flanders, who immediately despatched an army of 40,000 foot and 300 horse into Scotland, under the command of Henry Percy, which, on the 9th of July 1297, came up with that of the Scots, encamped at Irvine, and consisting of nearly the same strength. Dissensions had however broken out among the leaders; the feudal barons, from pride and jealousy, would not submit to the orders of Wallace, and they therefore entered into negotiations with Percy, which ended in their submission to Edward. Sir Andrew Murray of Bothwell was the only man of rank who adhered to Wallace; and, with a large body of tried and veteran followers, they retired indignantly to the north. Percy, considering that he had put an end to the revolt, returned to England; but Wallace and Murray, dividing their forces, carried on their operations against the English, and with such vigour, that in a short time all the strongholds north of the river Forth, except the castle of Dundee, were retaken. Wallace had just laid siege to that fortress, when his scouts informed him of the approach of a powerful force, under the command of the Earl of Surrey, and Cressingham the treasurer. He instantly left the siege to be continued by the citizens, and by a forced march took possession of the high ground on the north side of the river Forth, above Cambuskenneth, at Stirling, before the English forces reached the south side of the river. On the morning of September 11, 1297, Surrey, urged by the taunts of Cressingham, and against the advice of those who knew the nature of the ground, ordered his troops to deploy over the narrow bridge which at that time crossed the river; but when only half their number had passed, and before their ranks could be arrayed on the narrow peninsula which formed the field of battle, Wallace attacked them with his whole force, and nearly every soldier that crossed was either slain or drowned. This decisive defeat was followed by the expulsion of the English from the kingdom. To lessen the severity of a dreadful dearth and famine which now spread over Scotland, Wallace resolved on an expedition into England, not only to procure subsistence for his numerous army, but also to retaliate for the calamities to which Scotland had been subjected. After collecting his forces, he proceeded as far as Newcastle, wasting the northern country with fire and sword, sparing neither age nor sex, and carrying off a large and valuable booty. Soon after his return from this successful expedition, he was elected governor of Scotland, and, strengthened by this high title, he proceeded to regulate the affairs of the kingdom; and so firm and determined was his rule, so beneficial his measures, that the powerful nobility were compelled to submit to his authority, while the lesser barons and the people willingly supported him. This state did not long continue. Edward, in July 1298, at the head of an army of nearly 100,000 foot and 8000 horsemen, entered Scotland, while Wallace retired before him as he advanced, wasting the country, so as to make the English army depend on its own supplies. This mode of warfare reduced it to such straits, that the king had to order an inglorious retreat. At this critical moment, when the military skill of Wallace predicted the most complete success, the treachery of two Scottish nobles, Patrick, earl of Dunbar, and the Earl of Angus, revealed to the English monarch the dispositions of Wallace. Edward immediately ordered his army to readvance, and by a rapid night-march came up with the Scottish army at Torwood, near Falkirk; and Wallace, with not one-third of the number of foot-soldiers, and unsupported by horse, was compelled by his position to fight at disadvantage, and was defeated with great loss. Shortly after this disastrous event, he resigned his high office as governor, and, apparently with the consent of the regents who succeeded him, proceeded to France, with the expectation of obtaining assistance for Scotland from its sovereign. In this he was deceived, as, on arriving at Amiens, he was thrown into prison, and a letter was written by Philip to Edward, offering to send him to London. Philip, however, in this offer, showed more policy than sincerity; for Wallace was secretly released from prison, and furnished with letters, dated November 3, 1298, to the French agents at the court of Rome, ordering them to solicit Pope Boniface to give Wallace an attentive hearing regarding the affairs of Scotland. There is no positive proof that Wallace was at Rome; but certain it is that Boniface, in his bull to Edward, exhibited a knowledge of Scottish history and affairs which he could only have derived from such a source as Wallace. This noble-minded patriot remained on the continent until late in the year 1303, when he returned into Scotland, and immediately commenced active operations in assisting those who still defended the liberties of their country. Their efforts were however of no avail, and Wallace, by his resolute and unflinching conduct, rendered himself so obnoxious to Edward, that when mercy was extended to the few remaining patriots on certain conditions, Edward excluded him, and set a reward of 300 merks on his head. At last, by the treachery of a servant who waited on him, of the name of Jack Short, this great man was betrayed to Sir John Monteith, a Scottish baron, who captured him at night in bed in the house of a certain Ralph Rae, at Robroyston, in the neighbourhood of Glasgow. For this service Monteith received from the English privy council a grant of land of the annual value of L.100. Wallace was taken to Dumbarton Castle, and from thence to London, where he arrived upon Sunday, the 22d of August 1305. On the following day he was tried in Westminster Hall, with mock splendour and ceremony, by the form of English law, but without the least regard to its justice, and, in accordance with the predetermined resolution of Edward, was condemned to death. The sentence was executed the same day, with disgraceful and revolting cruelty.

Wallace.

Thus ended the career of this noble-minded patriot, but not without leaving a name which will ever be revered. He found his country overpowered and disorganized, her people disheartened, her nobles and leaders in prison, or in the pay of one of the ablest monarchs that ever swayed the English sceptre, himself without wealth or influence, and an outlaw; yet, under all these disadvantages, his love of freedom and hatred of oppression, his fearless courage and continued perseverance, his military skill, his political sagacity, his natural eloquence, and the ardour with which he animated his companions and followers, all conspired to restore the confidence of his countrymen and the freedom of the nation; and had it not been for the pride, jealousy, and treachery of her nobles, the measures that he pursued for organizing the strength and extending the commerce of the kingdom would have given it a stability which the warlike power of the English, aided by the experience, military tactics, and judgment of her monarch, would not have been able to overturn. As it was, both he and his country suffered from the venality of those who by birth and power were her natural protectors.

Wallace. His person was of the most perfect form, and of a stature approaching the gigantic. In strength he was superior to the strongest men of his day; and his frame was such that it was capable of bearing the greatest fatigue. At his execution it is probable that he was not thirty-five years of age.

WALLACE, WILLIAM, an eminent Scottish mathematician, was born at Dysart, in Fifeshire, on the 23d of September 1768. He acquired the art of reading at a school in his native town, and was indebted for his instruction in arithmetic to his father's tuition. His father, not succeeding as a leather-merchant in Dysart, removed in 1784 to Edinburgh, where young Wallace was apprenticed to a bookbinder in that city. During his leisure hours, he was busy in the pursuit of knowledge, and on the completion of his apprenticeship he was a tolerable proficient in geometry, algebra, and astronomy. Being introduced by the assistant of Dr Robison to the notice of that distinguished professor, Wallace obtained permission to attend his class for the study of natural philosophy, and received private instructions in the higher geometry from the same generous individual. Professor Playfair likewise contributed much to his advancement in the study of the mathematics. After various changes of situations, dictated mainly by a desire to gain time for his books, he became, in 1794, an assistant teacher of mathematics in the academy of Perth; and ultimately, in 1803, one of the mathematical masters to the Royal Military College in Great Marlow, Bucks, and subsequently in Sandhurst, Berks. In 1819, while Wallace was steadily adding to his fame as a lecturer in England, a more important situation was open for him in Edinburgh, the scene of his early struggles and victories. This was the professorship of mathematics, which he filled with great success till 1838, when, on account of ill health, he was obliged to retire. Wallace received the honorary degree of LL.D. from the university where he had taught for nearly twenty years; and, in consideration of his eminent attainments in science, he received a government pension for life. He died at Edinburgh, after a lingering illness, on the 28th of April 1843. He was fellow or honorary member of numerous scientific societies both in Edinburgh and elsewhere.

The contributions of Dr Wallace to mathematical literature were select and important, if not very extensive. He wrote a considerable number of papers for the Royal Society of Edinburgh, as well as contributing on various subjects to other scientific associations. He produced the principal mathematical articles for the *Edinburgh Encyclopædia*, and for the fourth edition of the *Encyclopædia Britannica*, some of which, from their abiding excellence, have still a place in the present issue of that work. The following is a list of his more important papers contributed to the *Transactions of the Royal Society of Edinburgh*:—

"Geometrical Porisms, with Examples of their Applications to the Solution of Problems," was written in 1796; in 1802, "A new Method of expressing the Co-efficients in the Development of the Formula which represents the Mutual Perturbation of two Planets." In 1808, he read an important paper to the Society, entitled "New Series for the Quadrature of the Conic Sections, and the Computation of Logarithms." A fourth paper was read before it, in 1823, on the "Investigation of Formulæ for finding the Logarithms of Trigonometrical Quantities from one another;" in 1831, another entitled "Account of the Invention of the Pentograph, and a Description of the Eidograph," the latter being an instrument of his own invention; in 1839, a paper on the "Analogous Properties of Elliptic and Hyperbolic Sectors," and his last contribution to the *Transactions* of the Society was entitled "Solution of a Functional Equation with its Application to the Parallelogram of Forces, and the Curve of Equilibration." In 1836, he contributed "Two Elementary Solutions of Kepler's Problem by the Angular Calculus" to the Royal Astronomical Society; and, for the Cambridge Philosophical Society, he wrote a paper on "Geometrical Theorems and Formulæ, particularly applicable to some Geodetical Problems." At the outset of his career, Wallace was an occasional contributor to Leybourne's *Mathematical Repository*, and to the *Gentleman's Mathematical Companion*.

Wallenstadt, Wallenstein.

WALLENSTADT. See SWITZERLAND.

WALLENSTEIN, ALBRECT WENZEL EUSEBIUS, DUKE OF MECKLENBURG, FRIEDLAND, and SAGAN, and COUNT OF WALDSTEIN, or WALLENSTEIN, was born at Prague in 1583. He belonged to an old Bohemian family, zealously attached to the Protestant religion, of which he was destined to become a dangerous opponent. He received his early education in the Protestant seminary of Goldberg, in Silesia, and subsequently at the university of Altorf; but he had no predilection for learning, and manifested in youth the same restless, ambitious spirit which characterized him through life. According to the custom of the time, he entered, as a page, the family of the Margrave of Burgau, and shortly afterwards renounced his religion and became a convert to the Roman Catholic faith. The margrave signalized his approbation of this step by providing him with the means of making an extensive tour through the chief states of Europe. His first appearance as a soldier was in 1606, when he served in the imperial army against the Turks with considerable distinction. His campaign was followed by his marriage with a wealthy widow considerably his senior, who, however, died shortly afterwards, leaving her not very disconsolate husband master of a large fortune, which enabled him to make a conspicuous figure at the imperial court. In 1617, he assisted the Archduke Ferdinand (afterwards emperor) against the Venetians with 200 cavalry maintained at his own expense, and thus acquired a high place in the favour of one who was afterwards his imperial master. On the breaking out of the thirty years' war, Wallenstein found the field for his ambition for which he had so ardently longed. He distinguished himself so greatly by his services against the revolted Bohemians, that the emperor, in 1623, invested him with the dignity of Prince of Friedland, in Bohemia. At the commencement of what may be called the second stage of the war, when Christian of Denmark came forward to support the Protestants, the genius of Wallenstein was again in request. He offered to maintain an army of 50,000 at his own expense, on condition that he should be commander-in-chief, and should be allowed to retain the contributions exacted from the conquered countries. Such a proposal, from a man so daring and ambitious as Wallenstein, might well excite alarm, but the emperor had no alternative, and closed with it. Wallenstein was soon at the head of a large force, with which he swept the districts of Saxony and the Upper Rhine that were opposed to the emperor. His career was one of rapid conquest. He defeated Count Mansfeld; compelled the King of Denmark to retreat; conquered the duchy of Mecklenburg, and parts of Holstein and Jutland; and occupied Pomerania. The want of a fleet alone prevented him invading the Danish isles; and the Hanse Towns refused to supply him with vessels. The tide of success now began to ebb. Twice he unsuccessfully besieged Stralsund, being repulsed on both occasions with great loss. The emperor was jealous of him; and his overbearing insolence, and insatiable extortions, which had not been confined to hostile districts, disgusted the German princes, who in the Diet at Ratisbon, in 1630, compelled the emperor to deprive Wallenstein of his command. Disappointed, but not desponding, the victorious general resigned his post, and lived in Prague in retirement, but with all the pomp of royal dignity. His loss was soon felt Gustavus Adolphus had espoused the falling cause of the Protestants; and Tilly, who had succeeded Wallenstein as generalissimo, after unsuccessfully opposing the valiant Swede, had fallen in the field. Wallenstein only could save the empire; and the emperor was compelled to restore him to his former power, and that on terms which made him virtually the head of the empire. He immediately set out

Waller. to oppose Gustavus, and after some skirmishing engaged on the field of Lutzen (November 1632), where the Swedish sovereign was victorious, but fell in the action. A sudden change now came over Wallenstein's conduct; he refrained from all active measures against the enemy, and suspicions began to be entertained of his intentions. He was accused of treason before the emperor; he replied by summoning a council of war before whom he laid all his complaints against the emperor's treatment of him; and the emperor in his turn deprived him of his command and outlawed him. Wallenstein was proceeding to open hostilities, when he was assassinated by some of his own soldiers. He fell, February 25, 1634. His character is familiar to all who have read the dramas of Schiller. For an attempt to prove the innocence of Wallenstein of the treason with which he was charged, see Dr Föster's *Waldstein's Briefe*, 3 vols. 8vo, Berlin, 1828–29; and *Wallenstein*, &c. by the same author, 1 vol. Potsdam, 1834.

WALLER, EDMUND, an eminent English poet of the seventeenth century, was descended from an ancient and opulent family, settled at a very early period in the county of Kent. Sir Richard Waller of Groombridge fought at the battle of Agincourt, and took prisoner the Duke of Orleans. The French Prince having been brought to England, was confined at Groombridge for twenty-four years, and his custodian was permitted by King Henry V. to add to his crest a shield of the Orleans' arms, still borne by the Waller family. A great-grandson of this gallant Kentish knight removed to Buckinghamshire, and from him sprung the Wallers of Amersham and Beaconsfield. Robert Waller, father of the poet, inherited estates in Bucks and Herts, and was married to Anne, daughter of John Hampden of Hampden. By this connection the poet was cousin to the patriot Hampden, and was also distantly related to Oliver Cromwell. Edmund Waller was born at Coleshill, Herts, on the 3d of March 1605–6. His father died in 1616, and the poet was left heir to estates said to have been of the yearly value of L.3500,—a sum which Dr Johnson considered to be equivalent in his day (about 1780) to L.10,000. There is reason to believe, however, that the amount of the poet's fortune has been exaggerated, and there had at least to be deducted from it the widow's jointure, and sums of L.500, each left to three younger sons.

In his eighteenth year, if not earlier, Waller had passed through Eton and King's College, Cambridge, and obtained a seat in the House of Commons! Almost from his childhood, as he stated, he had up to 1643 (when he was expelled the House) represented the borough of Agmondesham or Amersham, in Buckinghamshire. His first poem is also said to have been written when he was eighteen. It is entitled, *On the Danger his Majesty (being Prince) escaped in the Road at St Andero*. The Prince (afterwards Charles I.), on returning with the Duke of Buckingham from their fruitless and romantic expedition to Spain, was nearly lost in a sudden storm that overtook them, while proceeding in a boat from St Andero to the admiral's ship. They gained the vessel, however, and arrived safely at Portsmouth in October 1623. Waller's lines could not have been written immediately after the event, for they allude to the predicted marriage of the Prince with Henrietta Maria of France, which was not talked of till the following year. Their author was even then only about eighteen, and if we have the poem in its original form, Waller must at that early age have attained to a remarkable proficiency in the poetic art, judgment, and metrical harmony for which he was afterwards distinguished. His next piece, *To the Queen occasioned upon Sight of her Majesty's Picture*, is supposed to have been written soon after the Queen's arrival in England; and three years later (in August 1628), we have a copy of verses on the assassination of the Duke of Buckingham, or rather on the manner in which King Charles received intelligence of the event. His Majesty was at prayers; the news was whispered in his ear, but he continued unmoved until his devotions were over, when he retired to his chamber, and burst into tears. "God-like unmoved, and yet like woman kind,"—such was the courtly and profane language of the poet. The earliest printed verses of Waller, are those upon Ben Jonson in the *Jonsonus Virbius*, 1638, and they are by no means remarkable for correctness of expression, or melody of versification. The probability is, that he had written occasional poems in his youth at the dates now affixed to them; but that before they were first collected and published in his fortieth year, all had undergone a careful revision. Their general smoothness and regularity bespeak matured taste; and we know that Waller was a slow and fastidious writer. The Duke of Buckinghamshire told Fenton, that Waller spent the greater part of a summer in composing and correcting ten lines to be written in a copy of Tasso belonging to the Duchess of York. He laboured at his poetic conceptions, as artists of old did in cutting and polishing a cameo, and even at the last there were few without some flaw in the execution.

In his twenty-sixth year (July 15, 1631), Waller was married in St Margaret's Church, Westminster, to a London heiress, Anna, daughter of Edward Banks, Esq. The court, it is said, had tried to obtain the hand of this lady for a gentleman afterwards raised to the peerage as Baron Crofts; but even such high solicitations were unavailing,—the poet was irresistible. The lady survived her marriage only a few years, leaving a son, who died young, and a daughter, who was afterwards married to Mr Dormer of Rousham, Oxfordshire,—a place celebrated by Pope and Horace Walpole, and where a fine portrait of Waller is still preserved. Thus left a gay and wealthy widower, not of five-and-twenty, as Johnson states, but of somewhere about thirty, Waller made suit to the Lady Dorothy Sidney, eldest daughter of the Earl of Leicester. He commemorated her under the name of Sacharissa in various fanciful effusions, making the classic shades of Penshurst vocal with her praise; he endeavoured to enlist on his side the auxiliary powers of the lady's father and sister; and he even propitiated her maid, "Mrs Branghton, servant to Sacharissa," in a copy of verses; but the haughty high-born fair one was inexorable. "She was not to be subdued," as Johnson said, "by the powers of verse;" she was twelve years younger than her laureate, and in her twenty-second year (in 1639), she became the wife of Lord Spencer, afterwards Earl of Sunderland. It is related that, in extreme old age, Sacharissa once asked her poet, when he would again write verses upon her, and that Waller ungallantly replied,—"When you are as young, madam, and as handsome as you were then."[1] To forget for a time or to soften his disappointment, Waller is said

[1] They seem to have occasionally met. In a letter to Lord Halifax, written in 1680, Sacharissa says, "Mrs Middleton and I have lost old Waller; he is gone away frightened." (Miss Berry's *Lady Rachel Russell.*) The lady was then the wife of Robert Smythe, Esq. of Bounds in Kent. The Earl of Sunderland was slain at the battle of Newbury in 1643, and nine years afterwards, in 1652, Lady Dorothy married Mr Smythe. Johnson gravely and ponderously criticises the *nom de plume* of Sacharissa: "The name is derived from the Latin appellation of *sugar*, and implies, if it means anything, a spiritless mildness and dull good-nature, such as excites rather tenderness and esteem, and such as, though always treated with kindness, is never honoured or admired." The old poets, however, had an affection for the sugar-cane. A reference to Mrs Cowden Clarke's excellent *Concordance to Shakspeare* will show how often the greatest of them drew illustrations from this source, and every reader knows of "Shakspeare's sugared sonnets among his private friends." Lady Dorothy, who could, as Waller tells us, sleep when she pleased, and who always affected silence and retiredness, was well-named Sacharissa.

 to have accompanied the Earl of Warrick in a voyage to the Bermudas. In his verses written at Penshurst, he makes Apollo deliver this counsel:—

"On yon aged tree
Hang up thy lute, and hie thee to the sea."

And in his *Battle of the Summer Islands*, he describes the fruits and scenery of the fair archipelago, so celebrated in poetry. But his descriptions are vague and general; and from a passage in the first canto of the poem, it would appear that he rather dreamt of the charms of the "late-discovered isles," and longed to repose under the plantain's shade, than that he had actually beheld them. He makes no allusion to the ancient character of the islands—"the still vext Bermoothes,"—so famous for storms, shipwreck and enchantment, and as the scene of Shakspeare's *Tempest*.

In 1640, Waller appeared in a new character. The king had at last, impelled by necessity, summoned a meeting of Parliament. Pym, Hampden, Cromwell, Hollis, Maynard, and other stanch friends of the popular cause, were again returned, and the poet joined them in demanding that there should be an inquiry into the grievances of the nation before the House proceeded to a vote of supply. Charles resisted, and in a few weeks dismissed the uncomplying Parliament. His exigencies, however, compelled him before the close of the year to repeat the attempt, and on the 3d of November, the ever-memorable Long Parliament assembled. Among its various schemes of reform and retaliation was the proposed impeachment of Justice Crawley for his conspicuous support of the impost of ship-money. A conference of both Houses was held on the subject, and Waller was selected by the Commons to present and enforce the articles of impeachment. His speech on the occasion is able and animated. He had the sure ground of constitutional law and precedent on which to rest his argument; and as his cousin Hampden had been the grand mover of the opposition to the ship-money, and had suffered for his courage and patriotism, the zeal of the orator was quickened by the warmth of private feeling and attachment. The movement, however, proved a failure. Sir Francis Crawley escaped all pains and penalties, although Waller's speech was so popular that, when printed, 20,000 copies of it are said to have been sold in one day. In length it would do little more than fill a column of the *Times*, yet the constitutional argument is forcibly stated, and illustrations are drawn both from Scripture and from Roman history. One of these is peculiarly happy. "In the Old Law," he said, "they were forbid to seethe a kid in his mother's milk, of which the received interpretation is, that we should not use that to the destruction of any creature which was intended for its preservation. Now, my lords, God and nature have given us the sea as our best guard against our enemies, and our ships as our greatest glory above other nations; and how barbarously would these men have let in the sea upon us at once to wash away our liberties and to overwhelm, if not our land, all the property we have therein, making the supply of our navy a pretence for the ruin of our nation!" But though on this question strong on the popular side, Waller was no decided partisan. He defended Episcopacy, then assaulted by Puritans and Presbyterians, and he warned the House against letting the people know that nothing was to be denied them when 'they asked it in troops.' During that great struggle he spoke with sharpness and freedom, as Clarendon states, against many of the proceedings of the House, and even ventured to send money to the king—a thousand broad pieces—when Charles had set up his standard. This fact must have been unknown to the popular leaders; for in 1643, when they entered into fruitless negotiations with the king at Oxford, Waller was appointed one of the Parliamentary Commissioners. He was the last, according to the etiquette of rank and precedency, to kiss hands at the ceremony of presentation; and Charles said to him—'Though you are the last, you are not the worst nor the least in my favour.' This royal courtesy extinguished any remains of resentment or opposition in the breast of the Parliamentary Commissioner, if indeed Waller had not previously thrown himself entirely into the hands of the royalists. He soon left no room for doubt. The Oxford conferences took place in March. On the 31st of May, as the Commons were listening to one of their interminable fast-day sermons in St Margaret's church, a messenger was seen to enter and communicate some intelligence to Pym. Pym whispered the news to those near him, they conveyed it to others, and then the parties thus informed rose and left the church together. In a few hours all London knew that a horrid plot had been discovered, the object of which was to seize the leading members of the House of Commons—the conscript fathers—and to deliver up the city to the king's army and the cavaliers. Waller, it was reported, was at the head of the conspiracy! And undoubtedly the poet had entangled himself in the meshes of a secret association, which, though of little real danger, proved disastrous both to his reputation and his fortune. He had been in communication with the king's secretary, Lord Falkland, and had engaged to act with the royalists in endeavouring to put an end to the war by refusing to contribute to the support of the parliamentary forces. His brother-in-law Tomkins, clerk of the queen's council, Lord Conway, and several others, entered into the design; they met in secret, and discussed the matter, but apparently with no intention, on the part at least of Waller, of resorting to arms. The confederacy, as Waller said, was a civil, not a martial one. Unfortunately, however, at the same time a keen royalist, Sir Nicholas Crispe (who had raised a regiment for the king), obtained from Charles a commission of array, or power to call out the military. Tomkins was connected with this design also, and from the two schemes, though really unconnected, one great plot was easily formed or imagined. A servant of Tomkins had overheard the conversation at the secret meetings of Waller and his friends, and gave information to Pym, who instantly had the parties apprehended. "Waller," says Clarendon, "was so confounded with fear, that he confessed whatever he had heard, thought, or seen—all that he knew of himself, and all that he suspected of others." He accused parties who denied the charge, and against whom he could bring no proof; and he appealed *ad misericordiam* to the House of Commons, saying he was worthy not only of being put out of the House, but out of the world too! His petition was that he should be saved the exposure of a trial by the Council of War. All the parties, however, were tried and convicted; Tomkins and another conspirator, Chaloner, were hanged within sight of their own houses; others were imprisoned and their estates confiscated; and Waller, after a year's confinement in the Tower, was suffered to go into exile on paying a fine of L.10,000. His character had received a stain which never could be effaced. Great crimes, united to daring and courage, may be pardoned, but the meanness of an informer and abject supplicant for life with dishonour is never wholly forgiven.

Waller appears to have been about eight years in exile. Evelyn met him in Venice in the spring of 1646, and they travelled together in Italy for a short time. Next year we find him in Rouen, and there he probably entered into his second marriage, of which his biographers tell us no more than that the lady's name was Bresse or Breaux (a French name), and that she brought her husband the large family of five sons and eight daughters.[1] At Rouen, on the sug-

[1] One of the daughters was married to Dr P. Birch of Westminster, and another, Margaret, born at Rouen, was his favourite daughter

Waller. gestion of some unknown lady of rank, Waller collected and revised his scattered poetical pieces, and the first edition of his poems appeared in 1648. From Rouen he removed to Paris, and there he is reported to have lived in a style of splendour and hospitality which at length compelled him to sell his wife's jewels. His poverty, however, could have been but temporary; for he still had his patrimonial inheritance, and on his return to England in 1653, we find him building a house at Hall Barn, close to Beaconsfield, where his mother resided. The poet is said to have obtained permission to return, in consequence of the intercession of Colonel Scroop, to whom his sister was married, but Lord General Cromwell may also be supposed to have been favourably disposed towards his banished and suffering kinsman. To the government of the Commonwealth Waller gave a willing and implicit submission, and after Cromwell had assumed the supreme power he dedicated to him some of the most energetic and finished of his poems. His *Panegyric to my Lord Protector* (1655), is usually held to be the best of his poetical productions. No finer compliment was ever paid to a successful ruler, self-elevated and self-sustained, than is conveyed in this picturesque stanza:

> "Still as you rise, the State, exalted too,
> Finds no distemper while 'tis changed by you—
> Changed like the world's great scene, when, without noise,
> The rising sun Night's vulgar lights destroys."

His next piece, *On a War with Spain*, is specially eulogistic of the Protector's foreign policy, and the poet hints, what he no doubt knew would be welcome, that as the Protector's head had no more room for bays, the Spanish gold should be melted down to give him a crown. Oliver, however, died without this "round and top of sovereignty," and Waller bewailed the national loss in a short poem of about thirty lines, remarkable chiefly for its appearance of earnestness and sorrow, but containing several bald and prosaic couplets,—*e. g.*

> "Under the tropic is our language spoke,
> And part of Flanders hath received our yoke."

As might be expected from the political flexibility of Waller, he was as ready to congratulate Charles II. on his restoration as he had been to laud or to lament the Protector. *To the King on his Majesty's happy Return*, is a strain of joyous unmixed adulation. Tropes and metaphors, all flattering, are poured forth in profusion. The sea "trembled to think she had ever obeyed his majesty's foes," the "giant isle had got her eye again," the Muses' inspired train had raised their drooping heads, and the king (ludicrously said to be "to himself severe, to others kind,") is assured that—

> "Faith, law, and piety, that banish'd train,
> Justice and truth, with him return again!"

It required some courage or audacity to say all this of Charles the Second; but it was not said well, and when the king hinted at the inferiority of the poem to the panegyric on Cromwell, Waller replied with admirable readiness, "Poets, sir, succeed best in fiction." Charles twice conferred upon Waller the vacant office (for which he had applied) of provost of Eton College; but it was decided that it could only be held by a clergyman. The first rejection proceeded from Clarendon, and Waller, in revenge, joined keenly in the persecution of the chancellor. Clarendon, on the other hand, when drawing the character of the poet, contrasted the excellence and power of his wit with his great fault—"a narrowness in his nature to the lowest degree; an abjectness and want of courage to support him in any virtuous undertaking; an insinuation and servile flattery," &c. His insinuation, indeed, was remarkable. He was a favourite with all classes, and though a water-drinker, his society was eagerly courted by the gay and dissipated cavaliers. His witty replies and lively conversation were celebrated both at home and abroad. In Parliament it was thought to be no house if Waller were not present. He was returned to the first Parliament of Charles II. in May 1661, and he continued to sit for different places till he was past eighty. At that age he wrote a *Presage of the Downfall of the Turkish Empire*, and presented it to the king (James II.) on his birth-day. The shrewd old man predicted the fate of the bigoted monarch: "he will be left alone," he said, "like a whale upon the strand." James wondered that Waller could marry one of his daughters to "a falling church," alluding to the marriage of Dr Birch. "The king," rejoined the other, "does me great honour in taking notice of my domestic affairs; but I have lived long enough to observe that this falling church has got a trick of rising again." And it did rise most potentially to thrust down the king himself! The latest poetical efforts of Waller were devoted to religious subjects. When he had become too infirm either to read or to hold the pen, he dictated a few lines superior both in thought and diction to most of the pieces composed in the prime and vigour of his life. He had bought a small house with some land at Coleshill, and said he "should be glad to die like the stag where he was roused." But this natural wish was not realized. He died at Beaconsfield on the 21st of October 1687, in his eighty-second year, and a handsome monument in the churchyard of that place marks his grave.

Waller. Waller seems to have published two collections of his poems, one in 1648, and another in 1664. In 1690, after his death, a supplemental volume appeared with a preface, understood to have been written by Atterbury, who is also said to have contributed a sketch of the poet's life to a subsequent edition issued in 1711. In 1729 Fenton edited the poetical works of Waller, adding some new pieces, and subjoining to the volume copious "Observations," critical and explanatory. It was then the fashion to consider Denham and Waller, particularly the latter, as the great refiners and improvers of English poetry, an opinion which seems incredible when we remember Shakspeare, Spenser, and the minor poems of Milton. Dryden, Prior, and Pope have borne testimony to the *sweetness* of Waller's style. Atterbury does not hesitate to call him "the parent of English verse, and the first that showed us that our tongue had beauty and numbers." Such language is the more remarkable from Atterbury, as he was one of the few literary men of his day who fully appreciated Milton. But the preface to Waller was an early production, and cannot be held to express the mature convictions of that able though turbulent and pretentious churchman. The heroic couplet was then the favourite measure. Drummond had excelled in it, but he was little read; and Denham and Waller unquestionably wrote it with greater ease and more uniform correctness than Donne, Hall, or Ben Jonson. They

---

and amanuensis. Among his various troubles, it was perhaps not the least in the poet's estimation that his eldest son was an idiot and one of his daughters a dwarf. Edmund, the second son, inherited the estate, and, like his father, represented Amersham in Parliament, but at last turned quaker. The fourth son, Stephen, became eminent as a lawyer, and was one of the commissioners for the Union. He was his father's executor, and the poet in his will leaves his dwelling-house in St James's Street (which he had occupied for twenty-seven years) to his son. Byron, it will be recollected, lodged for some time in St James's Street; Steele, Rogers, and Moore are connected with offshoots from it; and to persons fond of literary associations it may be pleasant to recall those names in that region of clubs,—

> "Where the beaux cavalry pace to and fro,
> Before they take the field in Rotten Row."—*Sheridan.*

Wallingford ‖ Wallis.

were better artists, and had the grace of well-bred courtiers, familiar with men as well as books. But there are not, perhaps, two hundred really good lines in all Waller's poetry. Extravagant conceits, feeble verses, and defective rhymes, are constantly recurring, although the poems, being mostly short, are not tedious. Of elevated imagination, profound thought, or passion, he was utterly destitute; and it is only in detached passages, single stanzas, or small pieces finished with great care and elegance, as the lines on a lady's girdle, those on the dwarfs, and a few of the lyrics, that we can discern that play of fancy, verbal sweetness and harmony, which gave so great name to Waller for more than a hundred years. (R. C—S.)

WALLINGFORD, a municipal and parliamentary borough of England, county of Berks, on the right bank of the Thames, 46 miles W. by N. from London. The river is here crossed by a handsome stone bridge of nineteen arches with four drawbridges, erected in 1809 upon the site of a similar structure. The town is neat, and generally well built, containing a number of elegant buildings, among which are the three churches of St Leonards, a fine Norman edifice recently restored; St Mary's, an ancient structure in the early English style, with an elegant tower; and St Peter's, a handsome edifice, restored 1769–77, with a tower erected at the expense of Sir W. Blackstone, author of the *Commentaries*, whose tomb is in the church. There are also places of worship for Independents, Baptists, and Methodists. Only a few portions of the walls of its old castle, which contained a college, now remain. There are no manufactures of any importance, except the making of malt, in which, with corn, flour, coal, &c., some trade is carried on. The town is governed by a mayor, four aldermen, and twelve councillors, and returns one member to parliament. The parliamentary borough, which extends over a considerable area, contained, in 1851, 8064 inhabitants; the municipal borough only 2819.

WALLIS, JOHN, a distinguished mathematician, logician, and grammarian, was born on the 23d of November 1616, at Ashford in Kent, of which parish his father was then minister. Having been previously instructed in the Latin, Greek, and Hebrew languages, he was, in 1632, sent to Emmanuel College, Cambridge, where he applied himself with great success to various branches of learning. He afterwards removed to Queen's College, of which he was chosen fellow. Having been admitted to holy orders, he left the university in 1641 to act as chaplain to Sir William Darley; and in the following year he accepted of a similar appointment from the widow of Sir Horatio Vere. It was about this period that he displayed surprising talents in deciphering the intercepted letters and papers of the royalists. His adherence to the parliamentary party was, in 1643, rewarded by the living of St Gabriel, Fenchurch Street, London. In 1644 he was appointed one of the scribes or secretaries of the Assembly of Divines at Westminster. During the same year he married Susanna Glyde, and thus vacated his fellowship; but the death of his mother had left him in possession of a handsome fortune. In 1645 he attended those scientific meetings which led to the establishment of the Royal Society. When the Independents obtained the superiority, Wallis adhered to the Solemn League and Covenant. The living of St Gabriel he exchanged for that of St Martin's, Ironmonger Lane; and, as minister of that church, he in 1648 subscribed the Remonstrance against putting the king to death. Notwithstanding this act of opposition, he was, in June 1649, appointed Savilian professor of geometry at Oxford. In 1654 he there took the degree of D.D. In 1658 he succeeded Dr Langbaine as keeper of the archives. After the Restoration, he was confirmed in both his academical offices, and was named one of the king's chaplains in ordinary. He complied with the terms of the Act of Uniformity, but he seems always to have retained moderate and rational notions of ecclesiastical polity. "It hath been my endeavour all along," says this excellent person, "to act by moderate principles, being willing, whatever side was uppermost, to promote any good design for the true interest of religion, of learning, and of the public good." He died at Oxford on the 28th of October 1703, in the eighty-seventh year of his age. He "was happy in the enjoyment of a vigorous constitution of body, and of a mind which was strong, serene, and calm." His son, John Wallis, who was a barrister, acquired a good estate by his marriage with Elizabeth Harris; and we likewise hear of two daughters, who were both married. Dr Wallis was eminently distinguished by the superiority of his talents, as well as by the variety, extent, and solidity of his learning. His works are numerous, and relate to a multiplicity of subjects. Of his scientific genius he has left a conspicuous monument in the collection of his *Opera Mathematica*, Oxon. 1697–9, 3 tom. fol. In this collection he did not think it necessary to insert the tracts which he published against Hobbes, because, as he has himself stated, he had no inclination to trample on the ashes of the dead, although it was his duty to expose the fallacious reasoning of that writer when alive. His *Institutio Logicæ* was published in 1687, and was much more run upon than its excellence deserved. In his *Grammatica Linguæ Anglicanæ*, we likewise find many indications of an acute and philosophic intellect. Of this grammar, originally printed in 1653, there are six editions, but the best is that published by Bowyer in 1765. Among various other works, he produced some theological tracts, among which are three dissertations on Melchizedek, Job, and the titles of the Psalms. He was engaged in controversies relative to the doctrine of the Trinity, and to the observance of the Christian Sabbath. In the latter controversy, his antagonist, Thomas Bampfield, a barrister-at-law, maintained that the Sabbath ought to be observed, not on Sunday but on Saturday. He published several reliques of the ancient Greek writers on science, and thus established another claim to the regard of his learned contemporaries.

Wallsend ‖ Walpole.

WALLSEND, a village of England, county of Northumberland, between Newcastle and North Shields, about 3½ miles E. of the former. It is so named from its position at the termination of the Roman wall built by the Emperor Severus, and is noted for the excellence of its coal, which abounds in the vicinity. The inhabitants are chiefly employed in the collieries, but partly also in the shipbuilding yards, limeworks, and potteries about the village. It has a neat parish church, and several dissenting places of worship. Pop. 2161.

WALMER, a small village of Kent, in the vicinity of Deal, where is Walmer Castle, the official residence of the warden of the Cinque Ports. It was here that the late Duke of Wellington, who held that office, died. (See DEAL.)

WALPOLE, SIR ROBERT, Earl of Orford, was born at Houghton in Norfolk, 6th September 1676, and was educated on the foundation at Eton school. Thence he was erected to King's College in Cambridge; but on the death of his elder brother he resigned his scholarship. He was elected member for Castle-Rising, and represented that borough in the two short parliaments assembled during the last two years of William's reign. In 1702 he was elected for King's Lynn, and represented that borough in several succeeding parliaments. In 1705 he was nominated one of the council to Prince George of Denmark, lord high admiral of England; in 1707, was appointed secretary-at-war; and, in 1709, treasurer of the navy. In 1710, upon the change of the ministry he was removed from all his posts, and held no place during the remainder of the queen's reign. In 1711 he was expelled from the House of Commons for what they called notorious corruption in his office as secretary-at-war.

Walpole. The borough of Lynn, however, re-elected him in 1714; and though the house declared the election void, yet they persisted in the choice. In the well-known debate relating to Steele for publishing the *Crisis*, he greatly distinguished himself on behalf of liberty, and added to the popularity which he had previously acquired.

On the death of the queen, a revolution of politics took place, and the Whig party prevailed both at court and in the senate. Walpole had before recommended himself to the House of Hanover by his zeal for its cause, when the commons considered the state of the nation with regard to the Protestant succession; and it is not surprising that his promotion soon took place after the king's arrival. In a few days he was appointed receiver and paymaster-general of all the guards and garrisons, and of all the other land-forces in Great Britain, paymaster of the royal hospital at Chelsea, and likewise a privy councillor. On the opening of a new parliament, a committee of secrecy was chosen to inquire into the conduct of the late ministry, of which Walpole was appointed chairman; and, by his management, articles of impeachment were read against the Earl of Oxford, Lord Bolingbroke, the Duke of Ormond, and the Earl of Strafford. The eminent service which he was thought to have rendered the crown, by the vigorous prosecution of those ministers who were deemed the chief instruments of the peace, was soon rewarded by the extraordinary promotions to the offices of first commissioner of the treasury, and chancellor and under-treasurer of the Exchequer.

In two years time he resigned all his offices, on account of a misunderstanding which took place between him and the rest of the ministry about certain supplies demanded for the support of his majesty's German dominions. On the day of his resignation he brought in the famous sinking-fund bill, which he presented as a country gentleman, saying that he hoped it would not fare the worse for having two fathers, and that his successor, Mr Stanhope, would bring it to perfection. His calling himself the father of a project, which has since been so often employed to other purposes than were at first declared, gave his enemies frequent opportunity for satire and ridicule; and it has been sarcastically observed, that the father of this fund appeared in a very bad light when viewed in the capacity of a nurse. In the next session of parliament, Walpole opposed the ministry in everything; and even Wyndham or Shippen did not exceed him in patriotism. Upon a motion in the house for continuing the army, he made a speech of above an hour long, and displayed the danger of a standing army in a free country with all the powers of his eloquence. Early in 1720 the rigour of the patriot began to soften, and the complaisance of the courtier to appear; and he was again appointed paymaster of the forces, and several of his friends were found soon after in the list of promotions. No doubt now remained of his entire conversion to court-measures; for, before the end of the year, we find him pleading as strongly for the forces required by the war-office as he had before declaimed against them, even though at this time the same pretences for keeping them on foot did not exist.

It was not long before he acquired full ministerial power, being appointed first lord commissioner of the treasury, and chancellor of the exchequer; and when the king went abroad in 1723, he was nominated one of the lords justices for the administration of government, and was sworn sole secretary of state. About this time he received another distinguished mark of the royal favour, his eldest son, then on his travels, being created a peer, by the title of Baron Walpole of Walpole. In 1725 he was made knight of the bath, and the year after knight of the garter. The measures of his administration, during the long time he remained prime or rather sole minister, have been often canvassed with all the severity of critical inquiry. It is difficult to discern the truth through the exaggerations and misrepresentations of party. He has indeed been accused of employing the sinking-fund for the purposes of corruption, of which it was long the fashion to call him the father; but the man who reflects on the transactions of Charles II. and his infamous cabal, will acquit him of the latter part of this charge. He was an enemy to war, and the friend of commerce; and because he did not resent some petty insults of the court of Spain so suddenly as the fiery part of the nation thought he should have done, a formidable opposition was formed against him in the House, which had influence enough to employ in its cause almost all the wit of the nation. Pulteney and Pitt were the great leaders of the party in the House of Commons; while Bolingbroke, and Pope, and Johnson, and almost every man of genius, exerted themselves without doors to enlighten, by pamphlets in prose and verse, the minds of the people, and show the necessity of a Spanish war. This he strenuously opposed, because he knew that the foreign settlements of that power are very remote, and in a climate destructive to Englishmen; and that such of them as we might be able to take we could not possibly retain. The opposition, however, prevailed. The nation was indulged in a war, of which it surely had no cause to boast of the success; and it is now universally known, that the greater part of those who with honest intentions had, either in parliament or out of it, been engaged to run down the minister, lived to repent of their conduct, and do justice to the man whom they had so pertinaciously vilified. Walpole.

In order to encourage commerce and improve the revenue, Walpole projected a scheme for an extension of the excise, as the only means of putting a stop to the frauds of merchants and illicit traders. This was another ground of clamour to the orators within and the wits without doors; and while the opposition represented it as a measure big with public mischief, Swift and Pope occasionally alluded to it as an oppression calculated to deprive private life of all its comforts. The minister was therefore obliged to abandon the scheme; but in a succeeding administration it was partly carried into execution, at the express solicitation of the principal persons concerned in that article of trade which it was suggested would be most affected by it; and afterwards the most popular minister that ever directed the councils of this country declared in full senate, that if a time should ever arrive which was likely to render the project feasible, he would himself recommend an extension of the excise-laws, as a measure of the greatest advantage to commerce, to the revenue, and to the general interests of the kingdom.

In 1742 the opposition prevailed; and Walpole, being no longer able to carry a majority in the House of Commons, resigned all his places, and fled for shelter behind the throne. He was soon afterwards created Earl of Orford; and the king, in consideration of his long and faithful services, granted him a pension of L.4000 per annum. The remainder of his life he spent in tranquillity and retirement, and died in 1745, in the sixty-ninth year of his age. (Coxe's *Memoirs of the Life and Administration of Sir Robert Walpole, Earl of Orford*, Lond. 1798, 3 vols. 4to.)

He wrote the following pamphlets:—*The Sovereign's Answer to the Gloucestershire Address*,—the Sovereign meant Charles, duke of Somerset, so nicknamed by the Whigs; *Answer to the Representation of the House of Lords on the State of the Navy*, 1709; *The Debts of the Nation stated and considered, in four Papers*, 1710; *The Thirty-five Millions accounted for*, 1710; *A Letter from a Foreign Minister in England to Monsieur Pettecum*, 1710; *Four Letters to a Friend in Scotland upon Sacheverell's Trial, falsely attributed in the General Dictionary to Mr Maynwaring; A short History of the Parliament*,—it is an account of the last session of the queen; *The South Sea Scheme considered; A Pamphlet against the Peerage Bill*, 1719; *The Report of the Secret Committee*, 9th June 1715.

WALPOLE, *Horace*, the third son of Sir Robert, was born in 1717, and became fourth Earl of Orford in 1791.

Walpole. After having been educated at Eton and Cambridge, Horace Walpole passed two years on the continent, accompanied during the greater portion of the time by the poet Gray, whose acquaintance he had made at school. He spent the greater part of these years in Italy, where he acquired that taste for art which afterwards furnished the main employment of his life. In the autumn of 1741 he returned to England; and he took his seat in the parliament which, meeting in the end of that year, drove his father from power before the close of its first session. He continued to be a member of the House of Commons for twenty-six years, retiring at the age of fifty-one. His political career was by no means distinguished. We do not hear of his having delivered more than three speeches in all, and of these the two that have been preserved exhibit no great talent for oratory. For political business he possessed neither industry nor ambition; and the character in which he appeared throughout was little more than that of a spectator, who took greater pleasure in watching the acts of others, and recording his own impressions in regard to them, than in endeavouring himself to act either for his own benefit or for that of others.

As an observer of public men, however, he never allowed his attention to flag; and his observations were most diligently set down in a multifarious correspondence with friends, and, for a part of his life, in political memoirs, avowedly intended for publication when the writer and his contemporaries should have quitted the scene. Politics, however, like all things else, were for Horace Walpole nothing more than an amusement. Literature, art, and antiquities ministered by turns to the same end, although all these pursuits were followed in the same careless and Epicurean spirit. But his pen never lay long idle; few themes that demanded but little study for their treatment proved alien to it; and among his works there gradually accumulated, not only an immense mass of letters, as evidently calculated for publication as anything else he ever wrote, but specimens of his aptitude for the composition of novels, of dramas serious and comic, of political tracts and satires, of grave historical disquisitions, of memoirs for the history of English art and of English aristocratic literature, and of those light verses which may be written by gentlemen having but slender pretensions to the name of poets.

Walpole's circumstances, however, allowed him to indulge, in a more dignified fashion, his taste for art and literature. One who was ashamed of writing plays and poems had no need to be ashamed of collecting books and antiques, or of building baronial castles, and designing romantic gardens. Although Sir Robert Walpole himself left his affairs exceedingly embarrassed, he had carefully provided for the younger branches of his family by grants of public posts. Several sinecure offices conferred on Horace made up his income, during the greater part of his life, to L.4000 at least, or perhaps considerably more. To a bachelor, sufficiently methodical and cautious in money-matters, a sum like this offered no inconsiderable facilities for the indulgence of one or two expensive tastes. Walpole began to collect a few antiques while in Italy; but his passion for collecting did not arrive at its height till much later. In 1747, when he was thirty years old, he purchased a cottage and piece of ground at one end of the village of Twickenham. Subsequent purchases increased the domain to an extent of several acres, the whole of which was laid out as pleasure-grounds; and the "little plaything house," incessantly altered and enlarged, grew at length into the Gothic castle of Strawberry Hill. Its owner's taste had received, partly perhaps from his friend Gray, an early direction towards this style of architecture, as well as to the branches of antiquarian study connected with it.

In the erection and decoration of his mansion, in desultory study and composition, in the enjoyments of society which embraced many of the aristocracy, and a very few of the literary men of the country, and in several excursions to Paris, which introduced him to the philosophical precursors of the revolution—in employments such as these, varied only by his retirement from Parliament, passed the life of Horace Walpole, till he had attained his seventy-fourth year. The death of his unfortunate nephew then gave him his father's earldom, an honour unaccompanied by any substantial accession of fortune. He had for many years been a victim of gout, and the short remainder of his life was spent in utter helplessness of body. But his mind was unshaken to the last, and he died on the 2d March 1797, in his eightieth year. Walpole.

The earliest compositions of Horace Walpole were in verse: and while they were undoubtedly sprightly and agreeable, they wanted the charm of imagination. His *Ædes Walpolianae*, a catalogue of his father's pictures, appeared in 1752; in 1761–1771, appeared his *Anecdotes of Painting in England;* and in 1763 he published his *Catalogue of English Engravers.* These works, for which the greater part of the materials were furnished by Vertue the famous engraver, were happily written, and they form agreeable volumes of anecdote and entertainment. His *Catalogue of Royal and Noble Authors* in 1758; his celebrated *Castle of Otranto,* of which the interest is not yet entirely dead; the *Mysterious Mother,* a spirited tragedy, founded on a disgusting tale of incest, in 1768; *Historic Doubts on the Life and Reign of King Richard III.,* all tended either to amuse his leisure or to gratify his vanity. Besides other minor works which occupied his time during those years, he printed, by means of a private printing-press, at Strawberry Hill in 1757, where he brought out the *Odes* of Gray, his own *Anecdotes of Painting, A Description of Strawberry Hill, Lucan,* the *Life of Lord Herbert of Cherbury,* &c.

The works in which Walpole exhibits most characteristically all his qualities of mind, both moral and intellectual, are his *Letters,* especially those in which the politics of the country are the matters chiefly handled. Accordingly, his correspondence with Sir Horace Mann (which was prudently suppressed till the present generation) may be most advantageously studied as a likeness of the writer; and to this interesting series other sets of letters, such as those to the Conways, and even the posthumous *Memoirs* (4 vols. 1844), may be regarded as little else than supplementary. The dissection of motives, which is the task undertaken with the greatest readiness, is that which is performed least satisfactorily. The analysis of the springs of action is often evidently just; but as often it is clearly performed by one who was incapable alike of believing that men whom he disliked could act patriotically or nobly, and of even conceiving that any party or any individual could be actuated by motives of a higher class than those by which, unconsciously in part, he himself was led. The selfishness of Strawberry Hill, though not its refinement, was indeed a fair enough measure by which to estimate such statesmen as the Pelhams; but both the selfish indolence and the confined though acute intellect were utterly alien to the mind of Pitt, and utterly incapable of estimating him and the few other spirits which in that age of intrigue and detail possessed real strength and elevation. Akin to this temper of universal censoriousness, and indeed springing from the same source, is another distinctive peculiarity of Walpole's political sketches; namely, his incapacity for determining the relative importance either of principles or actions. An intrigue which substitutes in the ministry a Holdernesse for a Pelham, possesses in his eyes equal consequence with the agitation which decides whether the foreign policy of the nation is to be swayed by strength and patriotism or by

Walsall ‖ Walsingham.

weakness and corruption—by William Pitt, or by the creatures who, during the greater part of his life, thwarted and crippled his exertions. Nay, the politics of the day themselves appear, in Walpole's eyes, as standing on the same level with the amusements, the family history, the debauchery of the fashionable world: Lady Orford is satirized in the same breath with the Chancellor Hardwicke, and the King of Prussia is not less a theme of merriment than "Prince Pigwiggin," or the Duchess of Kingston.

These very qualities, which at once bear unfavourable witness to the state of the writer's mind, and diminish the value of the writings as historical documents, do nevertheless give a peculiar attraction to them as literary compositions of a certain class. The class is not a high one, but in it the best parts of this Correspondence occupy the very foremost place. The *Letters* are inimitable pictures of society and of human character, drawn by the hand of one who was a master in the delineation of scenes from familiar life; not, it is true, inspiring his figures with poetic truth or serious significance, but shedding over all of them a gaily comic light. They are a kind of satires, and few compositions claiming that name are equal to them in lively wit, in striking grasp of character, in picturesque colouring of incidents, and in apposite, epigrammatic, vigorous language. These *Letters*, which have hitherto appeared in an incomplete state in various editions, have been recently brought out in an entire form under the editorial superintendence of Peter Cunningham, in 8 vols. in 1857. They comprise a period of more than sixty years, from 1735 to 1797.

WALSALL, a municipal and parliamentary borough of England, county of Stafford, stands on an eminence near the river Tame, 8 miles N.N.W. of Birmingham, and 15 S.S.E. of Stafford. The main street is very steep, and many of the others have a considerable inclination. In the older parts of the town the streets are generally narrow, crooked, and irregular, and the houses badly built; but in the newer parts the streets are regular and well built. It has three churches, the principal of which, St Matthews, occupying the centre and highest part of the town, is an ancient cruciform edifice, with a finely proportioned tower, surmounted by a lofty spire. There are also places of worship for Independents, Baptists, Methodists, Unitarians, and Roman Catholics; a free grammar, Blue-coat and other schools; an old town-hall, and a small borough jail. The public library and news-rooms occupy a handsome building, with a Doric colonnade. Walsall is situated on the borders of the Staffordshire coal and iron districts, and hence many of its inhabitants are employed in the coal and iron mines. Limestone is also extensively quarried in the vicinity. Its chief manufactures are machinery, and ironmongery articles for saddlers, coachbuilders, carpenters, &c. It is governed by a mayor, 6 aldermen, and 18 councillors, and returns one member to parliament. Pop. (1821) 11,914, (1831) 15,066, (1841) 19,654, (1851) 25,680.

WALSH, William, an English critic and poet, the son of Joseph Walsh, Esq. of Abberley in Worcestershire, was born in 1663. He became a gentleman commoner of Wadham College, Oxford, but left the university without taking a degree. His writings are to be found among the works of the Minor Poets, printed in 1749. Johnson says, "he has more elegance than vigour, and seldom rises higher than to be pretty." He was made gentleman of the horse in Queen Anne's reign, and died in 1707–8. He was the friend of Dryden and of Pope, the former of whom esteemed him the best critic then living; and Pope says of him in his *Essay on Criticism*, that he had "the clearest head and the sincerest heart."

WALSINGHAM, Sir Francis, secretary of state during the reign of Queen Elizabeth, was descended from an ancient family in Norfolk, but was born at Chislehurst in Kent, in or about 1536. After having made great progress in his studies at Cambridge, he was twice sent ambassador to France, and on his return to England was employed in the most important affairs, became secretary of state, and was one of the commissioners for the trial of Mary Queen of Scotland. Sir Francis was undoubtedly one of the most refined politicians and most penetrating statesmen of his age. He was very skilful in detecting the motives of men. He cautiously listened to their talk, surveyed their countenances as they spoke, and read off their characters with eminent sagacity. He had his spies in most courts in Christendom, and allowed them a liberal maintenance; for it was his maxim, that knowledge cannot be bought too dear. In 1586, the King of Spain having made vast preparations, which surprised and kept all Europe in suspense, Walsingham employed his utmost endeavours for the discovery of the royal secret; and accordingly procured intelligence from Madrid, that the king had informed his council of his having despatched an express to Rome, with a letter written with his own hand to the pope, acquainting him with the design of his preparations, and begging his blessings upon him; which design for some reasons he could not disclose till the return of the courier. The secret being thus lodged with the pope, Walsingham, by means of a Venetian priest, whom he retained at Rome as a spy, got a copy of the original letter, which was stolen out of the pope's cabinet by a gentleman of the bed-chamber, who took the key out of the pope's pocket while he slept. After this, by his dexterous management, he caused the Spaniards' bills to be protested at Genoa, which should have supplied them with money for their extraordinary preparations; and by this means he happily retarded this formidable invasion for a whole year. In short, he spent his whole time and faculties in the service of Queen Elizabeth, on which account her majesty was heard to say, "that in diligence and sagacity he exceeded her expectations." However, after all his eminent services to his country, this man gave a remarkable proof at his death, which happened on the 6th of April 1590, how far he preferred the public interest to his own. He was so poor, that, excepting his library, which was a very fine one, he had scarcely effects enough to defray the expense of his funeral.

Walter.

WALTER, John, late manager and principal proprietor of the *Times* newspaper, was born in 1784. His father, John Walter, was for eighteen years printer to the customs, and was likewise chief proprietor of the *Times*, the first number of which he published on the 1st of January 1788. His son, the late John Walter, became joint-proprietor and sole manager of that greatest of English newspapers in 1803. Since that date, the improvements undergone by that newspaper have been enormous. The munificent sums paid to the editor and writers, the very efficient staff of reporters, the prodigious amount and general accuracy of the information gleaned almost from every corner of the world, the singular swiftness with which intelligence is conveyed to its pages, the enormous steam-power employed in the printing of it—turning out at present upwards of 50,000 daily—and the general excellence of the entire arrangements, all render this newspaper the foremost in the world, and reflect the highest credit upon those who have been engaged in the management of it. The directorial power of John Walter was characterized, as it always is, much more by tact than by any brilliant quality of mind. From the 29th of November 1814, when steam was first introduced by him to the printing of the *Times*, down to the year of his death, the amount of risk, anxiety, and labour that he expended on it was such as few men could have undergone.

John Walter married in 1818, and having purchased an estate in Berkshire, he represented that county in parliament from December 1832 till 1837, when he retired in consequence of a difference of opinion with his constituents regarding the poor-laws. In 1840 he was an unsuccessful

Waltham Abbey ‖ Walton.

candidate for the representation of Southwark, but in 1841, he was returned for the borough of Nottingham. He died at his residence in Printing House Square, Blackfriars, London, on the 28th of July 1847. His son, the present John Walter, who has been M.P. for Nottingham since 1847, continues to conduct the *Times* on his father's principles with great success.

WALTHAM ABBEY, or HOLY CROSS, a market-town of England, county of Essex, on the river Lea, 13 miles N.N.E. of London. It takes its name from a stately abbey erected here by Harold II., and further endowed by Henry II. The present church formed part of the ancient abbey, and presents some interesting features of Norman architecture. It is about 90 feet in length by 48 in breadth, and has at the west end a square embattled tower 86 feet in height, bearing the date of 1558. There is a free school for the education of twenty boys and twenty girls. There are also several government powder-mills, which employ many of the inhabitants; as well as silk and corn mills, a pin-factory and malt-kilns. At Enfield Lock, about 2 miles below Waltham Abbey, is a government manufactory of firearms. Pop. (1851) 2329.

WALTON, BRIAN, a very eminent biblical scholar, was born in the year 1600, at Seymour in the district of Cleveland in Yorkshire. He is said to have been admitted a sizar of Magdalene College, Cambridge, in the month of July 1616. In 1618 he became a sizar of Peter House. He took the degree of A.B. in 1619, and that of A.M. in 1623. He left the university for a curacy and the mastership of a school in Suffolk. He next removed to the metropolis, as an assistant at the church of Allhallows, Bread Street; and in 1626 he was collated to the rectory of St Martin's Orgar, London. On the 15th of January 1635–6, he was instituted to the rectories of St Giles-in-the-Fields, and of Sandon in Essex. The former he does not appear to have retained. About this time, he is supposed to have been chaplain to the king, and to have been collated to a prebend of St Paul's. In 1639 he took the degree of D.D. at Cambridge; and in the public act, he maintained a thesis against the infallibility of the pope. His wife, Anne Claxton, died in the course of the following year.

Dr Walton was involved in the troubles which ensued; and in 1641 he is supposed to have been dispossessed of both his rectories. Towards the close of the year 1642 he was ordered into custody as a delinquent. Like many other members of his order, he afterwards sought a place of refuge at Oxford; and on the 12th of August 1645 he was incorporated doctor of divinity. Here among the learned fugitives he met with Dr Fuller, dean of Ely, whose daughter Jane became his second wife. On his return to London, he resided in the house of his father-in-law. Undismayed by the change of his circumstances, he planned and executed one of the greatest, if not the very greatest, literary enterprise of which his country can boast. This was the famous Polyglott Bible, of which the plan appears to have been brought to considerable maturity in the year 1652. The design was approved by the Council of State, who exempted from duty all the paper to be employed in the edition; and to the credit of the age it must be recorded, that in the month of May 1653, subscriptions had been obtained to the amount of L.9000. Dr Walton had various coadjutors, but the very laborious task of editorship devolved upon himself. As a precursor, he published *Introductio ad Lectionem Linguarum Orientalium*, Lond. 1654, 8vo. This introduction was reprinted at London in 1655. The great work itself was completed in the space of about four years, and made its appearance under the title of *Biblia Sacra Polyglotta*, &c., Lond. 1657, 6 tom. folio. In this edition, nine languages are employed, but not a single book is printed in so many. The four evangelists are in six, the other books of the New Testament only in five, and those of Judith and the Maccabees only in three. The Prolegomena have been repeatedly printed in a separate form, and are allowed by the most competent judges to be a work of great erudition, as well as of great value. The last edition is that of Wrangham, published at Cambridge in 1825, in 2 vols. 8vo.

Walton.

Among those who assisted Walton in his very arduous undertaking, we must first of all mention the venerable Archbishop Usher, who not only aided and directed him by his counsel, but likewise furnished him with a collation of sixteen manuscripts. His learning was so varied and so profound, that it was of no small importance for the editor to have access to him on all occasions of doubt and difficulty. Another able coadjutor was Dr Lightfoot, and a third was Dr Pocock. The services of Edmund Castell, Abraham Wheelock, Patrick Young, Dudley Loftus, Herbert Thorndike, Thomas Hyde, Thomas Greaves, and several other individuals, are likewise commemorated. Selden, who possessed a great fund of oriental learning, was a zealous promoter of the design; and he joined with Usher in signing a recommendation which was printed with the prospectus. He was one of those to be consulted in the progress of the work, and his valuable library was open to the editor.

Dr Walton's next publication bears the title of *Dissertatio, in qua de Linguis Orientalibus, Hebraica, Chaldaica, Samaritana, &c., et de Textuum et Versionum quæ in Complutensibus, Regiis, Parisiensibus et Anglicanis Polyglottis Bibliis habentur, Antiquitate, Authoritate et Usu, breviter disseritur*, Daventriæ, 1658, 12mo. This is followed by Wower's *Syntagma de Græca et Latina Bibliorum Interpretatione*. His meritorious labours were not duly appreciated by some of his contemporaries; and he was very unadvisedly attacked by Dr Owen, in *Certain Considerations on the Prolegomena and Appendix to the late "Biblia Polyglotta."* The writer was himself a man of learning; but the dangers which he contemplated were imaginary, and he ventured upon ground which he could not maintain against such an antagonist. His work was very ably refuted by Dr Walton, in *The Considerator considered*, Lond. 1659, 8vo. This work forms the second volume of Todd's *Memoirs of the Life and Writings of Brian Walton, D.D., Lord Bishop of Chester*, Lond. 1821, 2 vols. 8vo.

At the period of the Restoration, Dr Walton's great and conspicuous merits could not be disregarded. He was speedily restored to his former preferments, and was nominated to the bishopric of Chester. On the 2d of December 1660, he was consecrated in Westminster Abbey. In March following he was one of the commissioners at the Savoy conference, which so strikingly displayed the unmitigated bigotry of the triumphant churchmen. The Bishop of Chester however appears to have acted with sufficient moderation. His new honours were very short and fleeting. He reached his episcopal seat on the 11th of September 1661; and having soon afterwards returned to London, he died there on the 29th of the ensuing November, in the sixty-second year of his age.

WALTON, *Isaac*, or *Izaak*, "the Father of Angling," and an early writer of great popularity, was born on the 9th of August 1593, in the parish of St Mary and town of Stafford. The condition of his father is not mentioned, but his mother is described as the daughter of Edmund Cranmer, archdeacon of Canterbury, and the niece of the archbishop. His own occupation was that of a shopkeeper, but his love of literature, as well as his upright and amiable simplicity of character, recommended him to the favour and friendship of many individuals distinguished by their talents and station. In 1624 we find him residing on the north side of Fleet Street, two doors west of Chancery Lane;

Walton.

and in 1632 he had removed to a house in the Lane. The tradition of his family represented him as a Hamburg merchant, or wholesale linendraper; but, according to Anthony Wood, he followed the occupation of a sempster. He married Ann the sister of Thomas Ken, afterwards bishop of Bath and Wells. While an inhabitant of St Dunstan's in the West, he was a regular attendant on the ministrations of Dr Donne, then vicar of the parish; and with this witty poet and divine he contracted a friendship, which was only terminated by death. Walton visited him in his last sickness, and wrote a circumstantial account of his life, which in 1640 accompanied a collection of the dean's *Sermons*. Another of his distinguished friends was Sir Henry Wotton, whose life he also undertook to write, and finished it about the year 1644. It was prefixed to the *Reliquiæ Wottonianæ*, which he edited in 1651. It is to be regretted that he did not execute his design of writing the lives of other two individuals connected with Eton, Sir Henry Savile and John Hales, both very eminent in their generation. About the year 1643, we are informed, he left London, and, with a fortune very far short of what would now be called a competency, seems to have retired altogether from business. While he resided in the metropolis, angling had been his favourite recreation, and in that art he arrived at great skill and proficiency. The result of his experience he embodied in a very pleasing volume, entitled *The Complete Angler, or Contemplative Man's Recreation*, Lond. 1653, 8vo. This work was so favourably received, that other four editions were published during the author's lifetime, namely, in 1655, 1664, 1668, and 1676. To this last impression a second part, containing instructions how to angle for trout or grayling, was added by his friend Charles Cotton. Of both parts there are many subsequent editions, and the popularity of the work continues unimpaired. An elaborate edition, with a life of the author, was published by Sir John Hawkins in the year 1760; and in 1833 Sir N. H. Nicolas published a splendid edition of it in 2 quarto vols., with an excellent life of the author. Walton having resumed his biographical labours, published the life of Hooker in 1662, that of Herbert in 1670, and that of Sanderson in 1678. His *Lives* were afterwards collected together, and in this form have repeatedly been printed. An edition containing a meagre account of the author, together with annotations, was published by Dr Zouch, York, 1796, 4to. The work, thus illustrated, reached a third impression, York, 1817, 2 vols. 8vo. Another good edition of Walton's *Lives*, with a Memoir of the author, was published by Dowling in 1857. These specimens of circumstantial biography are rendered very interesting by the native kindness of the author's disposition, and by the garrulous simplicity of his narrative. In 1680 he published, but without his name, *Love and Truth*, Lond. 1680, 4to. This tract was reprinted in Dr Zouch's edition of the *Lives*. At the age of ninety he edited *Thealma and Clearchus; a Pastoral History in smooth and easie verse: written long since by John Chalkhill, Esqr. an acquaintant and friend of Edmund Spencer*, Lond. 1683, 8vo. As to the author, he states "that he was in his time a man generally known, and as well beloved; for he was humble, and obliging in his behaviour, a gentleman, a scholar, very innocent and prudent; and indeed his whole life was useful, quiet, and virtuous." Of this poem there is a recent edition. Chiswick, 1820, 12mo. The name of Chalkhill is otherwise so entirely unknown, that Mr Singer, who published this edition, is inclined to doubt whether the poem may not have been a youthful production of its first editor. But Sir H. Nicolas has set the matter at rest by proving the relationship of Chalkhill to Walton's second wife. Having attained to a healthful and happy old age, he died on the 15th December 1683, at Winchester, in the prebendal house of his son-in-law, Dr Hawkins, and was interred in the cathedral of that city. His wife died in 1662. Their son Isaac Walton having been educated at Oxford, became rector of Polshot, and canon residentiary of Salisbury. He died unmarried in the year 1716. His only sister Anne was married to William Hawkins, rector of Droxford, and prebendary of Winchester. Their only son, William Hawkins, was the author of a well known *Treatise of the Pleas of the Crown*. There is an edition of Walton's whole works by Major, published in 1823.

Wandsworth ‖ Wantage.

WANDSWORTH, a village and parish of England, county of Surrey on both sides of the river Wandle at its confluence with the Thames, 5 miles S.W. of London. Its main street along the old Portsmouth road is long and spacious. The old parish church is a plain brick edifice, with a heavy square tower at its western extremity. The new church of St Ann's, erected in 1824, is an elegant Grecian edifice, with a handsome portico and steeple. There are also several dissenting places of worship. Wandsworth is the seat of numerous manufacturing works of chemical products, bolting-cloths, hats, vinegar, malt, spirits, beer, candles, paper, &c. It is also inhabited by many wealthy Londoners, so that its residents are for the most part in the extremes of rich and poor. Pop. of parish (1851) 9611.

WANTAGE, a market-town of England, county of Berks, on a branch of the Ock and of the Wilts and Berks Canal, at the E. extremity of the vale of the White Horse, 22 miles W.N.W. of Reading. It stands at the intersection of the high roads from Hungerford to Oxford, and from Farringdon to Wallingford, which form its principal streets. The parish church is an ancient cruciform edifice, with a square embattled tower rising from its centre, and some fine monuments. It has also several dissenting places of worship, a new town-hall, and a free grammar-school. The manufactures are unimportant, but it has a large weekly market on Wednesdays for the sale of agricultural produce, from the fertile vale district. Alfred the Great was born here in 849, and a festival commemorating his 1000th birthday was held on 25th October 1849. Bishop Butler was also a native of this place. Pop. (1851) 2951.

W A R.

War. ALL history, whether sacred or profane, teems with proofs that war has been a social evil or disease, afflicting mankind from the earliest times, and recurring with such regularity at successive epochs, as to have almost appeared necessary to, or inherent in, the constitution of mankind, as an aggregate of men, just as some diseases are known to be to the constitution of the individual man. Many, however, if not most, of the diseases which afflict the human frame, are not of a normal character, or the necessary result of a natural law, but are abnormal, being the consequence of the unrestrained and vicious indulgence of human passions. In the same manner, it may be justly said, that most wars have originated in the impulsive action of human passions. Sometimes, in the earlier stages of the earth's history, one race of people, urged by want or necessity, abandoned a country no longer able to support its increasing numbers, and, like a hive of bees or a swarm of locusts, migrated to and ravaged the lands of their neighbours; whilst, in later or more civilised times, the ambition of the monarch has generally kept alive national prejudices, and induced his people to strive after objects which could in no degree benefit their own condition, or advance their own happiness. Taking, for example, the present difficulties in settling the affairs of Italy, may it not be asked, what possible advantage have the natural subjects of the Emperor of Austria either gained, or can by possibility gain, from the sovereignty of any portion of Italy being vested in their own monarch, or in the princes of his family? But though worthless as a *national* possession, the Emperor doubtless considered it a matter of honour and ambitious pride to secure for every member of his family, if possible, the position of a reigning prince; just as a man of rank endeavours to place not only his heir but all his descendants in positions similar to his own. The son of a gentleman shuns a contact with mechanical or other trades, and keeps himself, though not in a Scriptural sense, unspotted from the world. And, in like manner, the Emperor of Austria doubtless considers that the sons, the nephews, or the cousins of an emperor, are born to be the governors of other countries; whilst it is doubtless a matter of convenience to shift the cost of their maintenance from their native country to any other country on which they can be imposed.

War a social evil.

Such feelings as these would be harmless, were it not that it becomes the motive of the governing body in every country to keep up national prejudices and natural hatred in the governed, and thus to make them share in the passion for conquest; nor is this confined to despotic governments alone, as history tells us that republics have shared with them in the craving desire to trample on the rights and liberties of their neighbours, and to impose upon them the government, often oppressive and always distasteful, of the stranger.

The most remarkable, and, up to this time, the most successful, republican government which the world has ever seen, the United States of America, has not entirely escaped from the charge of giving way to this absorbing passion for aggrandizement; nor is the charge entirely unfounded, though at the same time it should be remembered, that in the United States the spirit of encroachment or of conquest is strongly mixed with the spirit of propagandism; for, whilst Republicanism in America wars against the governments of other countries, it admits the People, when overcome, to its own advantages and privileges. America does not strive to force foreign rulers upon other countries, but to draw those countries into its own bosom as integral parts of one great whole. The advance of education, and probably still more, the increased facilities of intercommunication, have doubtless done much to soften the asperities of national prejudices; but the enthusiastic advocates of peace, at any price, ought to remember, that individual passions and individual crimes have not yet ceased on the surface of the earth; and although the inhabitants of one country may have ceased to hate those of another, yet no one can say that the Autocrat of one nation may not yet desire to rule over another. England, of all countries, has the most reason to cherish the institutions it possesses, and the happiness it enjoys; and let Englishmen remember, that national defence ought with them to be considered a personal question, as the most humble man in the nation has an interest in keeping off the hand of the spoiler or the foot of the invader. They do not desire to interfere with the affairs of others; but let them always feel that English institutions are those best fitted for Englishmen; and let them convince the world that they are always ready to resist any attempt, from whatever quarter it may come, to impose upon them the yoke of any foreign autocrat, however blandly he may smile upon them. War.

There are some persons who appear to imagine that peace has now supplanted war in the social system; but such persons should look at the records of crime, and then remember, that so long as individual passions continue to lead to the infraction of law, both as regards person and property, so may it also be expected that similar passions will, on the large scale, lead to like results, and excite the ambition of rulers to encroach upon the territories of their neighbours; whilst the national pride and animosity of their subjects will abet them *con amore* in their injustice. Individual passions must cease before it can be hoped that national animosity will die away. The real littleness of the motives which have led to most wars is exemplified by the difficulty which systematic writers have found in giving a satisfactory definition of the term itself. War, says old Montecuculli, means the conflicts of armies seeking for victory; whilst his commentator, Turpin, considers that peace, rather than victory, is the object of war. It may indeed be said, that whilst men's passions are at their height they rush into war, thinking only of victory and conquest; but when they begin to suffer under the privations it draws down upon them, they cease to think of victory, and yearn after that peace which they had thoughtlessly assisted to break.

Von Decker observes, that, in studying the history of wars, it is very interesting to discover the *real* causes which have led to them; but to do so, he adds, "it is not only necessary to go back to the first steps of a war, but to dive into the political history of the states involved in it." Time, he adds, in such questions, "affords the best solution to even the most complicated enigmas; but what does that solution teach us when it is found necessary to seek for the motives of war, not in anything immediately present and patent to us, but in the almost forgotten records of the opinions and policy of emperors, kings, and statesmen of other days?"

It is usual to speak of wars as either offensive or defensive; but it may be fairly asserted that a defensive is the only legitimate form of war, though sometimes the necessities of defence may cause it to assume the aspect of offensive war. Von Decker, for example, observes that Frederick the Great, having rightly judged the real design of the coalition of 1756 to have been the dismemberment of Prussia, defeated the project by himself abruptly assuming the offensive, even at the risk of being proclaimed by the rest of Europe the aggressor. But the same author quotes many other examples where peace has been abruptly

War. broken merely for the purpose of rendering aggression more successful; as, for instance, when Russia, in 1805, wishing to obtain possession of Finland, did not think it prudent to avow such an intention, but, regardless of reasons, took Sweden by surprise and rushed into war. Purely offensive wars, for the mere purpose of extending the authority of one monarch over the territories of another, are as unholy as purely defensive wars for the purpose of upholding the independence of one country, and of resisting the interference of another in its affairs, are holy. Let no one be deceived by the cunning device of securing peace by a universal autocracy; for though, in truth, wars might cease, peace would be gained by the abandonment of that wholesome emulation between nation and nation which is the result of their independent existence under their own approved though varied institutions, and which, like individual emulation between man and man, leads to the development of the higher qualities of mankind. It is better to be awake and active, even amidst the storms of war, than to be in a state of torpor under the dull and oppressive atmosphere which peace would spread over the world were it obtained by the abandonment of national independence, and by submission to the will of one irresponsible ruler.

Let it then be laid down as an established law amongst nations, that, just as no individual is considered justified in using arms except for self-defence, so also will no nation be held justified in waging war for any other object than the preservation of its independence; and, further, as the violence of individuals is brought under the cognizance of proper tribunals, so let a great national court be established for the consideration and arbitration of all disputes and complaints arising between nation and nation. The present system of holding congresses is an approximation to such an arrangement, though it has been hitherto conducted in a manner not calculated to produce the desired results, as the greater states or powers have assumed to themselves the right of deciding upon the interests of the smaller states, and even dismembering them, without any reference to national feeling, which may be, and often is, as intense in them as in their more powerful neighbours: witness, for example, the manner in which a Congress assumed the right to hand over the ancient and historically renowned Republic of Venice to Austria.

Whilst, however, it is to be devoutly hoped that a time may come when offensive or aggressive war, in the literal sense of the word, will be considered a national crime; still, in practice, offensive and defensive will be convertible terms, according to the various exigencies of war, a defensive changing into an offensive, and an offensive into a defensive; and it may be fairly said, that whilst the objects of those engaged in a defensive war should be to assume as soon as possible the attitude of aggression, so must those who undertake an aggressive war be prepared for defence in case of discomfiture.

Military science. As the first rules of every science must be established on the observation of facts, so also must war, as a science, be built up on the careful consideration of the facts and results of the wars of preceding ages. It is on this account that the study of military history becomes so important a means of training the soldier; not, however, contemplating that loose kind of reading which is sufficient for a novel or other book of fancy, but that close analytical study which endeavours to trace every effect to its cause, whether that effect be success or failure. In mechanics, it is a recognised fact that the greatest effect is produced when the power is applied in the right direction and to the right place, so also in war, it has been laid down as a fundamental maxim by successive military writers, including Jomini, and the commandant of our own staff college, Colonel Macdougall, that to obtain success in the shortest time, the greatest force should be brought to bear, in the right direction, on the weakest or most impressible point of an enemy. This maxim is manifestly equally applicable to a war viewed as a whole, to a single campaign as part of a war, or to a battle as an incident of a campaign; and it is therefore evident that the first step on entering into a war is to determine by what plan of operations the war as a whole may be best conducted to a successful issue, in the least possible time; next, to prearrange at the commencement of each campaign the operations by which the forces then available may be brought to act against the enemy in that point which will lead to a decisive result, or, in other words, to prepare the plan of the campaign; and, last of all, preparatory to a battle, to carry out the same principle in respect to the disposition and movements of the troops, so that each arm may be brought to bear on the enemy's line in such a manner that the more powerful mass may be directed on that point which will not only be easiest shaken, but will lead, when shaken, to the overthrow of the whole, or, in ordinary phrase, on the most decisive point. Each of the plans which have been here enumerated—the plan of war, the plan of campaign, and the plan of battle, requires to be settled on considerations of equal importance but of varying character. War.

Plan of war. The plan of war necessarily involves political considerations, such as the value of the result to be gained as compared to the cost of the struggle; the necessity and possibility of avoiding any infraction of the neutrality of adjoining states; the determination as to the best mode of carrying on the war, whether by sea or by land, either singly and in succession, or conjointly and simultaneously; the selection of the most vital point against which the operations of the war should be directed; the possibility of securing pecuniary and other means for carrying it on without interruption for a definite time. On such questions as these the combined talents of the statesman, the financier, and the soldier must be exercised.

Plan of campaign. The plan of campaign requires the conjoint consideration of the soldier, sailor, and of the authorities in charge of all the departments connected with war. The final results expected to be gained by a war having been previously determined, the first question to be determined is, whether they are within the scope of a single campaign, or will in all probability require to be extended over several. In either case the General, or the Admiral should it be decided to carry on the war principally by sea, must, from his knowledge of the country to be attacked, point out the proportions of the several arms of the service which are best suited to the physical conditions, resources, and communications of the country, or of the different classes of vessels which are best suited to navigate its coasts, and to approach its assailable points, so that the heads of departments may be early warned of the amount of equipment and of *matériel* of every description they will have to supply, not only at first, but under any conceivable circumstances during the whole of the campaign. These are all matters which require the greatest administrative ability, and on the part of the General, a power of thought and acquaintance with all the rules, casualties, and necessities of war, which are rarely to be expected from any but a man of high intellect, sound judgment, and ready decision.

Plan of battle. The plan of battle requires in the General for its consideration not only that intimate acquaintance with military rules, strategical and tactical, which will enable him to anticipate the probable movements of his opponents, but also the *coup d'œil* which brings at once to his mind all the features of the ground, and enables him to adjust each arm of the service to its proper place, to select the positions which will enable artillery, cavalry, and infantry each to act with the best effect, both in supporting his own army and in annoying that of the enemy.

Each of these Plans—the Plan of war, the Plan of campaign, and the Plan of battle—is *sui generis*, and requires

War. for its determination a variety of knowledge, a maturity of judgment, and an accuracy of perception, which are sufficient to prove that a good general cannot be an ordinary man. Nature bestows genius and physical endowments of a high order, but art has supplied the knowledge and the training which renders the application of nature's gifts to practice easy and certain. It may indeed be justly said, that to no man more than to a general is a power of rapid combination necessary; and those studies, therefore, which have a tendency to strengthen the mind for the exercise of this species, as it were, of mental arithmetic or of mental geometry, ought not to be despised, even though they may not be dignified with the appellation "military." Every country in Europe, and we may add America, has long felt that a large amount of education is necessary to prepare an officer for the fulfilment of the higher functions of his profession; and in no country has this necessity been recognised and acted upon with so much energy as in France; and however tenaciously some old officers may still cling to the prejudice which leads them to imagine that, in military men, ignorance even of common things is no defect, the French have acted upon the very opposite principle, and proved that even the high mathematical instruction, for which the Ecole Polytechnique, the Ecole d'Etat Major, and, though in a less degree, the Ecole Imperiale de St Cyr, have long been distinguished, has in no degree deteriorated from the high character of their military officers.

In the Austrian army less attention is paid to what may be called scientific instruction (including mathematical), on the supposition, doubtless, that sound professional instruction can be given without any such elaborate preparation. The result of the late war in Italy may be appealed to as a proof that the intellects of the French officers had been cultivated and invigorated to a truly good purpose, as, under their guidance, and the command of their clear-headed Emperor-general, the French army was always found quickest in movements and most successful in action. The scientific education of French military officers may possibly be pitched too high, but experience has proved that there is far less danger to be expected from the excess of such education than from the want of it, which want so many fondly desire to continue as the distinguishing quality of the British officer. It was reserved for the present commander-in-chief, H.R.H. the Duke of Cambridge, to supply one of the most serious deficiencies in the British army by establishing a Staff college, and almost at the same moment to remove the barrier, corporal punishment, which had long deterred the more intellectual and better educated portion of the working classes from entering the military service of their country. Without doubt, there are still some who look with apprehension at both these signal improvements, considering the teaching of a staff college worse than useless, and the lash the only security for military discipline; but the country at large will hail them as steps in military reform, consistent with those either made or about to be made in civil reform, and essential for the good of the army.

As each of the plans to which reference has been made is necessarily dependent on a great variety of circumstances, so the "decisive point," which is the proper object of all, cannot be defined or selected according to any one rigid rule, but must vary with the circumstances of each case. It must also be remembered that what is decisive as to one Plan may not be so as regards another. For example, though the decisive point for attack in a battle may be rightly chosen and the battle gained, no decisive result may have been produced on the campaign, the blow having been struck at a point and on a part of the enemy's force which do not prevent his keeping the field with a fair chance of recovering his lost ground, or at least of balancing his failure at one point by success in another. In like manner, a campaign may be throughout successful, and yet not materially affect the issue of the war itself. In fact, the strength of a country may be exhausted in efforts to gain an object which, when attained, may either prove of little value, or be only gained when its resources have been exhausted, and no strength or means are longer available to make use of it. Surely then the qualifications of a General-in-chief cannot be rated too high, when it is considered that, whilst he ought to be unshackled in the formation of his own plans, he ought to be held responsible for defects in them, or for errors in his mode of carrying them into effect; and this is specifically laid down as a rule for the general-in-chief of the army of the German confederation. After what has been said, it will appear remarkable that several modern writers, and some of them military men, maintain that attempts to teach war as a science are delusive, and lead only to pedantry; nothing in their opinion being of any value but experience. War.

What is the object, it may be asked, of reading military history but to benefit by the experience of others? Little good, however, would be derived from such reading were it unaccompanied by any analysis of the facts recorded, or by any attempt to trace effects up to their causes. In war, as in every science, the impulse of genius may, and often does, outstrip, in its results, the slower process of reasoning; but it is not the less necessary for those who do not possess such genius, and yet are likely to be required to walk in the same path, to investigate every step in the process which has been successfully followed by the man of genius. Grammar has grown out of language, and military science out of military experience. Warnery, himself an experienced general of Frederick the Great, has observed that, in his opinion, "an officer who had made himself fully acquainted with the theory of war (that is, with the results of experience), although he had not been actively engaged in war, would be more likely to succeed as a general than one who, though he had served long as an inferior officer, had no knowledge of the theory of war." The mere soldier may act as an automaton, others thinking for him; the man in high command must both think and act. It is indeed a sad thing that the lives of soldiers, the conduct of warlike operations, and the interests of a country, should be intrusted to a man who has yet to learn his first lesson in war, and is forced to excuse his blunders by the plea of want of experience.

A staff college has now been established; the instruction, to be given there, is founded on a judicious combination of sound military training with an extensive professional education, calculated at once to invigorate and inform the mind. So high a standard of scientific education has not been adopted as in France; it is more practical in its design, and though in conformity with the school and college systems of our own country, is calculated to supply their more palpable deficiencies. The British staff officer, and therefore the General, will henceforth be efficient as well at the beginning as at the end of a war or of a campaign. Having thus stated the necessity which is every day more powerfully forcing itself upon the public attention, of educating and training for war those men who are destined to act one day as subaltern officers, and at some future day as generals; it is right to add, that for national security it is equally desirable that those youths whose ambition can scarcely aspire to the rank of officer, should also, in their respective positions, be trained to military exercises. Staff college.

The curious spectacle has been afforded of a monarch who has no ancestral claims to rule over the rich and powerful nation which has submitted itself to his absolute rule, being still urged on by ambition to appropriate to himself Savoy. Such an act has necessarily alarmed Switzerland for the preservation of its neutrality, and indeed of its independence as a nation; for how much more tempting than Savoy are the prosperous lands of Switzerland adjoining it. Aroused to a sense of the danger which threatens, the Military training of the people.

national militia, or rather the volunteers, for they include the great mass of the people, begin to bestir themselves. England had before caught up the same feeling, and, the national spirit being awakened, our volunteers are rapidly swelling into a body which will erelong supplement our regular army, and our enrolled militia, with a force which may, perhaps, one of these days, lead Englishmen to feel that they are as able to cross the channel, and, like their ancestors, invade France, as continue to live in apprehension of an invasion from France. Of every free country its volunteers should be the main resource, the standing army being just sufficient to form the nucleus of defence at home and abroad; in our colonies a local volunteer force is equally necessary. It is well to bear in mind the judicious observations of Jomini on this most important subject. After pointing out the many examples of national wars, either partly or entirely successful, such as that of the Low Countries against Philip II., that of our American colonies against ourselves; that of La Vendée against the French Republic; those of Spain, Portugal, and the Tyrol against Napoleon; that of the Morea against the Turks, and of Navarre against the forces of Queen Christina; he observes, that without the aid of any regular force, popular risings may, as in La Vendée, long protract the struggle without entirely preventing invasion or ultimate conquest; but when the population in arms rest upon a considerable nucleus of disciplined troops, a war of conquest becomes one of immense difficulty. On one side there is indeed an army, but on the other there is an army aided by the whole mass of the people, all panting for the destruction of the enemy. The invader occupies only the ground on which he is encamped, as everything beyond is pregnant with hostility and danger. He gives some examples from his own experience of the nature of such struggles. "On one occasion," he observes, "I placed in cantonments the artillery companies between Betanzos and Corunna, there being no signs of any Spanish troops within 20 leagues on either side." Notwithstanding this, "one fine night the companies of the train, men and horses, all disappeared, and no one at the time knew what had become of them. A wounded corporal, however, saved himself, and brought in the news that the peasantry, led by the priests and monks, had seized upon and massacred all his comrades. A similar event occurred when the army of the gallant Romana cut off some of the isolated regiments of the division of Marchand." Jomini sums up his observations by the following statement:—"No army, however warlike, can act successfully against such a plan of national defence, unless it is sufficiently numerous to occupy in force all the essential points of the country, cover its communications, and keep in motion corps sufficiently powerful to attack and defeat the enemy wherever he may appear." Napier cites many instances of the gallant conduct of the Portuguese armed peasantry, even when opposed to regular troops. When, in fact, a nation has a respectable regular army forming a nucleus, round which the population may be grouped (not only armed, as in the case of our volunteers, but also disciplined), the forces required by the assailant in order to be at once superior in the field, and to preserve his own communications, would be enormous.

Volunteer armaments.

National defence.

Enough, it is hoped, has been said to prove that, in a defensive war, and England ought rarely to be engaged in any other, the national policy ought to be to maintain a moderate but highly trained regular army, effective in every arm, and to supplement it, in time of need, by the militia and volunteers; the latter not being a rabble or mob, but men well armed, well trained to the use of arms, and ready to sacrifice everything to the protection of their country. Proceeding, then, on this principle, that defensive warfare is the only form of war which it is probable England will be ever called upon to engage in, a few sentences may be well devoted to the question so often agitated at the present time, On what system ought that defence to be conducted? In the first place, then, it may be boldly asserted, that every country ought to rely for ultimate security on the number and efficiency of the armed men it is able, in the event of danger, to bring into the field. A nation united in itself, provided with the best arms, and trained to their use, willing to submit itself to authority when acting against an enemy, and in its nature warlike and fearless of danger, would be unconquerable by any army which could be brought against it. Though much is said by those who rest the defence of the country either on works of fortification or on a regular army only, of the past invasions of England, they should remember that in no one case were all the conditions here enumerated fulfilled. Warnery has well argued, that the boasted invasions of Britain by Cæsar were productive of no permanent results, and deserved, therefore, to be looked upon as reconnaissances; and that if William III. conquered England with a small force, the army and people were with him. In such a country as England, little help can be obtained from the natural difficulties of the ground; and hence, were the defence to depend solely on a regular army, that army must be equal in strength to any which can be brought against it. The maintenance of such an army within Great Britain and Ireland would swallow up all the resources of the country, leave no troops for the defence of our colonies, and reduce the whole population to beggary. The only really available method is that which has now become as popular in England as it has always been in Switzerland and America—viz., to supplement a moderate but highly disciplined army by a well armed and fairly trained mass of volunteers.

Light infantry movements.

The movements of light troops are undoubtedly more difficult of execution than those of the ordinary line soldiers, but the increased difficulty is due to the increased intelligence required, and, therefore, the more likely to be mastered by the class of men who become volunteers. There is something, also, in the drill which assimilates it more to the rapid and independent action required in many a manly game of amusement, and thereby renders it rather fascinating than irksome. Let a light-infantry regiment be stationed in the vicinity of several volunteer corps, and let them go through the exercise, first separately and then combined together, and it cannot be doubted that the power of imitation, and the spirit of emulation, would soon render volunteers an efficient addition to the light-infantry, as the militia force is to the line and artillery. An invading army advancing into an enemy's country, and having before it a smaller but equally brave and disciplined army, would find its progress both difficult and dangerous, when subjected on each side of its route to the incessant worrying of a crowd of active and brave, though volunteer, riflemen. It should be also remembered, that the skirmishers sent out by an invading foe to clear their way, lose that peculiar moral advantage which they had derived from acting together, and are obliged, like the volunteer, to depend on individual activity, coolness, and intrepidity. We believe that Englishmen, whether regulars or volunteers, are exceeded by the people of no other nation in those qualities.

Having thus stated the manner of providing for the active defence of the country in a defensive war, it remains to inquire how far the security of the country can be promoted by material or passive defences, such as works of fortification. Every fortress must of course, according to its magnitude, absorb so much of the active army, and hence lead to the great evil to which defensive warfare is generally liable—namely, the breaking up of an army into detachments. Where a defensive war is carried on by active means only, this evil may be reduced to a minimum, by

War. allowing the enemy to waste his time and efforts on unimportant points, and by concentrating the great body of defenders on the most vital points. Many fortresses, however, must necessarily require many garrisons, as it would be folly to build what it is not intended to defend; and though even here volunteers will relieve a portion of regular troops, it must be deemed a piece of good fortune that there are few fortresses in England.

So many and such conflicting opinions have been advanced on the best mode of defending a country against invasion, that it would be in vain to attempt to discuss them all. Some have attached importance to such arrangements as the triple line of fortresses, by which France was once supposed to be rendered secure; whilst others, pointing to their inefficiency on several occasions to stop the progress of invading armies, have gone to the opposite extreme, and declaring all fortresses useless, have recommended their demolition. Unquestionably fortresses are more important, in facilitating the operations of offensive warfare than as auxiliaries to those of defence, and yet they cannot be entirely abandoned: the real object ought to be to restrict them to the smallest possible number, and to take care that their value justifies the expense of their construction. Captain Vandevelde has well summed up the question in the two following passages:—

"Passive defence is pernicious: fortresses which are not constructed for some special object of utility are injurious. Most states have too many fortresses; fortresses ought not to have for their object the closing or defence of a frontier. The disposition of defence which requires a cordon of fortresses erected on the frontier of a state is vicious and out of date."

"Active defence is the best that can be adopted. Active operations may require to be aided by fortresses. The defence on the flanks ought to be combined with the defence on the front. The combination of the two kinds of defence, which is the best system to be adopted, requires that the capital, which is the focus of the national power, and the main object of attack, should also be the focus of general defence, or, in other words, should be secured by a great intrenched position, where the principal military resources of the kingdom might be concentrated; that in the dispositions for defence account should be taken of the new modes of propulsion; and, finally, that the military forces and resources of a state ought to determine the number of fortresses, their strategic position, and their tactical form and development."

Acting on these maxims, Vandevelde proposes a system which, applied to France, would require twenty-one fortresses only—namely, six maritime, Toulon, Rochefort, La Rochelle, L'Orient, Brest, and Cherbourg, as covering the dockyards, ports, and depôts of the navy; six frontier places to serve as bases for an offensive war, and as advanced posts to watch the movements of an enemy in a defensive war; five places of large development between the frontier and the centre or capital, where of course the armies destined to act in particular directions would be assembled, and to which, in case of defeat, the frontier detachments would retire, as the enemy advanced towards the great central fortress, or intrenched camp, being in France, the capital, Paris.

Applying the same principles to England, it must be premised that the coast becomes the frontier, and, as Vandevelde observes, the protection of that frontier from insult should mainly depend on "the moveable citadels afloat rather than on inert coast defences." Keeping this principle in view, and it is undoubtedly a sound one, our maritime fortresses should be simply those which are necessary to afford safe rendezvous to our fleets, whether armed or commercial, and protection to our arsenals and dockyards. A communication between them should be kept up by occasional watch-towers, and by a naval police, or, in other words, by small steam-vessels running from one port to another, and so built as to secure great speed, and be efficient in running down boats or other small craft. Railway and telegraphic communication should also be established, so that, an enemh being observed, immediate notice of his apparent strengt War.

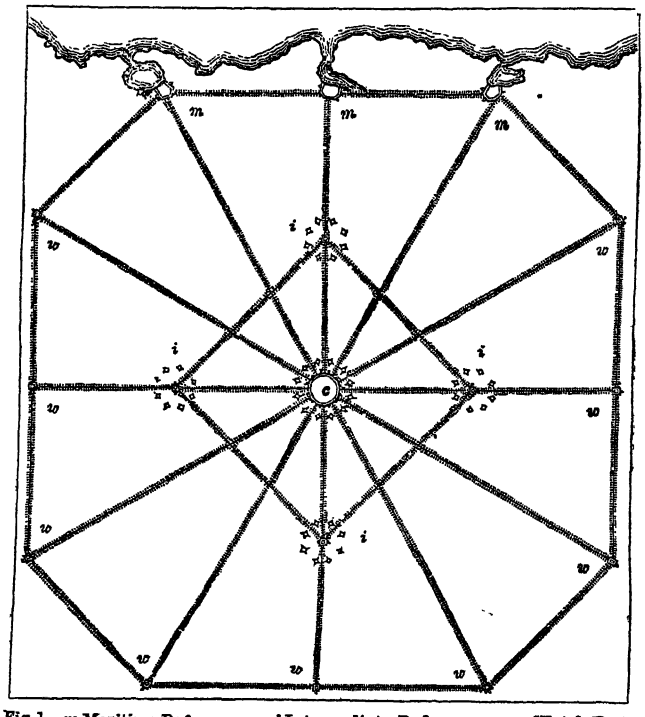


Fig. 1.—*m* Maritime Defences; *i* Intermediate Defences; *w* Watch Forts; *c* Central Porch.

and object should be spread through the country, so that troops from every adjacent locality, as also all the available scout or police boats, might be at once directed to the point where the landing of the enemy was expected, in order to dispute it, or arrest his progress. The landing being effected, should the enemy direct his march towards one of our maritime fortresses, the volunteers, and other available forces of the district, will be concentrated within its defences, whilst an army will be assembled at the intrenched camps most convenient to it, ready to act upon the rear of the enemy. Unless the fleet had been entirely crippled, and we cannot believe that such could be the case without, at least, a corresponding destruction on the part of the enemy, reinforcements would, by its aid, be thrown into the besieged fortress; and the invading army, thus placed in an extended line between two forces, every day increasing, would soon be utterly destroyed, or else, abandoning the siege, be obliged to attempt a forward movement in a hostile country, cut off from its communication with its own base.

Possessing for a moment, as it were, a superiority in the Channel would be of very little avail; for, though an army might be landed, its destruction would be unavoidable, unless the enemy's fleet could maintain that superiority sufficiently long to enable its army to obtain possession of one of the maritime fortresses, and thus secure a base of operations. Supposing, however, the enemy advance at once towards the metropolis by the aid of railways, &c., the troops should be immediately concentrated in those intrenched camps which command the line of his march, when, if he attempted to turn them, he would be subject to attack in flank, and doubly so if he attempted to pass between them. If, however, the enemy succeed in passing these obstacles, without having received any material check, all the forces should be concentrated on the central pivot, the great intrenched camp either surrounding, or in the neighbourhood of the metropolis. This great internal line of defence should include Woolwich arsenal, and be formed of a circle of detached forts, and within the great area they encircle should be assembled all the available troops,

War. whether regulars, militia, or volunteers within reach, not with a view to remain passive, but to harass incessantly the enemy by throwing a concentrated force on any part of his army which appeared weakened by its necessary extension.

It is not to be supposed, that in a country like England, an enemy would be allowed to pass beyond the intermediate fortresses or intrenched camps, such as Chatham, without being brought to a stand; but, if it were possible, he ought certainly to be not only stopped but destroyed before London. Lord Cathcart proposed, in 1803, a continued *enceinte;* but of late years the more general opinion has been to adopt detached forts, the active defence of the army within being more effectual when it can move readily to the attack of the investing force, which it could not do were it shut up within the walls of a fortress. Coast defences, in the ordinary sense of the word, as understood in this country, would only be a source of weakness, by disseminating over a vast frontier a large mass of valuable troops. The intermediate fortresses, or intrenched camps, would become training-camps for troops during peace, points d'appui on which to concentrate armies of defence in time of war, the intrenched capital, or the highly developed works in its vicinity, the final point on which the whole energies of the nation should be directed. If, with the external aid of its navy, and the activity and energy of its brave inhabitants, England cannot be secured from the attacks of an enemy, it is in vain to seek for that security in inert masses of earth or stone. Fortresses are useful for gaining time; but no country was ever secured by them from conquest when its army was unable to face the invader in the field, and its population was neither inclined nor prepared to co-operate with that army. The annexed woodcut explains the views of Vandevelde, or his reticular type of arrangement.

Terms used in military science. Referring now to war in a more general sense, and more especially viewing it as offensive in its design, and therefore intended to pass beyond the limits of the country which engages in it, it is necessary more particularly to define the terms adopted in military science; following Jomini, as the best guide in so doing, and bearing in mind his observation, "As to me, I am persuaded that good definition leads to clear conceptions." 1. Strategy is the art of rightly directing the masses of troops towards the objective of the campaign. 2. Logistique is the science of the Quarter-master general's department, one of the most important of all departments of an army about to enter on a campaign. It comprises the preparation of all the materials required for the army when about to move or open the campaign; drawing up of all orders, instructions, and routes necessary for guiding its movements; and also taking the orders of the general-in-chief on the projects of attack; the determination, in conjunction with the commanding officers of Artillery and of Engineers, of the measures required for placing in security the necessary depôts, and the posts which it is desirable to fortify, in order to facilitate operations; making reconnaissances, and taking every other measure necessary for obtaining exact information of the position, strength, and movements of the enemy; concerting with the several heads of departments what posts or guards it is necessary to establish, what depôts to form, and the best manner of placing them in security; to receive the orders of the commander-in-chief; and then so to arrange the movements of the several columns that they shall all, at the prescribed moment, arrive at the place of rendezvous; to provide in the same manner for all the casualties of retreat; to establish cantonments, and to indicate to every corps the place of assembly; in short, the Quarter-master-general, or, in more general terms, the Staff, have to act as the eyes and the ears of the Commander-in-chief; or, likening the latter to a voltaic battery, the Quarter-master-general and the Staff represent the conducting wires, which carry his wishes and orders onwards, and put in motion the whole army tactics. 3. Tactics.—As strategy may be considered the science, so tactics constitute the art of war. Whilst the strategist weighs all the considerations which influence the determination of the *decisive points* in the field of operations, calculates all the chances in favour of success, whether by battle or otherwise, and prescribes all the measures which are likely to ensure that success, the tactician directs and superintends those combinations of troops, and those details of their movements, which are best calculated to carry into effect the leading principle of military science, that the main body of troops should be brought to bear on that part of the enemy's army, and on that point of his position, where it is likely, taking into due consideration the fitness of the ground for the effective action of the most powerful arm of his troops, that his attack will produce the greatest results. It is usual to subdivide tactics into grand or greater, and petty or lesser; but this is merely a question of degree, the first referring to the greater movements or operations of war, the second to those of drill and of the parade, or in other words, to those of preparation for war. The latter involves a multitude of details, which, when incorporated in a soldier's habits, render him fit to perform, with precision and with confidence, the more important movements of actual warfare. War.

Choice of commanders. Before quitting this part of the subject, it is well to dwell for a moment on a question which has been often agitated, namely, whether the chief command of a great army would be most safely confided to an officer of great experience in regimental affairs, and in the ordinary command of troops, or to a general taken from the staff, or from the scientific corps, but who has previously been little accustomed to the management of troops. This question would not, until lately, have been applicable to the British army, as commanding officers, whether they had previously served in the staff, or had been taken immediately from the body of regimental officers, were equally without any previous training for the duties of high command. It is true that some generals had been previously students of the senior department of Sandhurst; but the scheme of study there adopted was imperfect, in not including a sufficient proportion of instruction in the science and art of war. It was sufficient to stimulate the intellect, and even sufficiently practical to turn out many able staff officers, but it fell short of the requirements of an officer destined to high command, by not accustoming the students to read and analyse the accounts of preceding wars, and to discover the causes which led to the success, and even the occasional failures, of great generals. This defect is now remedied by the Staff college, in which preparatory studies are blended with lectures on military history and military art; just as is the case in the Ecole d'Etat Major of France and other countries; whilst the British system has this advantage, that the students have all served at least three years, and come, therefore, to the college fully acquainted with regimental affairs and with the lesser tactics. Jomini has named, in the order of their relative importance, the essential qualification of a general:—1. Moral courage, which enables him to form great resolutions, the reverse of nervousness; 2. *Sang froid*, or coolness amidst dangers; 3. Knowledge, which, though not vast, must be sound; 4. Bravery, justice, freedom from jealousy of the merits of others, more especially of the merits of his subordinates. Touching one of these qualities, knowledge, which is presumed to include an accurate acquaintance with the leading principles of war, the opinion of Warnery has been already quoted, and Jomini seems, in some degree, to hold a similar opinion, for he observes,—"It is un-

War. doubted that war is a peculiar science, and that a man may very well direct the operations of an army although he may never have commanded a regiment; and he quotes as examples, Peter the Great, Condé, Frederick, and Napoleon, to whom may be added the present Emperor of the French. Whilst, however, admitting the probable superiority for command of a general who has come from the Staff corps, the Artillery, or the Engineers, under similar circumstances, over one who is only acquainted with the service of a particular arm, he rightly adds, that a General selected from the infantry, who has studied the art of war, will be equally fitted for command. In some cases genius may compensate for deficiencies, but as a rule it may be asserted, that the great captain will combine knowledge of his science with the other qualities which have been enumerated. Without, therefore, going to the same length as Warnery, who declares that "he has never known a general arrive at the highest command, and acquit himself creditably, who had served *only* with the line," we may safely assume that the system of our Staff college, which provides that an officer should first possess a knowledge of regimental details, and then study the higher branches of military science, is more likely than any hitherto devised to curb patronage, and to furnish our armies with able staff officers, and with equally able generals.

Every preliminary arrangement having been completed, and the army being in all respects prepared for action, it must first be determined whether an offensive or a defensive war will be the most prudent. If it be intended to carry the war into the enemy's country, it will commence offensive, and should be so maintained as long as possible: every relaxation will be attended with difficulties, as it must be the result of at least temporary weakness. If, on the contrary, it is intended to be restricted to the boundaries of the country attacked, and to be therefore primarily defensive, no opportunity ought to be lost of assuming the offensive, and taking the initiative in the operations. An active defence is, indeed, as productive of important results in a war, as it is in a fortress.

Base of Operations.—The theatre of war, or the field of operations, having been determined on the principle before stated, that it shall strike at the enemy's most vulnerable point, a Base must be selected, as the preliminary measure antecedent to any further act or movement. A Base may consist of one fortress only, understanding by that term such an extensively developed work as will afford shelter to an army, as in the case of Sevastopol, or Verona in its present state; of two or more points strategically connected together, so as to afford security for supplies of all kinds to the army when put in motion, or for affording shelter to that army if obliged to retreat. The word points here used means strategical points, or those capable of being made defensible either in themselves, or as parts of a position or line of defence. The extent of ground to be taken up by a base-line, and the number and importance of the strategical points to be embraced by it, must depend on the force which can be applied to its permanent defence, on the mode and direction in which the supplies for the army are to be obtained, and on the manner in which it is intended that the campaign shall be carried on. If the communications with the sources of supplies all tend to one point, that point should be made a fortress of large development, capable of affording cover to the army intended to commence operations, and to secure from attack the magazines of all kinds. Subsidiary points should be also taken up to secure the principal basal point in flank. Where, however, there are several roads, each leading from a productive source of supply to the intended front of operations, a defensible point should be established at each, and a transverse communication maintained between all the points which thus constitute the base of operations. There is, indeed, an advantage in thus spreading the depôts of provisions and material amongst several fortified posts, as the loss of any one would not leave the army deprived entirely of its resources; or should it be obliged to retire, not expose it so much to the chance of being cut off from its supplies. As a general rule, also, the base ought to be proportioned to the expected length of the line of operations, or to the distance the army would have to march into the enemy's country. War.

If the base be very short, an army must be very restricted as to the choice of its line of operations, as the slightest deviation to one side or the other must expose it to the danger of being cut off from the base; and in case of discomfiture, it is reduced to one line of retreat. If the base be too long, it will absorb too many troops in the defence of the posts of which it consists. These considerations demonstrate, that the disposable force of the army, ought to be in proportion to the distance required to be passed over before arriving at the objective of the campaign, as the base must either be proportionately lengthened, or detachments left by the advancing army to secure important points on the line of march, either to serve as links of connection with the base, or to form intermediate or secondary bases. Bulow has endeavoured to reduce this question to one of geometry, and has laid down as a rule, that lines drawn from the extremities of a base to the objective should meet in a right angle, or, in other words, that the line of operations, that is to say, the total length of march to be effected, ought not to exceed one-half the length of the base; but this is evidently a vain attempt to introduce mathematical precision into the art of war.

The maxim itself, that a base should be proportioned to the length of the line of operations intended to spring from it, is one of reason, and indeed of common sense; but the exact proportion must vary in every particular case, as no general confident of his own powers, and of the activity, zeal, and bravery of his troops, and at the same time thoroughly acquainted with the physical geography of the country to be invaded, the dispositions of its inhabitants, and the nature of the enemy's troops, ought to allow himself to be trammelled by any fixed rules. Napoleon has afforded striking illustration, both of the wisdom of sometimes deviating from strict rule, and of the danger which may be the result of so doing. Sponzilli, an ingenious writer, thus notices two great acts of his life, the one ending in glorious success, the other in ruin. "In 1805, after he had destroyed the Austrian army at Ulm by his bold and brilliant movements, he ought probably, in conformity with the rules of science, to have established a new base in Bavaria before directing his march on Vienna: but genius counselled differently; for, observing that the Russians and the army of Vienna were likely to effect a junction with the Archduke Charles, and thus to render the victory of Ulm useless, Bonaparte hastened at once towards Vienna, had the luck to find that the bridge over the Danube had not been destroyed, passed the river, advanced against the Russians in Moldavia, defeated them, together with the Austrians, at Austerlitz, before the junction with the Archduke had been effected, and concluded peace." Here it is evident a great risk was run in order to insure a still greater advantage; and yet how much of the success depended on want of precaution in the Austrians.

The next example is drawn from the result of the celebrated campaign of 1812, in which "The French, retiring on Smolensko as their secondary base, had scarcely abandoned Moscow before they saw their communications threatened by the movement of the Russians towards Kalovga; and finding the line of their retreat cut off after the battle of Maloiareslavetz, were forced to make a disastrous retrograde movement in order to regain the road to Smolensko." Bold as the first forward movement was, it

War. would, in all probability, have been attended with success, had not the Russians wisely determined to tempt the enemy on by continued retreat, and then to deprive him of all chances of subsistence by burning the capital and ravaging the country; but when retreat became necessary, then the evil of being so distant from even the secondary base became palpable, and ended in the ruin of the most remarkable general of these times. It is, indeed, in case of failure in attaining the object of advance, that an army will assuredly suffer most from a neglect of the principles which regulate the establishment of bases of operations. One man may, conscious of his powers, leap without hesitation over a yawning chasm; another, without those powers, may attempt the same leap, but precipitate himself to destruction. In defensive war, it may be possible in some countries, which are only accessible in one or two directions, to establish a first base of operations in connection with frontier fortresses, providing, however, secondary bases in the interior, to be used in case of the enemy overpowering the first resistance, and obliging the defenders to retreat. In this case, it is manifest that the retreating army will, by its continued concentration, become stronger as it retires, and hence require for their reception highly developed fortresses. In respect to England, where the accessible frontier is so extensive, the rules which have been suggested and explained above appear to be best fitted for its defence. Maritime fortresses for the security of dock-yards and arsenals; minor works for purposes of watching or look-out, combined with a naval police; largely developed fortresses or fortified positions, to serve as bases or points *d' appui* at which to make a firm stand, and, in case of success, to assume the offensive; and, finally, a central fortified station, at which the final stand should be made—a fight for victory or ruin.

Lines of operation.—It is well to form in the mind a conception of this term, distinct from that of all others; and it is to the facility of describing and understanding military events, that the precise language of Jomini and of other great military writers owes its principal recommendation. Thus, for example, the general theatre of war may embrace a large space, including several objectives: a zone of operations refers to a section of that theatre relating to one objective, although there may be several lines of operation directed upon it. Lines of operation mean simply those lines of march or of movement which represent the direction, either of advance or of retreat, springing at the one extremity from the base or bases of operations, and terminating on the other at the objective.

The meaning thus attached to a zone of operations is well explained by Jomini, who observes, in the plan of campaign for 1796, Italy was the zone of operations for the army of the right, Bavaria the zone for that of the centre, and Franconia that for the army of the left. The general theatre of war embraced all three. Lines of communication may, in a secondary sense, be applied to the road or roads along which the several divisions of an army may move; but in the general sense in which it is here understood, it implies simply the line of direction, and therefore includes within its range every road or path by which all the columns or sections of the same army, or division of an army, make their way from the same base towards the same objective. It is only necessary that all these columns, moving in the same, or rather in nearly parallel directions, shall be able at any moment to unite into one body, to establish that they are operating on the same line. If, however, they are prevented by any natural obstacle—such as a river not affording means of communication by bridges—from uniting, they are no longer moving on one line of operations, but upon two, just as much as if the leading direction were not the same. It will be observed, that the distinction between territorial lines and lines of operation is not here dwelt upon, as too much refinement in terms leads to confusion. Any detachments from the main body, which move in lines diverging from the principal line, in order to effect some subsidiary object, may be considered as moving in auxiliary manœuvring lines, which become independent when they pass beyond the range of support from the principal line. War.

Double lines of operation are those which two armies follow when acting independently, and at a considerable distance from each other, even though they are acting under the primary orders of the same general-in-chief, and are directed towards the same objective. They are Interior when the two armies have the power of rapidly combining together, and concentrating their attack on either one or the other division of the enemy's army, which is presumed to be moving in separate and exterior lines—one on one side, one on the other side of their direct line. This definition explains that the position might be central, and yet the lines not interior; by which it is meant, that should two lines be unable to maintain communication with each other, or to concentrate their force, so that their respective armies may act together, they cease to be interior lines, as the army on the right is then moving on a simple line, parallel to that of the enemy's army next to it; and the same in respect to the army on the left. The important difference between these two conditions may be readily understood from the following simple cut:—

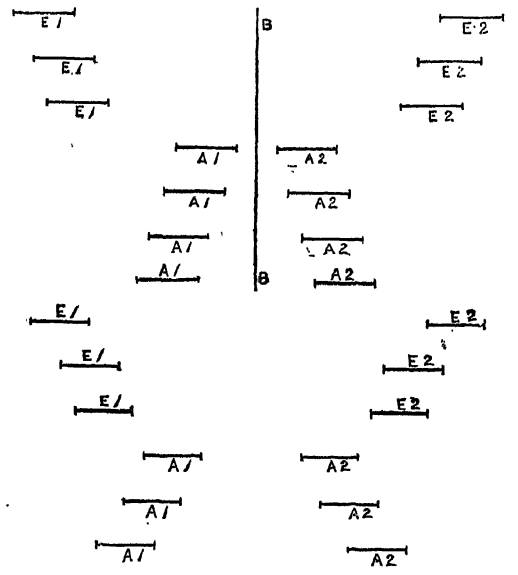


Fig. 2.

On the left of the figure A^1 A^2 are moving on interior lines; E^1 E^2 on exterior lines. Now it is evident that the distance between E^1 and E^2 being so much greater than between A^1 and A^2, and the communication between the two latter being always possible, they are able to combine and make a conjoint attack upon E^1 E^2 before the other can come to its support; and then having destroyed one army, is free to act against the second. On the right of the figure, B B represents a range of obstacles—either an impassable river, a line of impenetrable swamp, or a mountain-ridge—which cuts off communication between A^1 and A^2, and obliges each army to act independently and alone,—one against E^1 on the left, and the other against E^2 on the right; the conflict being in each case on equal terms.

Exterior lines are the opposite of interior, or those in which two armies are so arranged that one acts on the right extremity of one or more of the enemy's armies, and the other on the left extremity. E^1 and E^2 in Fig. 1 of the above cut are acting on exterior lines; E^1 and E^2 in.

War. Fig. 2, though exterior in locality to A^1 and A^2, are each strategically acting in simple parallel lines to them; the disadvantages of exterior and the advantages of interior lines being here neutralized.

The terms converging and diverging, when applied to lines of operation, explain themselves.

Deep lines are those which have to pass through a large extent of country between the base line and the objective to which they are directed. Other terms, such as secondary and accidental, seem a useless refinement; for though one army may be acting in support of another, it must still have a special objective and a special line of operations; and in the same manner, whenever a general finds it necessary to change the direction of operations, though the change is *accidental*, or consequent on a change of circumstances since the plan of campaign was decided upon, the new line is then the true line of operations.

From what has been said it appears that the leading maxims of war might have been derived from common sense alone, and are almost capable of mathematical demonstration. To trace them in their application to war, the student must, of course, refer to military history, and more especially to the campaigns of Frederick the Great, Marlborough and Eugene, Napoleon and Wellington, as being those in which the leading principles of war have been most fully illustrated, though an analytical investigation of almost any campaign cannot fail to be of use in discovering the cause of success or of failure, which has often been more due to the observance or to the neglect of sound principles, than to superior bravery and discipline. No one can doubt the wisdom of the first great principle—that the greatest force should be brought to bear against the most decisive point, either in a campaign or in a battle; nor, in carrying out that principle to the necessity of a right consideration of the lines of operations. It is manifest that double interior lines, which may be more clearly defined as double interior *connected* lines, must enable a stronger force to be brought to act against a weaker, when the enemy has either voluntarily or by compulsion divided his forces and is acting on exterior lines. The other case might be with equal propriety called double interior *disconnected* lines, and has been the source of many discomfitures. Bonaparte's campaign in Italy has been often quoted in illustration of these great maxims. He commenced his glorious career in that country, and his object was first to isolate the Austrian and Piedmontese armies, which he effected by the battle of Millesimo, as they were then thrown upon exterior lines and successively beaten at Mondovi and at Lodi. A formidable army was assembled in the Tyrol with a view of relieving Mantua, then besieged by Bonaparte, but the imprudence was committed of marching by double *unconnected* lines, the Lake Guarda separating them. Bonaparte at once abandoned the siege, advanced with the greater portion of his forces against the first column which debouched by Brescia, defeated and drove it back to the mountains, then was ready to receive the second column as it came to the same ground, defeated it in turn, and forced it to retire into the Tyrol, and there seek to regain the right division.

Three causes co-operated here towards the success of Bonaparte: first, the Allies marching two armies on the opposite sides of a lake which intercepted all communication between them; secondly, defective calculation, which, in strategy, is a most serious evil, by which it happened that these converging lines did not come to the desired point of union at the same time; and, thirdly, the more accurate calculation and greater celerity of Bonaparte, who was enabled thereby to anticipate the junction of the two armies, and defeat them in succession.

Jomini has deduced certain rules or maxims of war, which, at the risk of some repetition, it appears desirable to cite, with some few modifications, as a summary of the preceding remarks. War.

The art of war consisting in bringing as large a force as possible to act on the most decisive point, the base line has to be so established as to ensure to the army during its advance a regular supply of all the muniments of war, and a place of refuge in case of retreat; and in doing so, the general's skill and judgment in determining the lines of operation are put to the test.

The direction to be adopted depends partly on the geographical peculiarities or physical features of the country to be traversed, partly on the political relations of the adjacent countries, and partly on the manner in which the enemy's forces are posted. If the enemy has disseminated his forces over an extensive space, and thereby left considerable intervals between his forces, it is manifestly most advantageous to direct a single, or a double connected line, upon his centre, as he will be thereby broken and forced to move in exterior lines. If, however, the enemy's forces are well concentrated, the line of operations should be directed on one of his flanks, so that the main body of the army may be brought not only to bear on a portion of that of the enemy, but also to threaten his rear. It is only in the case of a greatly preponderating force, that a conjoint attack on the front and on the extremities can be attempted at the same time.

In endeavouring to gain the flank of the enemy's front, with the view of turning it and attacking him in rear, care must be taken so to direct the line of operations, both geographically and strategically, as to keep open a safe line of retreat, and prevent the enemy, through any oversight, being able to intercept the communication of the attacking army with its own base.

It is unwise to act with two independent armies in the same zone of operations, unless the available forces are so large, or the physical conditions of the country such, that the attempt to combine their movements in one line of operations would cramp and interfere with their progress, and lead to confusion.

As a consequence of the preceding, it is evident that, as a rule, the opposing forces being equal, a simple line of operations is far preferable to two; but it will often happen, from the configuration of the ground, and from the fact that the enemy has already divided his forces, and shown an intention of moving in two lines, that it becomes necessary to adopt a double line, in order to hold each of the masses of the enemy in check. In this case, the lines should be interior, but *connected*, so that by a combined movement they may act against and overthrow either one or the other of the enemy's masses before the enemy can possibly effect a junction of his forces. A general having determined which of the two divisions of the enemy it will be most desirable to attack first, he will place a sufficient force as a corps of observation to watch the other, with orders not to risk an action, but merely to hold the enemy in check, taking advantage of every favourable position to make a momentary stand, but instantly retiring upon the principal army. When, however, the preponderance of force is so great on the one side that it would be possible to carry on operations with a reasonable chance of success on more lines than one, it is desirable to adopt double lines; and though, as a general rule, they ought to be interior, it may sometimes be advantageous that they should be exterior, so as to force the enemy into a space inadequate to the efficient manœuvring of his troops. This is also a contingency to be avoided when moving on internal lines, and a general should take care to effect the union of the two lines, and to make his decisive attack on one of the enemy's divisions before he has been driven into a position in which all his forces cannot be brought into action with effect. These remarks prove how essential

War. a knowledge of the country in his front is to a general conducting offensive operations.

Converging are more consistent with true principles than diverging lines, as they cover the communications with the base line; but they ought to be so arranged that their union may take place before the enemy can fall on either of the armies moving upon them. When a battle *has been gained*, the victorious army may move with advantage in diverging lines, so as to follow the dispersed troops of the enemy and complete their destruction,—but this of course, implies that the lines are internal though diverging, and afford, therefore, more facility than the enemy possesses for effecting a junction.

Change of Base. It may be necessary to change the line of operations, and to establish a new base, but this can only happen from some failure, or from unforeseen circumstances, and is therefore very precarious. Some generals have anticipated such a casualty and provided for it. For example, it is said that Bonaparte had, prior to the Battle of Austerlitz, determined, in the event of partial failure, to move by Bohemia, on Passau, or Ratisbon, so as to have before him a country new and full of resources, rather than to resume his march upon Vienna, the country contiguous to which had been ravaged, and where the Archduke Charles would also have resisted his progress.

In a similar manner Sir John Moore, intending to intercept the communcations of the French, proceeded from Portugal, adopting a line of operations from Salamanca across the Douro and the Tagus towards Burgos, but at the same time kept in view a way of retreat in case of failure, an accidental line from Villa Franca to Corunna. His bold project appeared to progress well, and he would have come in contact with Soult on the Carrion, had he not learnt that Bonaparte had left Madrid and already passed the Sierra Guadarama, so as to cut off his own communication with Portugal, and threaten that with Galicia; on the receipt of such alarming news he commenced the rapid retreat to Corunna, and thus to Moore's forethought was the British army indebted for its preservation.

Such lines as these should rather be called *contingent* than accidental, as they are planned beforehand in the event of certain contingencies. Purely accidental lines, taken up at the spur of the moment, must necessarily call into play not only the most accurate knowledge in planning, but also the greatest skill in execution,—qualities, in fact, of the highest generalship.

Effect of physical features. It is evident that the territorial boundaries and the physical geography of a country must have a material influence in both determining the line of direction to be given to operations, and the results to be expected from them. If the frontier of one country be projected far into another, forming a natural salient, the sides of which have been strengthened, if necessary, by art, it is favourably situated for commencing offensive warfare, as it leads naturally to the adoption of internal lines. Where no such central position is afforded by the natural projecting character of the territorial boundary, the same effect may be arrived at by the relative direction given to the manœuvring lines of operation, herewith exemplified (fig 3). CD, manœuvring on the right flank of the army AB, and HI upon the left flank of FG, form two interior lines, CK and IK, upon the extremities of each of the exterior lines AB and FG, both of which may be destroyed by carrying the mass of forces alternately upon them. This combination represents the effect of the French campaigns of 1796, 1800, and 1809, as it also does the spirit of the Duke of Wellington's defence of Portugal.

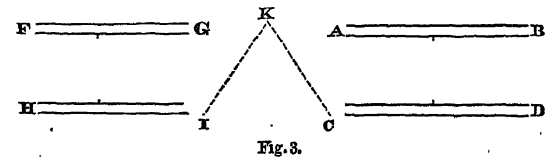


Fig. 3.

War.

The configuration of the country, and especially its physical geography, may materially modify the form of the zone of possible operations, thereby at once affecting the position of the base of operations and direction to be given to the lines of operation. In general, the actual theatre of war, may be studied in reference to a square or rectangular figure (see fig. 4). Now, if we consider the theatre of war to be that of Westphalia, 1757 to 1762, AB will be the line of the North Sea, BD the line of the Weser and base of the army of Duke Ferdinand; the side CD will represent the line of the Maine and base of the French army, and the side AC that of the Rhine also guarded by the French armies. Now, the French armies, acting offensively, have here the advantage of possessing two sides, whilst the third is also in their favour, being occupied by the North Sea. Their object was therefore to gain by manœuvring the fourth side, or, in other words, to cut off the enemy from it. Leaving the base CD, the French army E gained the front of operations FGH, thus cutting off the allied army J from their base line BD, and forcing it into the angle LAM formed towards Embden by the Rhine, the Ems, and the Black Sea; the French army retaining a ready communication with CD and AC, its bases of the Maine and Rhine.

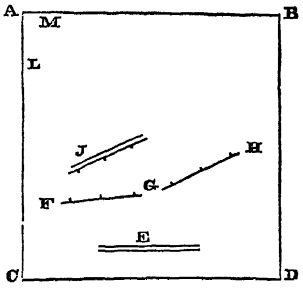


Fig. 4.

The manœuvre on the Saale in 1806, may be considered in connection with the same military formula and diagram. Napoleon succeeded in occupying at Jena and Naumbourg a line corresponding to FGH, and then, proceeding by Halle and Dessau, forced back the Prussian army J on the sea. or on the line AB. The result is well known to military readers to have been most disastrous to the Prussians.

Simple as these diagrams and reasonings are, they are sufficient to exhibit the great leading principle of war, that in a campaign the object should be to place the enemy in such a position that a battle lost will be decisive. To do this whilst keeping open his own communications, every effort should be made to cut the enemy off from his, and to bring him to action, without a chance of retreat in case of defeat. It may not always happen that the sea, or some other impenetrable boundary, presents itself for this purpose, but in many cases the territory of a great neutral power may afford, not indeed a barrier equally insurmountable as the sea, but yet one which, by checking the retreat of the enemy, may produce very similar results. The territory of a small neutral state is not likely to be respected, and the war, therefore, would sweep over it, and be stopped only by meeting the obstacle beyond it.

Sometimes the theatre of war would be better represented by a trapezium, as in fig. 5, but in the latter case the advantages of being able to establish a double base on two of the longer sides would be still more palpable, as it would be so much the easier to cut off the enemy's communication with his base when so restricted. It is not, however, to be supposed that the possession of a base occupying two sides of the diagram, or, in

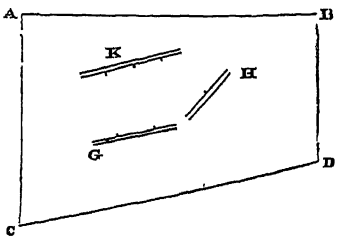


Fig. 5.

War. other words, where one base or part of a base is perpendicular to the other, implies that they should both be occupied in force; it is sufficient that the one from which it is not intended that the leading line of operations should proceed be fortified in its principal points, and occupied by a small observing corps. By such an arrangement the principles of fortification are extended to the operations of war, and part of the theatre of war is, as it were, exposed to a reverse fire. The base of the Rhine will exemplify what is here meant, as at Basle it exhibits almost a right angle, viz., from Basle to Constance on the one side, and from Basle to Kehl on the other. Moreau, taking advantage of this natural condition of the base, first attracted the attention of the enemy by pushing two divisions on the one side towards Kehl, whilst he advanced with his other nine divisions on the side of Schaffhausen, and arrived in a few marches at the gates of Augsbourg, the two detached divisions having in the meantine joined the main body. It is evident that in these manœuvring expedients much of the skill of a general is exhibited, and that manœuvring lines must be frequently adopted which are not strictly in accordance with the leading line of operations. Sometimes such manœuvring lines may be adopted in order to throw the enemy off the true scent, and induce him to abandon some enterprise which would be advantageous to him; sometimes to cut him off from his base line by intercepting his communications; and sometimes so to influence his movements, and to place him in such a position, that when it may be deemed expedient to try the chance of a battle, the battle, if gained, should be decisive. Battles may be lost or won without producing any material result on the chances of ultimate success, as may be seen in the life of the Great Frederick, for he always appeared to rise with fresh vigour from defeat; and, great general as he was, he did not escape from that chance of war; and as in the history of the late war in Italy, it cannot be said that any one of the battles then fought was attended with a decisive result. The last one, Solferino, which closed the war, certainly left the Austrian army in a condition to continue the struggle, even with success; and it may be fairly said, that peace was at that moment more anxiously sought by the successful than by the unsuccessful emperor, and that political rather than military reasons led to its conclusion.

Defensive operations, already examined in the preceding remarks, require, nevertheless, some further notice. Passive defence offers no security to a state, nor fortresses without an army; it is confiding in a shield without a sword. Reason and experience alike prove that the defensive system which provides the greatest number of facilities for offensive operations is the best; interior and simple lines so directed as to anticipate or counteract the designs of the enemy should be adopted. But as defensive measures imply inferiority of forces, they must in a considerable degree depend upon local means to counterbalance the superiority of the enemy, and to afford time for bringing as large a force as possible to act against him. Rivers and chains of mountains are the natural obstacles; fortresses, intrenched camps, and well selected positions upon the most advantageous lines of defence, the artificial means. Fortresses, with *têtes de pont* upon a river parallel to the frontier, are very advantageous; but upon a river perpendicular to the frontier they are still more useful, particularly if fortified upon both banks, or *en cheval.* In the former case an army acting on the offensive crosses the river only once, but in the latter it must cross as often as the defender thinks proper; for, placing his camp under protection of one of these fortresses, the enemy cannot pass him without being taken in flank or rear, nor besiege the place without dislodging him. Hence intrenched camps, covering and covered by a fortress, add considerably to the defence of a state; as, at the present moment, Verona does to the Venetian province of the Austrian kingdom. Fortifications are also eminently useful in the defence of passes in chains of mountains. The insignificant fort of Bard, with 600 men, arrested the progress of the principal column of Napoleon, when descending the Great St Bernard into the valley of Aoste in 1800. Again, the French emperor having constructed the fine roads into Italy, but not secured them by any fortifications, the first military use that was made of them was by the Austrians in the two successful invasions of the French, where the old fort of L'Ecluse, near Geneva, alone retarded them some days. Battles.

Fortresses likewise secure the magazines, stores, and hospitals of an army, and save the *matériêl* and broken troops after a defeat. But in order to make them capable of producing the share of security to a state which can reasonably be expected from them, fortresses should not be too numerous, because they absorb too great a proportion of troops for garrisons, and cost immense sums; nor small, for then they are easily invested and overpowered by artillery, or may be passed without notice; nor all on the frontiers, for if the enemy penetrate beyond them, the great arsenals, depôts, foundries, &c., of the nation are no longer within reach of the defensive army, which is also left without a final *point d'appui*, or position which may cover the capital, and enable them to turn the flank of the invader. Intrenched positions are often eminently useful, provided they intersect or flank the most direct lines of operations; but they are imperfect, if without arsenals or unconnected with fortresses, whilst the selection of their site is difficult. Those of Torres Vedras saved a kingdom; but then it must be remembered, that they had free communication with the maritime base of the English. To conclude, defensive war does not consist in covering every part of a state, but in so retarding the progress of an enemy, that any advantage which he may obtain may be constantly neutralized, until losing his temporary superiority, he finally fails in accomplishing his object.

Between a battle won and a battle lost there is an im- Battles.
mense distance, said Napoleon, the day before the conflict at Leipzig—empires lie between them; and indeed the plan of campaign, and the strategical movements, are only so many preparatory dispositions to arrive at the great crisis of a battle. The rules applicable to battles, therefore, form a most important branch of the science of war. In many respects this branch is less capable of being reduced to fixed principles than the others; but the chance of success will be increased or diminished by the due application of certain general rules. The first of these is that of operating with a superior mass upon the decisive point, because the physical force of organized numbers in arms furnishes the unerring means of victory, when the moral qualities in both armies are equal. The mode of bringing this force to bear in the most advantageous manner depends on the art of tactics; consequently, courage and fortune being nearly balanced, that general who can operate with the largest mass upon the most decisive point will be successful. But to effect this purpose, the combinations must be such as to produce a unity and precision of movements conducing simultaneously to the same object.

The following maxims are of general application:—1. No opportunity should be left till the morrow. 2. No battle should be fought but for an important object, unless the position should render it unavoidable. 3. After a victory, the enemy should not be allowed to recover—the pursuit should be incessant.

As in lines of operations, so on fields of battle, it is necessary to avoid dispositions which have generally proved fatal; such as, 1*st*, forming isolated divisions; 2*d*, ordering extended movements, which deprive the army of a part of its strength, and enable the enemy to ruin either the main

Battles.

body or the detachment; 3*d*, positions with too great an extent of front; 4*th*, allowing the connection of the wings or the columns to be interrupted by obstacles, and thereby exposing them to separate defeats.

The finest combinations are those which produce an oblique order of battle, those with a wing reinforced, those which outflank the enemy, and those which act perpendicularly upon a flank, or upon the centre of a scattered force. These are almost always successful, because they bring the whole or a greater mass to act on a part or a smaller. Thus the fundamental principle of all military combinations, namely, to effect with the greatest mass of forces a combined attack upon the decisive point, is applied; and it is easy to understand how a general of ability, with 60,000 men, may be able to defeat 100,000, if he can bring 50,000 into action upon a single part of his enemy's line; for battles are decided, not by troops upon the muster-rolls, nor even by those present, but by those who can be brought into action. Numerical superiority of troops not engaged, so far from being useful, only produces disorder.

The following rules are applicable to the working out of this great principle. The lead should be taken in the movements, for the general who has this advantage can employ his forces wherever he thinks them applicable; while, on the contrary, he who is obliged to await the enemy, is no longer master of a single combination, because his movements must be subordinate to those of his adversary, which it is often too late to counteract when actually commenced. The general who takes the lead knows what he intends to perform; he conceals his march, surprises or overpowers the extremity or other weak part of the hostile line, while the waiting army learns his intentions probably only from the attack. This applies, however, more strongly to strategical operations than to those of tactics, for in the latter case, when waiting in a position, prepared for receiving battle, as the operations are not spread over so large a space, the army taking the initiative cannot entirely conceal his intentions from the enemy, who, the moment he discovers, may counteract them by bringing up good reserves. The army marching to the attack has also to overcome all the difficulties of the intervening ground, and to support the fire of the waiting army, ready to receive the assailants when more or less thrown into disorder. In this respect, then, the chances of success from being the attacking force or the defending force, are in great measure balanced.

The second consists in directing the movements against a weak point of the enemy, when that point is decisive, and therefore offers the greatest advantages. An attack to the front, when the conflicting armies are equal in strength, is to be avoided, if a concentrated effort can possibly be made upon the extremity of an enemy's line, in which case simple demonstrations on the front are sufficient in order to hold it in check.

Against an enemy whose adopted line of battle is extended, it is preferable to direct the attacks upon the central point; for the central division having been ruined, the corps to the right and left can no longer operate in unison, and are forced to retreat eccentrically; as was proved in the disasters of Wurmser, Mack, and the Duke of Brunswick. Where the line of battle is not extended, the weak points are the flanks, because they are liable to be crushed before they can be sustained. Albuera offers, however, an example to the contrary; for here the right wing of the allies was turned and routed, and yet the battle gained by the centre forming an echellon to the rear. As a general rule, it must indeed be manifest, that an attack upon the centre of a widely extended force separates the right and left divisions from each other, and renders each liable to destruction in succession; but that the attack should be made on a more concentrated force, as far as possible from the centre, as the flank attacked can be only succoured by degrees.

Battles.

A deep column being attacked on the head, is in a similar condition to the extremity of a line; both the one and the other are engaged in succession and defeated, or what is termed rolled up. This was proved at Rosbach and Auerstadt. It is however more practicable to make a fresh disposition from a column than with the extremity of a line, when attacked by the enemy.

In executing a general movement against an extremity of an enemy's position, a mass is not only brought to bear against a weak point, but also, from that extremity, the rear may be gained, and communication, either with his base or with his secondary line, intercepted. Napoleon's manœuvre in 1805, by Donauwerth and the line of the Lech, turned the line of communication of Mack with Vienna, which was his base; and, at the same time, it intercepted his connection with Bohemia, from which he expected, as his secondary resource, the assistance of the Russians. Such were also the views of Soult when he turned the allies at Albuera, and of Junot in his attack upon the flank and rear of the British at Vimiera. Napoleon performed the same manœuvre against the Prussians in 1806 by Saalfield and Gera, Kutusoff in 1812 by Kaluga and Krasnoi, the grand allied army in 1813 when it debouched from Bohemia upon Dresden and Leipzig, and Napoleon finally attempted it in 1815 by Wavre.

Whilst the preceding truths prove that it is better to attack the extremity of a line, yet it is undesirable to manœuvre with a view to attack both extremities at the same time, unless there be a very great superiority on the part of the assailant. An army of 60,000 men forming two corps of 30,000 each, for the purpose of attacking an enemy equally numerous, is deprived of the power of striking a decisive blow; because it enables the adversary to adopt similar measures, or even, if the movement of attack be not sufficiently co-operative, to bring a mass to act against one of the divisions, and destroy it by his momentary superiority. But when there is a very great superiority of force on the side of the assailant, then indeed both the extremities of the hostile line should be attacked, because a greater number of troops is then brought to act against both wings; whereas, if the whole were kept in one mass and made to act against a single point, the adversary might deploy as many as the other party could bring into action, and thus engage with equal number, the greatest mass being collected where the attack was to be expected. Daun manœuvred in this way at Hochkirch and the whole allied forces at Leipzig.

The result of the combined manœuvring of two armies intending to act simultaneously against the two wings or the two flank divisions of an enemy, depends so much on accurate knowledge of the country, and in precision of movements, that even an army superior in numbers, say 50,000, attacking in this manner an army of 40,000, would still incur great risks; and if the inferior force, after leaving a corps to meet one attack, should rapidly take the offensive, and overtake the enemy in his preparatory dispositions, which would necessarily be calculated upon the principle of finding the opponent in his position, the heads of his columns might be turned and completely routed; and if the two hostile bodies should have between them some difficult object, a wood or river, they might each in turn be destroyed. Examples of this kind occurred at Lonato, Castiglione, Abendsberg, Eckmuhl, and Ratisbon.

When, however, the attacking army is double the force of the enemy, the principle no longer holds as stated in the cases of Hochkirch and Leipzig; but, to avoid the danger of divided forces, it is requisite to have the lead, and to conceal the movements in such a manner that both attacks may commence nearly at the same moment. Thus, an army intending to attack another of equal or superior

Battles. force cannot insure success but by a concentrated effort upon a single point of a weakened line, which is not in a condition to be timely supported. But when a superior army attacks one much weaker, two or three divisions should be formed, in order to bring all its masses into action against the inferior masses opposed; for if the attack were confined to a single point, the whole of the forces could not be brought into line, and the enemy might deploy an equal number; but it is necessary that the whole combinations should be so concerted as to arrive at the same instant, produce unity of execution, and avoid partial and successive defeat. It may appear that in these ideas the main stress of the argument rests upon the local superiority of numbers; but it is nevertheless true, that combination is the chief object; for 30,000 men may be defeated by half their number, if, in the disposition adopted, and in the choice of the ground, some vicious arrangement takes place which produces a division of the force; such as La Motte experienced from Webb at Wynendael, Chevert from Imhoff at Meer, and the Austrians from Moreau in the defiles of Hohenlinden.

To insure a favourable result, a general of ability will seize the proper moment to force the decisive point of the field of battle, and so combine the attack that all his forces may be brought into action, with the exception always of the reserve. But if his endeavours fail of the desired success, he should make a simultaneous general onset, in which the reserve is to be brought forward, to make a last and decisive effort.

In the strategical movement of a great mass in a combined effort upon one point, it is advisable to keep the forces concentrated, so as to have them perfectly disposable; or, in other words, that the depth of the disposition be nearly equal to the front, enabling the battalions to arrive with promptitude from all quarters towards the point attacked. Extensive fronts militate as much against good principles, as great detachments and isolated divisions deprived of the means of being sustained. The inattention of Napoleon and Ney to this maxim gave Benningsen an advantage at Eylau; whilst the allies in 1815, notwithstanding the difficulty of guarding an open frontier, were enabled to concentrate their masses at Waterloo.

One of the most efficacious means of applying the foregoing principles, is to induce the enemy to take measures which will facilitate it. By means of small corps of light troops, alarms may be excited for some important points of his communications. If he can be thereby tempted to detach strong divisions against them, and scatter his forces, he will be disabled from acting with vigour himself, and be exposed to an attack from superior forces. Operations by detachments have nevertheless been in fashion. To divide and subdivide, till the main army was reduced to the secondary character of a corps of observation, was considered as the highest strategical science. In the Hanoverian campaigns, the French, with two great armies, acted upon this system; nor were they undeceived, although Prince Ferdinand, with less than half their force, contrived not only to reconquer the country, but afterwards to keep them constantly at bay, and even to attack them with superior numbers. The Austrians, and the army of the empire, operated similarly in Saxony, and reaped similar fruits. Mack, trained in the Turkish wars, was the great patron of cordons, scattered posts, and inert positions; the Austrians had, however, little reason to exult in the success of that system. They fought on accessory points, while the main armies, reduced in strength, were unable to do more than menace the principal objectives of the campaign, wasting their time until they were attacked by superior forces.

Hostile armies are not destroyed by the mere act of taking up positions upon their communications, and then remaining inactive. Had Napoleon halted upon the Lech in 1805, or on the Saale in 1806, he could neither have prevented the escape of Mack by Donauwerth, nor the retreat of the Duke of Brunswick to the Elbe. The art of war does not consist in mere incursions upon communications, but in placing a force upon them sufficiently large to attack the enemy with decided advantage. Detachments upon the communications of an adversary are generally of secondary utility; though they may sometimes alarm and embarrass a timid enemy. Battles.

When the lead is taken in a decisive movement against the enemy, great importance is attached to an exact knowledge of the positions and movements which he may undertake. Spies are then of the utmost consequence, but light troops or even irregulars thoroughly versed in the tactics of watching the enemy, are of still greater utility. For this purpose the general should scatter small parties in all directions with as much prodigality as he would exhibit caution in great operations. Some divisions of light cavalry, expressly organized for this service, and not included in the order of battle, are the most efficient. To operate without such precautions is to walk in the dark, and to be exposed to the disastrous consequences which may be produced by a secret march of the enemy. Generally speaking, these measures are too much neglected. The *espionage* is not sufficiently organized beforehand; and the officers of light troops have not always the requisite experience to conduct their detachments. The Cossacks under Platoff, Chernicheff, Tettenborn, &c., in Russia and Poland; those, with the Prussians under Lutzow, in Germany and France; and the Guerillas of Mina, the Empecinado, and others, in Spain and Portugal, have shown the immense advantages to be derived from the services of such troops. While they were few in number, their real importance was not fully understood; but when 15,000 or 20,000 of them appeared in the field, they became a most formidable enemy, with respect to the combinations which a general could encounter, because they were always liable to be baffled by the interception of orders. Every convoy demanded a numerous and well-conducted escort, and every march was imperilled by the want of real information relative to the hostile positions. The duties, greatly multiplied, exhausted a great part of the army; and the regular cavalry was soon rendered unserviceable by their excessive fatigue.

In all which has hitherto been said, the greatest stress has been laid upon the necessity of concentrating forces and avoiding their too great dissemination; but it must not be hence imagined that detachments can be always avoided. The object of all manœuvring is to induce an enemy to make movements in some particular direction which may throw him into a position favourable for a *decisive* attack, and for this purpose it may be absolutely necessary to detach a force to make a demonstration which will divert the attention of the enemy in the desired direction. Again, it may be necessary to cover important points, to secure a secondary base, protect a line of operations, or even undertake a siege. It may even be done in direct face of the enemy, so as to engage his attention whilst the operations are mainly carried on in another direction. In all cases, however, care must be taken that all the operations are linked together and calculated to support each other; that a detachment is always equal in strength to the duty confided to it, and that it is never so isolated as to allow an active enemy to cut it off. In fact, whilst prudence enjoins that an army should be kept together, necessity may require its partial separation, and in this case the general must be fully acquainted with all the peculiarities of ground, and be prepared by promptitude of action to anticipate the enemy in *counter-movements*.

When it is incumbent on an army to occupy a greater extent of line than is actually proportionate to its strength, redoubts should be placed at intervals, so as to keep up

Battles.

the connection of the several posts without absorbing any great number of troops; and, in the contrary case, a large reserve should be formed and kept well out of the way, allowing at once freedom of action to the troops actually in position, and retaining full power to afford aid when required. Other considerations require to be taken into account: the openings or passages by which the defending army may, if able to assume the offensive, advance and fall upon the enemy, ought to afford greater facilities of movement than are possessed by the army advancing to the attack; the artillery should be so placed as to fire with the greatest effect; the ground should be of such a character as to screen from the observation of the enemy the movements of the troops from one flank to the other, and at the same time to facilitate the observation of the enemy's movements; the flanks should rest on some obstacle, either natural or artificial, which, by securing them from being turned, would oblige the enemy to attack in front. These points are rather named as desiderata than as always attainable; as, for example, it may be impossible to secure the flanks by obstacles, and then crochets, or returns to the rear, may be adopted; but this would expose the army at the angle thus formed to great loss if exposed to a powerful and well directed artillery, and a double reserve, drawn up in deep order behind the flank to be strengthened, might be adopted as a safer expedient. In the same manner, a position may be so chosen as to bring an obstacle so to bear on the movements of the enemy as to force him to attack either on the centre, or on some other point which has been expressly strengthened to receive him. The troops of those portions of the line which are more or less sheltered by natural or artificial obstacles ought to be kept available, to take part in the action, wherever their assistance may be desirable. Every possible advantage having been secured, either to render most efficient the passive defence, or to facilitate the assumption of active defence, which ought always to be the object of an army, the next great consideration is to secure the means of retreat; for though it may be said that an army ought not to anticpate defeat, provision should always be made against it. A battle becomes decisive if the defeated army be cut off from retreat; but many a battle may be fought and lost without producing a decisive effect upon a campaign, as is evident in the military history of the great Frederick of Prussia, provided that the beaten army can be drawn off to a fitting rallying-place. This was strikingly illustrated by Blucher, who, defeated at Ligny, rallied at Gembloux, and boldly adopting an *interior line* directed towards the English army, came up in time to complete the victory of Waterloo. Assuming that the army which intends to act primarily on the defensive has taken up its position, it now remains to consider in what manner the troops of the attacking army should be disposed, or, in other words, what order of battle should be adopted. Bearing in mind that the great object of strategy should be to produce a separation of the enemy's forces, and thus to bring a powerful mass to act upon a weaker one, as was the case with Bonaparte, who by the battle of Millesimo, induced the Austrians and Piedmontese to move upon exterior lines, whereby he was enabled to defeat them in succession at Mondovi and at Lodi,—a system which he followed up, combining, however, with the utmost accuracy of combination the greatest promptitude of movement.

Tactics of battles.

It has been shown that the object of strategy is so to manœuvre as to place the enemy in a position where he may be *decisively* attacked. In this case the enemy, finding his case hopeless, may give up the struggle, and the campaign be closed without a battle; superior strategy being in this case equivalent to a victory. But in most instances the battle will require to be fought; and passing from strategy we come to the technical operations necessary for leading the troops into action. The army acting on the defensive must be aware that in taking up a position as preparatory to a battle, it is not sufficient that it should be difficult of access, such as was the position of the Russian army on the left or scarped bank of the Alma, but that the obstacles of ground should interfere with the advance of the enemy, and render it difficult for him to deploy into line, whilst at the same time the scarped bank should be flanked, if possible, and the artillery so arranged that its fire should act upon the advancing columns. Nor can any position be deemed good which is not well suited to the particular arm of the service in which the strength of the army principally consists. Again, in selecting a position for giving a waiting battle, it ought to be accurately proportional to the number of troops at command; for whilst, as a rule, the disposable forces should be kept as much as possible together, and not disseminated over an extent of line which would reduce an army into fractions, every one of which would be so weak as to be easily attacked and overpowered; on the other hand, they ought not to be crowded into so small a space as would cripple their movements.

Battles.

In the attack the first step is to reconnoitre the enemy, and ascertain whether the arrangement of his troops has been made in due conformity with the configuration of the ground, and then to determine the most promising or decisive point of attack. In this estimate of the advantages or disadvantages of the several points of attack, it is manifest that not only the features of the ground occupied by the enemy should be considered, but also those of the ground over which the troops have to advance to the attack. If, for example, a flank of the wing of the enemy rest against heights from which his line may be enfiladed by artillery, it would, at first sight, appear that to gain these heights would be to prepare the way for a decisive blow; but then they might be of difficult access, nay even impracticable for artillery; and, further that, if actually gained, although leading to the defeat of the enemy, they might allow him to effect a retreat in good order, so that the battle would not strategically prove decisive; the tactical not always being the strategical decisive point: with a powerful army it may be desirable to attack on the strategical, even though it may not be on the tactical decisive point. At all times the disposition of the enemy's troops must materially affect a decision upon this point.

Whilst not representing an army as moving in some definite line, which from the irregularity of ground is scarcely possible, Jomini's views on the various orders of battle ought to be studied, considering them as directions to which some kind of approximation may be made in practice. *First*, then, the order may be simply parallel, the two lines exactly facing each other, and preserving an equal distance at all points of the line. *Second*, The parallel line may be combined with a crochet, defensive or offensive (fig 6). See, however, above, the objection to this arrangement.

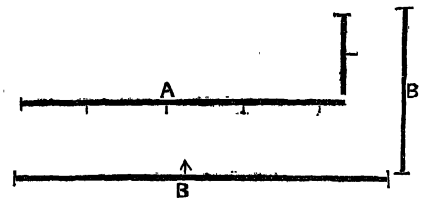


Fig. 6.

Third, A parallel order, reinforced on the centre or on one or both wings, so that the attack may be directed against the portion of the enemy's line opposite either; the other portion of the army remaining for the moment in the attitude of observation. This arrangement must, however,

Battles. materially depend on the manner in which the artillery of the enemy is placed; for it may happen that, whilst the reinforced portions of one army are moved to the attack, the artillery of the enemy might act with such effect upon the observing portion as to throw it into confusion, and allow a counter attack to be made with advantage. In the battle of the Alma the two armies were arranged in parallel order, and the attack was made on both flanks, the French effecting a turning movement on the Russian left, and the English attacking successfully on the Russian right.

Fourth, Orders either convex or concave, or echeloned approximatively into these forms. The concave order in defence, and the convex order in attack, have obtained a historical celebrity, because the great battle of Cannæ was lost by the Romans, who crowded their forces into the

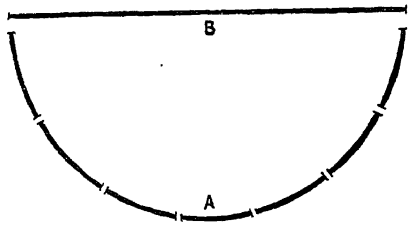


Fig. 7.

concave line of the Carthaginians; but this must not be interpreted as any proof of the merit of the concave order in defence, as it is evident that, had the Romans directed their attack against the flanks of the Carthaginian line, instead of penetrating into the curve, they must have gained

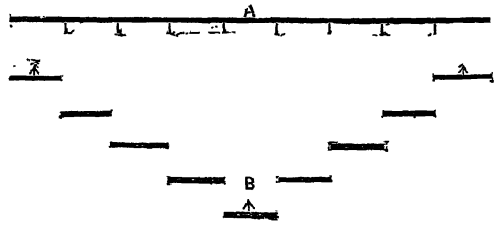


Fig. 8.

the battle. The concave order of attack fig. 8, is formed by echelon, which it would necessarily be, as a true concave curved line is merely imaginary. The convex form (fig. 9), or saillant to the centre, is applicable to an army after passing a river, when the centre naturally moves forward and still keeps up a connection with the river by its wings. In a similar manner, when making a stand against an approaching army, and being backed by a river which it is intended to pass, it is manifest that an attack made in force on the centre of such an order of battle, projecting so far in front of the wings, must be successful. This order is formed by echelon.

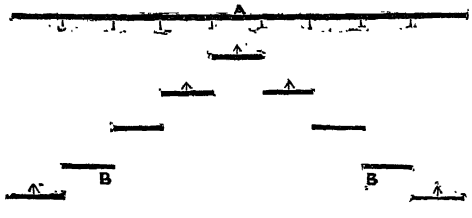


Fig. 9.

The oblique order is that which has been long recognised as the most fitting for an army of inferior or of just equal force, as it enables a large body of troops, the line being reinforced at the end approaching the enemy, to be brought to act against either wing, whilst it retains the rest of the line out of action, and ready to move at any moment either in front or laterally in support of the wing engaged (fig. 10). Military writers including Colonel Macdougall, the commandant of the Staff College, have said, that the battles of Leuctra and Mantinea were won by Epaminondas through this disposition of his army. The oblique order was Battles.

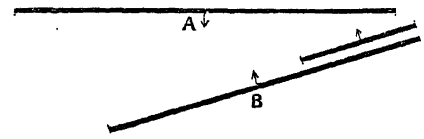


Fig. 10.

adopted by the Great Frederick at the battle of Leuthen; and Warnery observes, "I have known three instances in which the Prussians fought in a preconcerted true oblique order, namely, at Colin, Lissa, and at Finck, a combat in Saxony." Of these instances, Colin was unsuccessful, as Frederick was there defeated; but notwithstanding this *contretemps*, owing principally to neglect of his orders, it is generally admitted that the plan of attack was skilfully and judiciously formed, and affords therefore a warning against the too hasty condemnation of even an unsuccessful general. Bonaparte affected to speak contemptuously of the oblique order of battle, but yet he applied it to practice, whether intentionally or accidentally, as at Marengo. In fact, when an army directs an attack in force upon one wing, and holds back the other, it must necessarily assume an oblique order, whether it does so by arranging the troops in echelons from left to right or the reverse, or by an inclined direction of the line itself. In this case the oblique order is formed, not by retiring the flank to be held back, but by advancing the reinforced flank by which the attack is to be made, in an oblique direction.

As a general rule, it may be stated, that a combined attack on the centre and on one wing, as represented (fig. 11), is the most advantageous, the enemy's line being con-

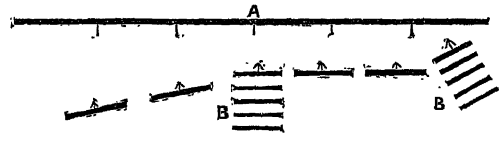


Fig. 11.

tiguous, as the attack on the wing prevents it from taking the troops engaged in the central attack in flank, whilst the wing attacked will be unaided in resisting the powerful attack made upon it; and should it give way in consequence, will enable the assailants to turn and attack in its rear the centre.

This was nearly the order of attack adopted at Wagram, the central attacking force being there aided by a powerful mass of artillery, and the division under Davoust which attacked the flank becoming a turning force, and materially contributing to the victory. The defensive line assumed in that case a slightly concave form, and thus afforded an example of the manner in which such an order of attack should be received. These rules accustom soldiers to ideas which may prove to them most valuable in the field, although the very best arrangements may be defeated by the promptitude with which an enemy may act in resisting them. An enemy, for example, acting on the defence, directs his reserve, the moment he discovers the design of the attacking army, on the required point of resistance. The attacking army should therefore conceal its movements as long as possible, and then act with the utmost promptitude, so as to anticipate the enemy in his movement of relief. In like manner, the army acting in defence should lose not a moment in assuming, when possible, the offen-

Battles.

sive; military history will indeed prove that inactivity has caused the ruin of many a defensive army, and promptitude of action, combined with accuracy of combination, has more conduced to success than even the most systematic arrangements. Great generals judge accurately, but also act promptly; and in the late Italian campaign, the great battle of Solferino was in great measure gained by the rapidity of the French movements, in taking advantage of the somewhat extended order of the Austrian army, whilst the persevering bravery of the division of Niel prevented the Austrians from overcoming the right wing of the French.

A military question has given rise to considerable difference of opinion. Guibert has stated that an able general and good tactician would not expose his scheme of defence until the enemy had shown in what point he intended to make his attack; but retaining his men drawn up in columns on the field of battle, would cause them to develop into line conformably to the movements of the enemy. This arrangement, at first sight, appears to be prudent, yet it has been urged against it, that, as a rule, the attacking army will direct its efforts against decisive points, considered either in a strategical or in a tactical point of view, taking into account the manner in which the defending army may best apply its most powerful arm in certain particular directions, and hence that he would gain by finding that, at the moment of attack, the defenders had not completed their development, or at least had not recovered from the confusion consequent upon it. The probable points of attack ought to be foreseen, and the troops arranged accordingly, the reserves affording occasional reinforcements, or a change of front, or any alteration required by an unexpected or exceptional movement of the enemy. It was once recommended, in a similar manner, that the attack should be made in column, but it is now generally admitted that, whilst the columnar formation is the best for advancing over ground often too irregular to allow the unbroken march of an army in line, the troops ought to be developed into line as soon as possible, both to avoid the destructive fire on the advancing columns and to oppose an equal front to the enemy.

All these observations point to one conclusion, which has been amply verified in practice, that a superior army looks forward to an offensive campaign, and to a battle on the active principle; that a weaker army may be obliged to act partly on the defensive, but even then it should be prepared to assume the offensive at the first favourable opportunity. In such a case a field of battle will be carefully reconnoitred beforehand, and its strategical and tactical advantages noted; and the enemy's attack will be then waited for, and the proper moment of passing from defensive into offensive measures with the best chances of success seized upon. The combinations of Napoleon at Rivoli and Austerlitz, of Blucher at the Katsbach and Laon, and of Wellington at Salamanca and Waterloo, are instructive examples.

It is difficult to prescribe fixed rules by which the choice of any of these systems should be guided. The circumstances of the moment, the moral character of the troops, considered in respect to their courage, discipline, and national temperament, and the conformation of the ground, must be taken into account.

A superior army should never wait to be attacked, nor should it wholly deploy into line if compelled by circumstances to remain in position. No more troops should be formed in line than are necessary to check the enemy. The remainder, formed into three or four columns, should be held in reserve ready to strike a decisive blow upon the most important point. A great army wholly deployed cannot manœuvre with the same facility as columns; and to render troops not engaged immovable, is the same as to deduct them from the strength of the army.

The manœuvres of two armies opposed to each other must mainly depend on the nature of the country both as regards its communications and its resources; on the information obtained by espionage or by cross-questioning the inhabitants; on that procured by reconnaissances made by the staff or by light troops; on an accurate appreciation of the most vulnerable points open to attack on either side. A general should be prepared for *contingencies;* and though military science will give him a general clue to an enemy's movements, he should be always ready to vary his movements so as to correspond with any accidental change of those of the enemy. In the late Italian war, the Austrians found such difficulty in obtaining correct information of the positions and intended movements of the French and Sardinian armies, that they were induced to try the desperate or at least dangerous expedient of making what they called reconnaissances in force, or, in other words, advancing with a small army intended to draw out the enemy from their position, and induce them to show their real strength. Such a system brought about its natural result. The French did show themselves, but, though at first in some degree taken by surprise, they, at the celebrated battle of Montebello, assembled in such rapidity as to overpower and drive back the Austrians with great loss. This engagement was a real trial of strength, and there can be no doubt the Austrians should have either retired without fighting, or have advanced in sufficient strength to overpower all resistance. Vandevelde thus comments upon this action, in which each army maintained that it had gained advantage. "It is true that this reconnaissance had as its object to oblige the allies to exhibit their strength, but did it do so, as Count Giulay affirms? We think not, and even believe that it exercised a fatal influence on all the subsequent operations of the Austrian army. By the published despatches, there could be no doubt that the mass of the French army, namely, the 1st, 2d, and 3d corps d'armée and the guard, were posted behind the Scrivia and around Alessandria; and what did the reconnaissance effect but bring into action one single division, or one-eighth part of the whole force which succeeded in driving back the two Austrian divisions engaged. Urban has been blamed for being too impetuous in his first attack; it may be replied, that had Stadion, instead of dividing the rest of his forces, and thus making them act on a front of more than two leagues, supported d'Urban by the whole division of Baumgarten, the result might have been different. Nothing is more difficult than to conduct well such reconnaissances; and they ought never to be undertaken except from pure necessity, as they are always bloody, and rarely, if ever, attain any satisfactory object. Giulay drew from the result of this affair a reason for drawing the mass of his troops towards Plaisance and Pavia, and thereby extended his front out of all proportion." A reconnaissance in force can only hope for success by surprising the enemy and driving in his advanced posts on the main body. This was done at Montebello; but the French were allowed to recover from their confusion, and to become the aggressors, by the too methodical and cautious movements of the Austrians. In all military affairs a bold and vigorous advance should be seconded by an equally bold and vigorous support. If the reserve creep whilst the front gallops, the advantage gained by the activity of the one will be lost by the tardiness of the other.

The following general remarks refer both to defence and attack. An army posted behind villages will obtain cover for its front by occupying inclosures, &c., with some battalions of infantry, and the outlets with cannon. The first line should be sufficiently near to support these advanced posts, and also to secure the evacuation of the place, in case the enemy should have gained so much ground on other points as to be able to take them in reverse. Villages, being

Battles. liable to be turned, should not be held by considerable corps of infantry, unless their topographical situation renders them the key of a position, as was the case at Vimiera. The battle of Blenheim deserves attention on account of the consequences produced by the neglect of these rules.

When an army occupies a position perpendicular to a river, with one wing resting on the bank, that wing should not be attacked, because, if the enemy changes front towards the river, the attacking corps might be driven into it. On the contrary, if the onset is directed against the other wing with the principal mass of forces, chances are in favour of the assailants; because the wing being turned, the whole line will be pressed towards the stream, and incur the risk of being destroyed. This would have been the case with Hiller's corps at Wagram, if a prompt retreat had not saved it. Similar would have been the fate of the united French army at Talavera de la Reyna had they persisted in an attack upon the Spaniards; but they acted with great judgment in directing their efforts solely towards Lord Wellington's left.

In the successful defence of a position, an attack not manifestly intended to be decisive, should not be followed up by pursuit when repulsed; because its object might have been merely to draw the defenders out of advantageous ground. An untimely pursuit by the Austrian right lost the battle of Prague, and by the Saxons that of Kesselsdorff, and again by the Austrian centre, that of Jemmapes.

As it is a maxim to operate against a weak part of the enemy's line, no position should be attacked upon its strongest point, as the Austrians did at Breslau, unless that point, though tactically the strongest, is strategically the decisive point; but if the hostile position be prolonged by a detached corps, the principal effort should be directed against that corps, even though posted on strong ground; because, if defeated, the main body may be turned, and thereby worsted.

Armies may sometimes be posted behind a ridge of hills with defensive points upon their summits. These should not be attacked without an exact knowledge of the position behind, and precautions being taken against a counter movement. The events of Austerlitz and on the Katsbach prove the necessity of this precaution.

When an army remains inactive in a position, manœuvring may be made with a view to turn its flanks, which should be opposed by others of a similar character, as was done at Albuera. These counter-manœuvres are not difficult to execute, because the army attempting to turn a flank moves upon an arc, and its opponent on the chord; consequently the one is enabled to bring into action a greater mass than the other in less time, even though both parties are equal in forces. Rosbach, Vimiera, and Salamanca, are examples, where the enemy moved in open day (it is both difficult and dangerous to do so in the night), and thereby rendered the counter-offensive both prompt and decisive.

There are positions which cannot be turned, nor attacked obliquely. If the stratagem to draw the enemy out of them does not take effect, a parallel attack with the centre reinforced is likely to be the best in such circumstances. The dispositions of Marlborough at Blenheim were of this class, and deserve the study of military men.

If two allied armies or great corps take up positions forming a re-entering angle with a space between them, and some considerable obstacle masks that space, they expose themselves to be attacked and defeated separately: the danger increasing with the increase of the distance between them. The corps AD being separated from BE by a wood, lake, or other considerable obstacle at G, the enemy FH, being covered by that obstacle, may attack and defeat one, before the other can come up to sustain it (fig. 12). This is a case of interior against exterior lines of operations. Such positions were occupied by Prince Henry and Hulsen, at Freyberg and Katzenhausern; the Tharand forest, and, what was worse, the Mulde, being between them; yet the army of the empire, superior in force, remained for three months without taking advantage of them, when Prince Henry moved forward and defeated it at Freyberg. Battles.

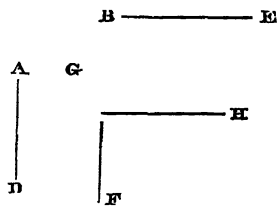


Fig. 12.

Taking advantage of the rapid manner in which Frederick developed his columns into line, the oblique order of attack may be combined with a turning movement, as shown

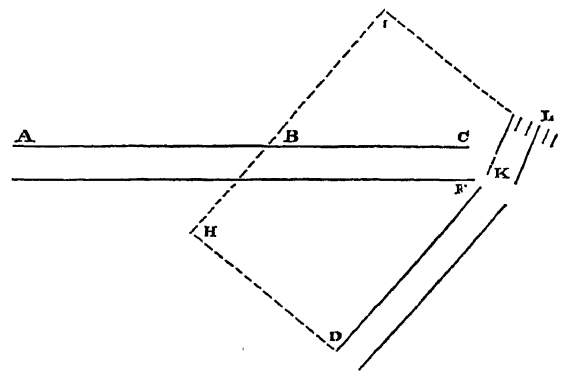


Fig. 13.

in fig. 13. The brigade to the extreme right is formed into column of divisions, and marches forward to the left wing of the enemy, the brigade to the left of it keeping up its fire; the moment the right brigade comes into action, it rapidly develops itself to the right, and thus outflanks the enemy. The next brigade than advances to the attack, whilst the third fires, and so on in succession, until all that portion of the army intended to take immediate part in the conflict has come into action. When the army, thus pushing forward, has come into the position HI, shown by the dotted line, it will have effected the turning movement, commenced by attacking in column.

An army AB (fig. 14) instead of forming two lines, as in the

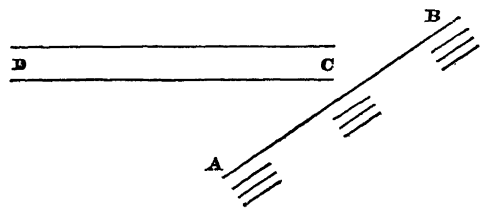


Fig. 14.

former figure, may draw up the first line only, and keep the second in columns at half distances behind the right, centre, and left, prepared to manœuvre or strike the decisive blow. These columns will be more moveable, and not being intended for the first attack, they will nevertheless cover it against counter-movements of the enemy. The battle of Salamanca offers a memorable lesson of this description, where the troops were concealed by the ground, and then suddenly brought in mass upon the enemy's left wing. That of the Katsbach, almost the counterpart, was equally grounded upon these principles; both, however, with the difference, that the adversary had the lead of the manœuvres. Jomini, habituated to the brisk character of French soldiers, lays too much stress on the value of the lead in manœuvres,

Battles. and does not fully appreciate the counter-manœuvres which the cool firmness of British and German soldiers are likely to develop.

Another important maxim may be deduced from the battle of Leuthen, namely, that an army with a flank resting upon an obstacle, such as the great pond of Gohlau, which covered the angle of Nadasti, may still be outflanked by an oblique attack. For this purpose, it is only necessary to mask the first brigade of the enemy by the nearest of the attacking corps, and move obliquely with the next, so as to direct the principal effort upon the second. The line being broken, the obstacle is no longer of use; and the masked brigade is in danger of being cut off, if not promptly withdrawn.

Marches, for the purpose of attack, in columns to the front, flank, or rear, which must be followed by deployment or by echellon formations, are useful as parts of elementary tactics; but not safely applicable near the enemy on a great scale, if at all complicated by the construction of the columns, or by the nature of the ground. Templehoff has described the nature of Frederick's columns, by means of which his dispositions were executed with so much simplicity and precision. Although the present system of moving by corps has in a great measure superseded the old method of organization, and consequently rendered the march-manœuvres, which triumphed at Rosbach, Leuthen, and Zorndorff, less applicable, they are still the best for such corps as are obliged to manœuvre in the presence of the enemy, whether it be to engage in front or to turn a flank.

It will be perceived that at Kollin, Leuthen, &c., Frederick's army, having broken into open columns by a mere wheel of divisions, right or left in front, was enabled to execute all its movements without danger of being attacked in detail, because the columns of lines were at no farther distance than was required for actual engagement. The enemy could neither cut them off nor penetrate between them. In taking the direction of the intended line, the army, when come to the ground, is formed in a few minutes, that is, in the space of time required for the word of command, "wheel into line," to pass down the column. In this method, it was only necessary to send an advanced guard to protect the march, and at the same time to keep the enemy in suspense. As the army requires only two or three hundred paces between the columns, and the divisions no more than their respective distances, to form into two lines, the manœuvre is easily executed with precision. The army having unnoticed reached the flank of the enemy, wheels into line, not allowing the enemy time to form an angle, or to change front; consequently he will be overpowered in succession along his line.

If two columns of the length of the line of battle be not advisable, the ground requiring a modification, four columns may be formed, by doubling up the lines, or by marching by wings, without increasing the difficulty of forming. The four columns being constructed of the two lines doubled, when arrived near the point where they are to form, the second and fourth halt until the first and third have proceeded so far as to disengage from each other. While halted, they protect the march of the others, and when cleared by them, they follow in their rear, and thus are prepared to wheel into line with them.

If the columns are formed by wings, they will again fall into two lines by a simple change of direction, executed by all the heads of columns of each line at the same time to the right or left, and then leading into the rear of the preceding. But this transition of columns of wings into columns of line should take place at some distance from the enemy. At Leuthen, this manœuvre introduced the battle: (fig. 15.) A, the advanced guard masking the march of the army in four columns; B B B B, the heads of the four columns which form the first line; and C C C C, the heads of the second line (now in the rear of the first), all changing direction by a wheel to the right at the same instant, and Battles.

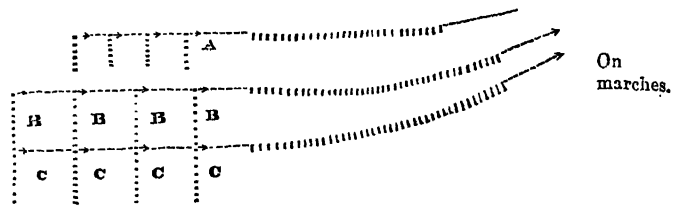


Fig. 15.

consequently forming two open columns ready to wheel into line. The advance meantime either halts in position to alarm the enemy on another point, or continues to open the march by preceding and covering it.

It is however evident that these kinds of marches must be made on open ground; for in countries deeply intersected, great movements are impracticable; and it thus becomes necessary to take advantage of known openings, and engage more or less in columns. By Guibert's and the regulation systems, the army being broken into several columns, they move with their heads often out of sight of each other at the distance of more than a mile, and yet being expected to keep their alignments and relative distances. When ordered to form, they either close and deploy, or march by echellons to fit into an exact alignment. All this is evidently impossible before the enemy, who seeing the tedious manœuvre, has time to act as he pleases while its probable errors are rectifying; and if the centre divisions should be chosen for the points of deployment, half the columns must turn their backs upon his fire to perform it. Frederick, during the whole seven years' war, attempted these movements only twice, and in both instances failed from accidental circumstances. At Minden the French manœuvred in the same manner, and were a great part of the night and the next morning employed in rectifying errors, which gave Prince Ferdinand time to arrive; and though he also moved in columns, he had previously sent all the generals to reconnoitre their routes and points of formation, and cut openings and fix marks to insure the exact direction. Such precautions resemble the contrivances adopted in aid of the manœuvres in a camp of instruction; and the necessity of recurring to them shows the difficulty of the manœuvre, which not even the new organization of corps, and the use of swarms of skirmishers, entirely remove.

Lehwald's manœuvre at Jöegerndorf is worthy of notice, as particularly applicable in intersected ground. His infantry advanced in a double column from the centre, and formed to right and left without risk of confusion; the cavalry, moving at some distance, easily took up the alignment.

Frederick's order of march should however be considered only as a manœuvre, and not be applied to marches in great operations. As this order of march is best calculated for attacks against lines, so is it also for the attack upon columns in march.

An attack upon an army while on the march is advantageous, for the same reasons as an attack upon the extremity of a line; because the army attacked on the heads of its columns is precisely in the same situation, relatively to the enemy, as one assailed in flank. The battle of Rosbach furnishes an illustration. AB, fig. 16, represents the army of the king, CD that of the French.

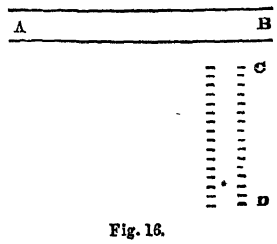


Fig. 16.

Supposing them both in line, CD would still be attacked perpendicularly, and out-flanked on one of its wings, exactly

Battles.

as it was on the head of its columns. The advantage of both these manœuvres lies in the necessity to which the enemy is reduced of bringing his battalions in succession to the front, while the opponent, acting with vigour, defeats them, one after another, by the superior pressure of his mass, provided his march be onward in an appropriate direction; horizontally if the column moves perpendicularly, and perpendicularly if the march is horizontal. The object for assuming, as nearly as possible, an opposite direction, is to present a whole line to the head of a column, or to the extremity of a line; because, if such a direction were adopted that the heads of columns should meet, both armies would be obliged to deploy, and a parallel order would be the consequence, without tactical advantage to either. In fig. 17, the columns AB meeting those of the enemy CD in the same order, both fearing to be attacked, will immediately deploy; AB will therefore form the line FG, and CD the line HI, which gives no advantage to either party.

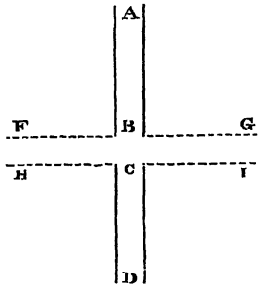


Fig. 17.

The battle of Rosbach offers a further illustration. As an angle must necessarily be formed when the heads of columns are attacked, to check the first efforts of the enemy, the advanced guard or leading brigade should deploy, while the rest of the army, should take a new direction of march, clear of the enemy's flank, in order to protect the retreat of the advance already engaged, and to gain a station for acting offensively, fig. 18.

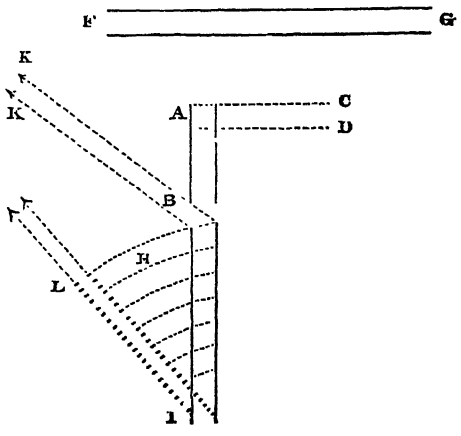


Fig. 18.

If the advanced guard or leading brigades AB of the columns HI be attacked, a deployment must take place according to the direction of the attack CD. This manœuvre having checked the enemy FG, the army in the rear being thus momentarily protected, should immediately change direction exteriorly, by filing the divisions into a new alignment IL; or by altering the direction of the columns in a similar manner, so as to produce a prolongation KK beyond the enemy's flank. It is, however, clear, that if the columns are left in front, the operation is according to rule; but if the right be in front, a direction to the left would present the reverse flanks to the enemy. There would be no time for a countermarch, and still less for wheeling up in succession. It therefore appears that the columns should change the pivots of divisions, and wheel to the right into line; for though this manœuvre would be against the letter of the regulations, no disorder would ensue, and it is actually practised, at least by cavalry, in some of the continental armies. There is no want of proofs of the occasional necessity of this manœuvre in every campaign; but the battle of Laswaree will suffice for an illustration. The British infantry advanced in a single column by the right, and after crossing the Mahnus Nye, a deep sunken rivulet, found itself opposite the enemy's right. To have prolonged the movement, was to produce a parallel order of battle; advantage was therefore taken of a ravine which led to the hostile right flank, and could conceal the movement. The head of the column turned to the left, and gained the flank; but when ordered to wheel into line, the pivots being reversed, some of the Sepoy troops, adhering to the letter of the rules and regulations, wheeled with their backs to the enemy.

Battles.

This method of converting a probable defeat into an offensive movement and oblique attack, will probably intimidate the enemy, and check his attack on AB, from the moment he perceives that his own flank is menaced. As a manœuvre it is also more rapid and simple than a change of front, which would only tend to a parallel formation. Although the existing modifications in the structure of armies, as already observed, renders this kind of attack more rare, and the organisation by corps and divisions is advantageous to prevent them, it is nevertheless true, that the Prussians lost the battle of Auerstadt, and the French were placed in the most critical situations at Marengo, Eylau, and Lützen, because they were attacked on the march before they expected a general action.

Organisation of armies.

In considering the actual organization of troops, it should be remembered that the heavy formation of the Greek phalanx and Roman legion were in conformity with the use of the spear or the pilum; and that it was partly preserved, in modern times, by the habit of mixing spearmen with the musketeers, the imperfection of firearms still rendering the absolute shock of a charge necessary for the decision of a battle. By degrees, however, it went on diminishing until the "thin formation," being by three ranks in foreign armies, and by two ranks in the British army, had become the military rule. The full benefit of fire can only be gained by the double rank, although even Jomini, whilst admitting that such is the fact, considers that no other than a British army could secure stability by a formation so shallow: lately, however, it has been adopted in the French army. In arranging an army in the line of battle, the primitive organization, so far as concerns the principal parts, remains nearly unaltered,—namely, it should consist of two wings; a centre and a reserve.

As a necessary measure towards the accuracy and rapidity of military movements, it is expedient that troops should be organised upon some definite principles, calculated to facilitate both the giving and the performance of orders. For this purpose a company has been considered as the unit of formation of infantry, a troop as that of cavalry, and a battery as that of artillery; and on the various combinations of these units has been founded the whole system of drill. In looking merely at manœuvring on a small scale, this selection of units is sufficient and judicious, as a battalion or a brigade of artillery (the old formation by battalions having in the artillery been abandoned) can be best manœuvred on the parade by the multiplying or subdividing the unit adopted. But in war a formation on a larger basis is required, and it may be then said that the battalion becomes the unit; but as the brigade of artillery does not correspond in magnitude or importance with that force, there is a certain degree of incongruity in the application of the term to that arm. The guns of a complete field-brigade of artillery would be a sufficient proportion for a small force of between 15,000 and 20,000 men; and it is evident, therefore, that some confusion is created in the due appreciation of the term as so applied, and that some other term should

Battles.

be adopted for the greater unit of artillery. The term *brigade* may be considered as usually applied to a combination of four battalions, or about 4000 men (assuming 1000 as the average strength of a battalion), to which proportion at least three batteries ought to be allotted, and that number ought to have some special designation. The *division* is the next term adopted, and this may consist of four or more brigades; 14,000 or 16,000 men, however, seeming a good normal number. The third and greatest division is the *corps d'armée*, which may consist of either two or four divisions, being either 32,000 or 64,000 men. The first is the best proportion for a moderate army, the latter for a very large army.

A division being assumed to consist of four brigades, or 16,000 men, the artillery would be six batteries, still being less than a brigade; and in like manner, the artillery for a corps d'armée of two divisions would be twelve batteries, being more than a brigade. So far, then, as concerns the convenience of field organisation, the designation "artillery brigades" is imperfect. In this arrangement, the combining multiple in the two first denominations being four, a brigade may be considered as drawn up with one battalion in each wing, one in the centre, and one in reserve; a division as drawn up with a brigade in each wing, a brigade in the centre, and one in reserve. But as it ought to be possible to reinforce the wing exposed to attack, it seems desirable that one battalion or one brigade should in either case be available for that purpose, which would raise the number to five. Two divisions, or two brigades, would enable the troops to be drawn up in double line on the same principle. Jomini observes, "that whatever may be the subdivisions or fractions of an army, the organisation by corps d'armée will probably continue as a normal type in all the great continental powers."

Considering the imperfect means of propelling offensive weapons possessed by the ancients, the legionary force of the Romans, consisting of about 6000 men of all arms, or double that number, including the combined Italian legion, possessed great advatages, as it may be considered to have contained some of each class of combatants, and was therefore closely assimilated in principle to the modern division in that respect. In respect to light cavalry, as its duties are of vital importance, and, further, as no battle can be decisive, unless, in case of success, there is a possibility of pursuing the vanquished enemy, breaking up any of his troops still maintaining their organisation, and preventing him from rallying—this arm ought not to be restricted in number in any country where it is able to act with effect. As a rule, therefore, one battalion of cavalry may be allotted to each brigade of infantry, which, estimating the strength of a battalion of cavalry at 600 men, would make the proportion of cavalry to infantry as about one to six, which would allow two brigades of cavalry, of four battalions each, to a small corps d'armée, and four to a large; but, of course, these proportions should be varied to correspond with the nature of the country. In respect to artillery, it must be remembered, that guns were not only inferior in scientific construction, but also in mobility, at the time when they were distributed throughout the whole line, each battalion having its own guns. To produce the greatest effect, it is evidently necessary that they should act in masses, although it is not probable that many instances will occur in which it may be desirable, or even possible, to bring together in one battery 100 pieces of cannon, for the mere purpose of making an opening in the enemy's line, as was done with such success by Bonaparte at Wagram. It has been usual to allow four guns to 1000 men; but with the improved range and powers of the modern artillery, and more especially from their greater mobility, they will doubtless perform in war more extended service than hitherto. If, then, one battery be allowed, or six guns, to 1000 men, it would be at the rate of about three of the present brigades to an army of 32,000 men on the field, and in the proportion of four batteries to a brigade of infantry. In all cases, the strength of an army ought to be estimated by its infantry, and the proportions of cavalry and artillery estimated in relation to the infantry, and more particularly to the peculiarities of country and of service in which they are to be employed. The horse artillery should bear a similar proportion to the cavalry; and heavy or reserve artillery and heavy cavalry should be estimated separately, in reference to the probability of their being useful in special services, such as the defence of positions, &c. In posting artillery—the most powerful auxiliary in modern warfare—horse artillery, like cavalry, ought to be always so placed that the ground will permit them to move freely in any required direction; foot artillery should be covered as much as possible from the fire of the destructive rifle, and secured from a sudden charge of cavalry; and where no natural protection can be found, it is absolutely necessary that security should be obtained from artificial intrenchments, or from other obstacles. Eminences so high as to produce a plunging fire are unfavourable for the action of artillery. A moderate height, sloping off towards the enemy like a glacis, is the most favourable, as it produces a grazing fire, and affords no cover; whilst a precipitous bank not only renders the fire plunging, but actually prevents its fire from being of any use when the enemy approaches very closely. Horse artillery are not only valuable when acting with cavalry, but they become most valuable in rapidly succouring a portion of the army when too hotly pressed; and it was thus that at Eylau much advantage was gained from the co-operation of a force of 50 light artillery, which General Benningsen had held in reserve, and which restored the balance between the centre and the left.

Battles.

There are several modes of drawing up troops for advance to action which Jomini details, and it is well to notice. Light infantry or skirmishers should cover the line properly so called, take advantage of the features of the ground so as to conceal themselves, protect the march of columns, fill up the intervals between them, and defend the outskirts of posts. Of modes of formation, he observes, there are four, considering that all others may be reduced to them—1*st*, The shallow, or deployment in two ranks, according to the English system, or three ranks as in foreign armies; 2*d*, A half-deep formation, consisting of a line of battalions, arranged in columns of attack on the centre, or in small squares; 3*d*, The mixed formation, the battalions being partly deployed and partly in columns; 4*th*, The deep order, consisting of large columns of battalions, each deployed, but one formed behind the other.

Some examples of the different modes of marshalling troops in order of battle may be represented by the aid of Jomini's figures. First, then, a line in which each battalion of the line is formed into a column of attack by divisions on the centre, with light infantry in the intervals. On such an arrangement as this (see fig. 19), it may be observed, that the advantage gained by the light infantry or riflemen in the intervals, is common to the whole army, as now armed, and that there is no good reason for forming troops in this manner, or by small columns, unless the peculiarity of the ground may render it necessary.

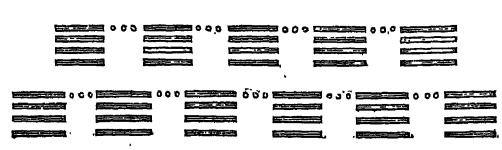


Fig. 19.

Considering that in the above the total depth of the

Battles.

Principles of dispositions at the battle of Waterloo.

columns becomes excessive, or twelve ranks in depth, which would render the number of non-combatants too great, and expose so large a mass to the artillery fire of the enemy, he proposes to adopt the two-rank arrangement of the English, and to spread one of the divisions as riflemen in front of the line (fig. 20). This would

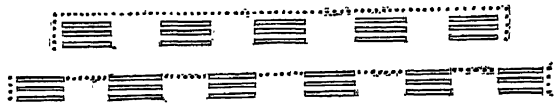


Fig. 20.

doubtless improve the formation, as its absolute depth would be reduced to six ranks; but the present perfection of the British musket renders any complication unnecessary. In all cases whilst moving to the attack, the columns should not halt to fire, but reserve their fire for a critical moment. When arrived at the point where the columns deploy into line, firing should steadily commence. If advancing with a probability of being attacked by cavalry, it may be necessary to move in such a manner as will enable the battalions to be thrown into hollow squares (fig. 21).

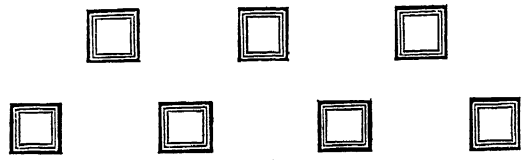


Fig. 21.

In this it will be observed that the formation by three ranks is represented; but the English squares, formed on a double rank, were found to resist effectually the attacks of cavalry at Waterloo; such a formation is, indeed, the fitting one for an English army. In squares it insures that every combatant shall act to advantage—the front rank in resisting the attack, the second by its cool and effective fire. As Jomini says that such a shallow formation may be trusted with the English, they are right in availing themselves of an advantage which has been awarded to them on the score of their superior stability as soldiers.

The troops may also move by echelons; and if these represent battalions, it is manifest they may be formed into squares if attacked on the march. On such an arrangement a flank may be first attacked, every battalion coming into action as it nears the enemy, thus producing the effect of an oblique line of attack.

The battle of Waterloo, unquestionably the most decisive event of the late awful contest, offers so many instructive circumstances, and so much matter for deep meditation, in the position and manœuvres, and in the exhibition of the soundest maxims of war, that it may be considered as a general illustration of the advanced state of the art of war at the present period. Without entering into details, the minutiæ of which are apt to confuse, the principal features only which it displays will be pointed out. As there are many plans, more or less correct, and the ground is generally known, the remarks about to be made will be readily understood by those who have any elementary knowledge of war. When Blucher had retreated from Ligny, and the Duke of Wellington had fallen back from Quatre Bras, he occupied the position of Mont St Jean, determined to risk a battle with the forces he could collect on that point. Exclusive of the Prussians, whose severe loss in killed, wounded, and stragglers, could be only replaced at the time by the expected arrival of the corps of Bulow, the duke's army consisted of about eighty-one battalions and eighty-seven squadrons; which, with the artillery, may have amounted to 66,700 men. Of these upwards of thirty battalions and as many squadrons had never been in action. This mass of forces was posted (see fig. 22) with the centre diagonally across and in front of the forking of the two causeways from Brussels to Charleroy and to Nouvelles; the right centre behind the chateau of Hougoumont, and the left, much held back, passed in rear of La Haye Sainte, along the cross-road in the direction of Ohain. Behind the right centre, Lord Hill placed his corps, *en potence*, in columns, prepared to manœuvre to his right, on the small plain of Braine la Leud; or to his left, to sustain the centre. In and about Braine la Leud was a Netherland division, with the right thrown forward, and covered by the rivulet Hain, and leaving the small plain open; a kind of gorge to tempt the enemy between the two sides of the re-entering angle of the right wing. The Prussians were expected to debouch through the woods of Lasne towards Planchenois, which would form the left into another gorge, or re-entering angle. Thus

Battles.

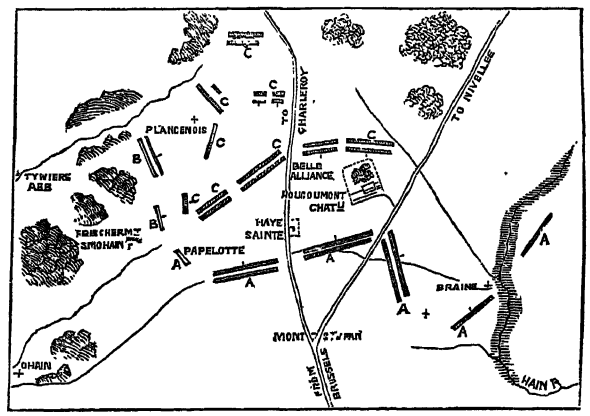


Fig. 22.
The letters A A A indicate the position of the British army, B B that of the Prussians, and C C C C that of the French.

the position formed a kind of open W (fig. 22, A A A A B B) with the chateau of Hougoumont at the summit of the salient angles, covered by a plantation of wood and enclosures, occupied by six or eight battalions; so that the enemy could not enfilade either of the faces of the centre, from behind that plantation, nor approach on either of the causeways which passed through the centre without presenting his flank. Besides this point, La Haye Sainte, a stone farm close to the chaussé of Charleroy, and farther on the left the farm of Papelotte and chateau of Frichermont, were occupied. The whole front sloped gently towards the enemy, and in the rear the cavalry was distributed in brigades, each in two lines, covered by the rising ground; and the artillery, all the field-pieces of which were nine-pounders or twelves, formed a line of almost contiguous batteries along the front, interspered with howitzers and rockets.

By the returns found after the battle, it appears that the enemy had debouched from Charleroy with 122,000 men,[1] exclusive of the reinforcements that joined after the 15th of June. Of these he produced on the field of battle about 80,000 men, formed in concentrated masses on both sides of the chaussé of Charleroy, and gradually advancing the right parallel to the British left (C C C C); but as he was jealous of the woods on the right, he formed an angle to the rear, and kept his reserves far back. He had made a demonstration with a corps of cavalry beyond the British right towards Hal, where he found the corps of General Colville and Prince Frederick of Orange, with two divisions posted at Tubise, Clabbeck, and Braine le Chateau, to cover that

[1] The return was dated the 13th, according to the assertion of a Prussian officer of the staff. The whole force brought over the frontier must therefore have amounted to nearly 150,000 men.

Batties. avenue to Brussels. Another corps, 42,000 strong, under Grouchy, was detached to his right upon Wavre, to turn the allies, pursue or arrest the Prussians, and prevent the timely junction of Bulow. Thus the dispositions of both the commanders were combined with consummate ability; Napoleon operating on the system of throwing two-thirds of his masses alternately on either side, and the allies in manœuvring so as to bring a superior mass on the decisive point. The problem, however, was difficult of solution. The communication with France was open only by the roads of Charleroy and Nivelles; hence the enemy could not quit them in the attack, nor could he gain Brussels by any other avenue than that of Waterloo; therefore, to possess the chateau of Hougoumont, without which he could not arrive at the position, was the natural object of the attack. As this was sustained by the mass of the allied army, and could not be enfiladed, his attack failed. All those directed on the road of Charleroy to the left centre were necessarily oblique, and exposed to the fire in flank before they could reach their opponents. To have risked a general onset of all his masses, before the British were thinned and exhausted, he knew, under the circumstances of the moment, to be too hazardous. The plain of Braine la Leud appeared open to him; but that very circumstance proved that opposition was prepared on that side. To have turned the force thither would in the first place have caused the loss of the communication by Charleroy, and next facilitated the junction of the Prussians; and, besides, the corps on the other side of the Hain flanked the advance, and could in a short time be sustained by the two divisions in its rear, and which he knew to be at hand. He would therefore have been placed between two fires, and have lost his point of retreat upon Charleroy; and the road by Nivelles might, meantime, be cut off by the troops left behind at Mons. Again, if he threw his masses towards the left, he only went to meet the Prussians, and left the British masters of the road of Nivelles, and possibly, if he advanced far, of that of Charleroy. He entangled himself in woods and defiles, where his superior cavalry could not act. The character of his opponent bespoke immediate offensive movements from the moment his right would be at liberty; therefore the chances were in favour of Wellington: yet this was the only advantageous side, because it brought him nearer Grouchy, and in case of defeat he could take a new line of retreat by Namur. He, however, preferred the experiment, depending on the enthusiastic valour of his troops; and committed himself so deeply, that, when at length the Prussians appeared, a retreat was no longer possible.

These observations disprove the assertion, that little skill was displayed on either side. The generals and the soldiers equally did their duty: the veteran Blucher behaved with proper prudence in keeping so long back from the dangerous manœuvre which was assigned him; and when he saw the hostile cavalry destroyed, he acted with vigour and skill. As for Grouchy, who wasted his time in forcing the position of Wavre across the Dyle, everywhere fordable, his manœuvres show that he felt the danger of his movement, and prudently remained on the banks. Much might be added on the details of this great battle up to the general charge to the front, and fate of the enemy's squares; but enough has been stated to recommend the study of a battle where three of the greatest commanders and the best manœuvring armies in Europe gloriously struggled for victory; and, let it be added, notwithstanding the assertions to the contrary, where none committed a positive fault, and where Napoleon, in particular, who has been condemned by some of his own partisans, operated with all the skill and vigour which the circumstances of the moment allowed. Both generals, Napoleon and Wellington, exhibited great abilities in all the combinations of this great battle. Had Grouchy's defeat of Blucher at Ligny caused Blucher to assume an exterior line, the position of Wellington would have been one of great danger; whilst the rapidity and precision of all Wellington's movements seemed to anticipate and frustrate the judicious plans of Napoleon, which were further somewhat neutralized by the misconceptions of some of his own generals. Battles.

This unpleasant operation in war requires even greater skill and firmness than an advance. The Austrians have often conducted theirs with sagacity; and it is perhaps owing to the persevering spirit of their retreats, that, after twenty unfortunate campaigns, the monarchy was as formidable as in the commencement. Their generals are not then controlled by cabinet orders, and therefore always operate with precision. Among the retreats which deserve the study of the soldier, are that of Schulemburg with the Saxons, the Duke of York's out of Belgium, the two retreats of the Archduke Charles, that of Moreau from Bavaria to the Rhine, the Russian retreat upon Moscow and Tula, and, lastly, the final movement of Prince Eugene Beauharnois in Italy. Of retreats.

In the choice of a position, it is not sufficient to have a strong front and to secure the flanks; the means of retreating must also be considered in case of defeat. Lloyd, in his *Reflections on the Battle of Kollin*, observes that a defeated army retires with greater facility by dividing itself into as many corps as the nature of the country will allow; because, 1st, if the enemy form an equal number of divisions, he cannot operate vigorously upon any, and the retiring army having the facility of *reuniting*, may totally defeat one of the hostile corps; 2d, if the enemy operates *en masse* against one, the others fall back unmolested, whilst that division, covered by a strong rear-guard, avoids serious actions, and being able to move more rapidly, because less numerous, can escape without great loss. Bulow maintains that the columns should move outwards or eccentrically; Jomini combats both these opinions. He observes that Lloyd states that by dividing the pursuing forces they are exposed to defeat, but he omits to consider that the manœuvre he recommends to a retreating army, which must be already inferior to the enemy, exposes each division to the same result. He quotes the fine concentric retreat of the Archduke Charles, and might have added the Russian and both Lord Wellington's. But in examining the mechanism of these movements, it appears that none of them was the consequence of a defeat, and especially such defeats as the modern system of attack inflicts; they were merely armies manœuvring back towards their base upon their own lines of operations, watching a favourable opportunity to resume the offensive; or retreats after battles where both parties had claims to the victory, as Benningsen's after Eylau, and Kutusoff's after Borodino. The difference between Lloyd and Jomini is merely in words; for the former points out the facility of uniting two corps, which, if he meant the eccentricity suggested by Bulow, would be impossible.

But an army completely defeated is no longer in the hands of the general, whether he be the Duke of Brunswick or Napoleon. A check, such as the Austrians suffered at Fleurus, and the allies at Lützen, Bautzen, and Dresden, does not prevent the commander from executing the best measures that circumstances will allow. Thus, in the three former, the armies retired in mass; in the latter, they divided into several columns, and thereby not only covered themselves by the mountains of Bohemia, but also applied Lloyd's maxim in uniting two corps to destroy one of the pursuer's at Kulm. Hence circumstances must govern the measure; and if, after a real defeat, a broad river, chain of mountains, or range of fortresses, can be gained in two or three marches, a routed army may be safely divided.

Battles. A retiring army is not always obliged to fall back upon its own frontier; it may sometimes change the direction of its operations, as Frederick did after the siege of Olmutz in 1758, when, instead of returning into Silesia, he changed his line and marched into Bohemia. This measure was also proposed to Napoleon before the battle of Leipzig. He was advised to approach the Elbe, call in the corps of St Cyr from Dresden, cross the river about Wittemberg, and descend by the right bank towards Magdeburg. The Prussian and northern armies, being on the left of the Elbe, could not have prevented the destruction of Berlin, Potsdam, and Brandenburg. And from Magdeburg, reinforced with its vast garrison, and connected with the Danes and the corps of Davoust at Hamburg, he could have operated by a new line, having his communications open by Wesel, Cassel, and all the fortresses of Holland; the allies must have followed him into a sterile country which would not have subsisted their vast cavalry, whilst the sandy roads would have prevented the transport of provisions. There were probably superior reasons, which led him to reject the proposal.

Pursuits. If the art of war consists in applying the superior force of a mass upon a weak point of the enemy, and in case of success to render the defeat decisive, it follows that a defeated army should be pursued with the utmost vivacity. "Never delay till to-morrow" is an ancient military maxim, applicable especially in pursuit; for the strength of an army consists in its organisation, in the unity resulting from the connection of all its parts with the mainspring which makes it move. After a defeat, this unity no longer exists. The harmony between the head which combines and the body which executes is broken; their connection is suspended, often destroyed. To pursue after a successful attack is to march to a certain triumph. All the late campaigns offer signal examples of this truth. Generals of mediocrity often neglect this maxim, and their victories are scarcely more than a forcible removal of their opponents. The direction of the pursuit, though guided by circumstances, should always aim at gaining the hostile line of communications, and thereby cutting off the enemy from his base; because, by so doing, he may be thrown upon such obstacles as to force him to surrender. It may be added, in opposition to what has been said respecting retreats, that the object of the pursuer should be to assume an interior line, and force the enemy to adopt exterior lines, as by separating he is liable to be defeated in detail.

Sieges. Sieges, according to Lloyd, should never be undertaken but with the following views:—1st, When fortresses are situate upon the passages which lead to the enemy, so as to render it impossible to penetrate without capturing them; 2d, when they intercept the communications, and the country is unable to furnish the necessary subsistence; 3d, when they are wanted to cover magazines formed in the country, and thereby to facilitate the operations; 4th, when the enemy has considerable depots within the fortress of which he is absolutely in want; 5th, when the capture of a fortress produces the conquest of a considerable tract of country, and enables the besiegers to winter in that vicinity. To these may be added, 6th, the recapture of a fortress essential in the defence of a frontier.

Covering sieges. As victory is best secured by taking the lead in an operation, an army covering a siege should never wait to be attacked by the enemy, but endeavour to anticipate him; for, by defeating the forces which aim at raising the siege, the place is sure to fall. If the enemy approach the covering army with an imposing mass, the siege should be raised, all the forces united, and an attack in force directed against him. When the relieving army is defeated, the siege should be resumed, while the pursuit continues, and the enemy is not in a condition to return before the capture of the place. When an army besieges a place, in consequence of offensive movements and anterior success, the covering army should not remain in a position near the place, but drive the enemy as far as possible forward; for the relieving army will find the difficulty of raising the siege increase with the distance it is removed from the place.[1]

Warlike Operations at Sea.

PART II.—WARLIKE OPERATIONS AT SEA.[2]

Warlike operations at sea. Referring generally to the articles ADMIRAL and ADMIRALTY, DOCKS, NAVIGATION, NAVY, SEAMANSHIP, and SHIP-BUILDING, for much that appertains to naval war, we shall here direct our attention to that branch of the subject which is commonly designated *Naval Tactics;* and notwithstanding the great alteration which the introduction of steam has produced, and which will be noticed hereafter, it seems desirable to give such an insight into this subject as will enable the results of the change to be better understood. By this term is understood the art of arranging fleets or squadrons in such an order or disposition as may be most convenient for attacking the enemy, defending themselves, or of retreating with the greatest advantage. Naval tactics are founded on those principles which time and experience have enabled us to deduce from the improved state of modern naval warfare, which has occasioned not only a difference in the mode of constructing and working ships, but even in the total disposition and regulation of fleets and squadrons. We here propose to lay down the general principles of naval tactics, and to describe, as briefly as is consistent with perspicuity, the most improved systems which have been adopted in modern times.

Ordinary division of fleets. Fleets are generally divided into three squadrons, the van, centre, and rear, each under the command of a flag-officer. The admiral of the fleet, or chief in command, leads the centre division, while the van is usually commanded by a vice-admiral, and the rear by a rear-admiral. Each squadron is distinguished by the position of the colours in the ships of which it is composed. Thus, the ships of the centre squadron carry their pendants at the main-top-gallant mast head, while those of the van division have their pendants at the fore-top-gallant mast head, and those of the rear at the mizen-top mast head. Each squadron, as far as possible, consists of the same number of ships, and as nearly as may be of the same force. In large fleets, the squadrons are sometimes again divided in a similar manner; the van and rear of the squadron being headed by rear-admirals, or senior captains, called commodores. In the usual mode of forming the lines, each commanding admiral arranges his ship in the centre of his own squadron, and thus the admiral of the fleet is in the centre of the line. When no enemy is in sight, the sloops, store-ships, fire-ships, and other small vessels, are dispersed to windward of the fleet, that they may be more easily supported, and more readily answer signals. The frigates lie to windward of the van and rear of the convoy, thus keeping a good look-out, and keeping the small vessels in their proper station. When the fleet sails in three columns, the centre still keeps in the middle, while the van and rear form the starboard or the larboard column, according to circumstances. These arrangements are called orders of sailing, and will be better understood from the following definitions.

Definitions. The *starboard line of bearing* is that line on which the arranged ships of a fleet bear from each other on a close-hauled line, whatever course they may be steering, so that

[1] The able article in the last edition by Colonel Hamilton Smith has been freely used in the present.

[2] This is adapted from the article in the former edition.

Warlike Operations at Sea.

when the ships haul their wind, or tack together, they may be on a line close hauled upon the starboard tack. The *larboard line of bearing* is that line on which the ships, when hauling their wind, or tacking together, may be formed on a line close hauled on the larboard tack. The ships of a fleet are said to be on *a line abreast* when their keels are parallel to each other, and their main-masts lie in the same straight line. Ships are said to be in a line on the bow or quarter when they are arranged in a straight line cutting their keels obliquely in the same angle, so that, reckoning from any intermediate ship, the ships towards one extremity of the line will be on the bow of that ship, while those towards the other extremity will be on her quarter. When several ships in the same line steer the same course, while that course is different from the line of sailing, they are said to sail chequerwise.

When the ships of a fleet arranged in any of the orders of sailing, and on the same line, perform successively the same manœuvre, as each gets into the wake of the ship that leads the van of the line or squadron, tacking or veering, bearing away or coming to the wind in the same point of the wake of the leading ship, they are said to *manœuvre in succession*.

Illustration of the five orders of sailing.

There are usually reckoned five orders of sailing, exclusive of the line of battle, the order of retreat, &c. In the first order (see figs. 23 and 24), the fleet is arranged on the *starboard* or *larboard* line of bearing, all the ships steering the same course. In these cases the fleet, by hauling the wind when in the starboard line, as in fig. 23, will be ready to form the line on the starboard tack; and when ranged on the larboard line of bearing, as in fig. 24, it will, by tacking, be ready to form the line on the larboard tack. The arrows annexed to the diagrams mark the direction of the wind, as in ordinary charts.

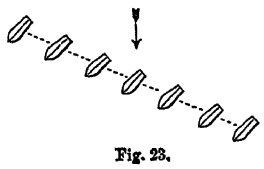


Fig. 23.

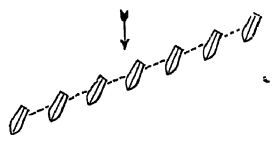


Fig. 24.

This first order of sailing is now seldom employed, except in passing through a narrow strait. In the second order of sailing, the fleet steering any proper course, is ranged in a line perpendicular to the direction of the wind, as in fig. 25. This second order, besides being equally defective with the former, is subject to the additional disadvantage of rendering it extremely difficult for the ships to tack, without each ship falling on board that next astern.

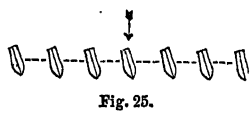


Fig. 25.

In the third order of sailing, the whole fleet is close hauled, and ranged on the two lines of bearing, so as to form an angle of twelve points, having the admiral's ship (A, fig. 26) in the angular point, and the whole fleet steering the same course. Thus, supposing, as in the figure, the wind at north, the starboard division of the fleet will bear W.N.W. of the admiral, and the larboard E.N.E. This order in small fleets or squadrons is superior to either of the former; but when the fleet is numerous, the line will be too much extended.

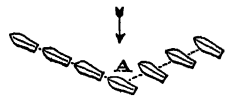


Fig. 26.

In the fourth order, the fleet is divided into six or more columns, and is thus more concentrated. The commanders, ranged on the two lines of bearing, have their squadrons astern of them, on two lines parallel to the direction of the wind; the first ships of each column being, with respect to the commander of the squadron, the one on his starboard and the other on his larboard quarter. The distance between the columns should be such that the fleet may readily be reduced to the third order of sailing, and from that to the order of battle. This order is adapted for fleets or convoys crossing the ocean, and is represented in fig. 27. But as it requires much time to reduce a fleet from this order to that of battle, it is defective when in presence of an enemy.

Warlike Operations at Sea.

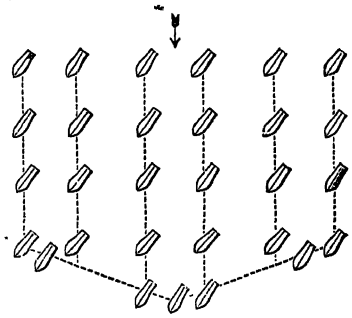


Fig. 27

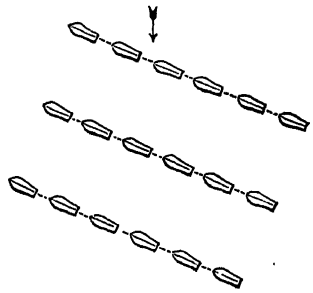


Fig. 28.

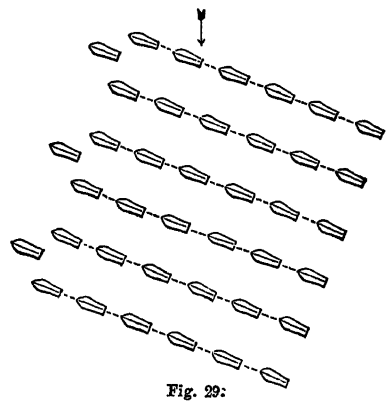


Fig. 29.

In the fifth order, the fleet, close hauled, is arranged in three columns parallel to each other, the van commonly forming the weather, and the rear the lee column. See fig. 28. Fig. 29 represents the same order, except that each column is here subdivided into two, with the ship bearing the commander of each squadron in the centre of each subdivision.

Order of battle.

In forming the order or line of battle, the ships of the fleet are drawn up in a line nearly close hauled, standing under easy sail, so that each ship may be at a certain distance from the ship immediately ahead, as a cable's length, or half that distance. The fireships and frigates ahead and astern form a line parallel to the former, and to the windward of it if the enemy be to the leeward, but to the leeward if the enemy be to windward. This order is denoted by fig. 30, where the fleet is sailing on the starboard tack, with the wind at north.

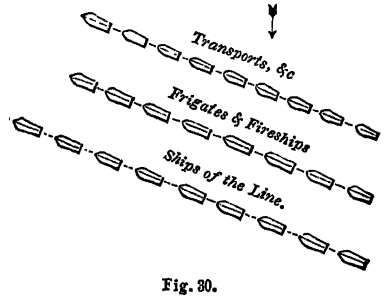


Fig. 30.

Order of retreat.

When a fleet is compelled to retreat before a superior force, it is usually arranged in an order the reverse of the third order of sailing; the divisions of the fleet being ranged in the two lines of bearing, so as to form an angle of 135° or twelve points, the admiral's ship being in the angular point, and the frigates, transports, &c., included within the wings to leeward. See fig. 31, where the fleet is sailing right before the wind. Though any other direction may be taken, the two lines still form the same angle.

Warlike Operations at Sea.

Order of convoy.

The order of convoy is that in which the ships are all in each other's wake, steering in the same point of the compass, and forming a right line. If the fleet is numerous, it

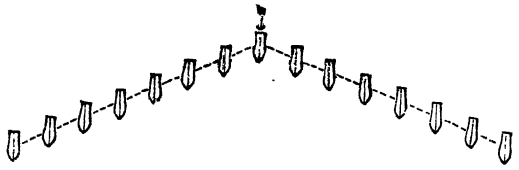


Fig. 31.

may be divided into three columns, which are to be ranged parallel to each other, that of the admiral occupying the centre, and all steering the same course.

Having thus described the ordinary positions of a fleet, we must explain the manœuvres by which they are produced, and beginning with the orders of sailing.

To form a fleet in the first order of sailing, supposing the ships to be in no particular order, that ship which is to lead on the proposed line of bearing for the order of sailing runs to leeward of the greater part of the fleet, and then hauls her wind under an easy sail. Each of the other ships then proceeds to take the proper station by chasing the ship which is to be ahead of her, and when in the wake of the leading ship, adjusts her quantity of canvass so as to preserve the proper distance. The ships thus arranged astern of each other are in the line of battle; and from this the first order of sailing is formed, by each ship bearing away at the same time, and all steering the proposed course.

In forming the second order of sailing, the leading ship runs to leeward of so many of the fleet that each ship may readily fetch her wake, and then steers a course eight points from the wind, under an easy sail. The line is formed by each ship in the same manner as in the first order, except that, before bearing away, the line is perpendicular to the direction of the wind, or each ship has the wind on her beam.

As, in the third order of sailing, the admiral's ship is in the centre, to produce this position, the fleet being formed in a line on one of the lines of bearing, and the ships steering in each other's wake, ten points from the wind, the leading or leewardmost ship first hauls her wind. The second ship does the same as soon as she gets into the wake of the former; and this is done by each ship till the admirals' ships haul their wind, when they reach the wake of the leading ship. At the same time that the admiral's ship hauls her wind, the sternmost half of the fleet does the same. The ships are now in the third order of sailing, from which the fleet can be formed in the line of battle on either tack.

To form the fourth order of sailing, the commanding admirals range themselves on the two lines of bearing, at a proper distance from each other, steering the proposed course; and the ships of the several columns take their respective places, parallel to each other, and forming lines in the direction of the wind.

To form the fifth order, the three leading ships of the divisions take their posts abreast and to leeward of each other, keeping their wind under an easy sail; then the ships of each squadron make sail, and take their respective stations at the proper distance astern of their leaders, while the commanders of each division, and the corresponding ships of each, keep mutually abreast of each other.

In forming from the first order of sailing, if the ships are running large on the tack that answers to the line of bearing on which they sail, and if the line is to be formed on the same tack, all the ships haul their wind at once, or as quickly as possible after the next to windward; but if they be on the other tack with respect to the line of bearing, they all haul their wind and tack or veer together. If the line of battle is to be formed on the other line of bearing, the ship most to leeward veers or tacks, and hauls her wind, while the rest of the fleet veer or tack at the same time, and steer with the wind four points free, and each ship hauls her wind as soon as she gets within the wake of the leader. See figs. 32 and 33.

Warlike Operations at Sea.

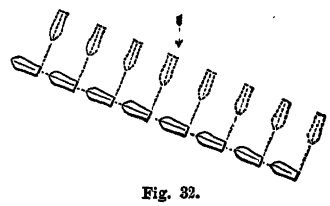


Fig. 32.

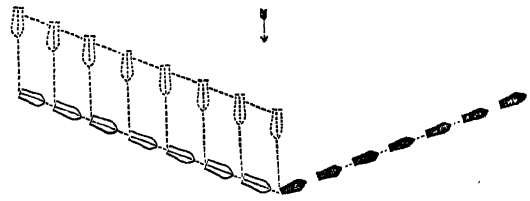


Fig. 33.

Suppose the fleet running before the wind in the second order of sailing. To form the line from this position, all the ships haul up together on the proper tack, presenting their heads eight points from the wind at the line on which they are arranged; the leading ship then hauls her wind, immediately making sail or shortening sail, so as to close or open the order, and the same is done successively by all the rest. See fig. 34.



Fig. 34.

In a fleet running large in the third order, the line of battle is formed by the wing which is in the line of bearing corresponding to the tack on which the line is be formed, and the ship at the angle, hauling their wind together, while the ships of the other wing haul up together eight points from the wind; each ship moving in this direction till she reach the wake of the other wing, when she hauls close up. See fig. 35.

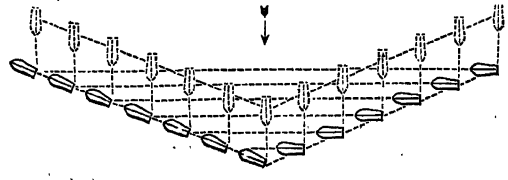


Fig. 35.

In forming the line of battle on the same tack from the fifth order of sailing (as the fourth is not calculated for forming a line of battle) the centre brings to, so as only to keep steerage way; the weather column bears away two points, and when it gets ahead of the centre, hauls its wind, while the ships of the lee column tack together, and crowd sail to gain the wake of the centre, when they retack together, and complete the line. (See fig. 36); or the weather column brings to, while the centre and lee tack together, and bear away two points free. When the ships of the centre column have gained the wake of the van, they retack together, and bring to; and when those of the lee have gained the rear line, they retack together, and all stand on; or, lastly, the lee column brings to, the centre runs under easy sail two points free, to get ahead of the rear squadron, while the rear bears away under a press of sail two points free, to get ahead of the centre division.

Warlike Operations at Sea.

Suppose the weather and centre columns to interchange. To form the lee under these circumstances, the

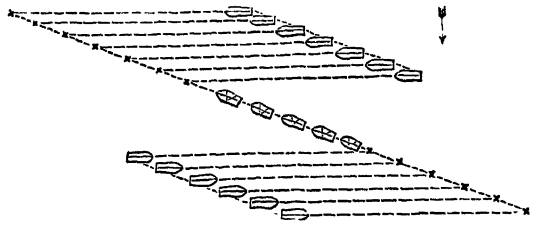


Fig. 36.

centre stands on, while the weather column bears away eight points, and having reached the wake of the centre, which now forms the van, hauls up; the ships of the lee column tack together, and run under a press of sail, within two points free, so as just to gain the rear of the line when they retack together (see fig. 37); or the lee column brings to,

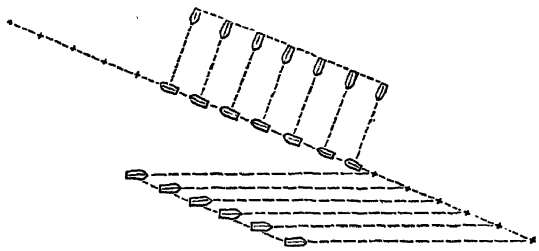


Fig. 37.

while the centre squadron bears away three points under easy sail, and having reached the wake of the van, hauls up to form the centre division.

Suppose the centre and lee columns to interchange. The lee column stands on close hauled under an easy sail; the weather column bears away two points under a press of sail, till it reach the head of the line, when it hauls up; and the centre bears away eight points, and when in the wake of the lee, now the centre, hauls its wind. See fig. 38.

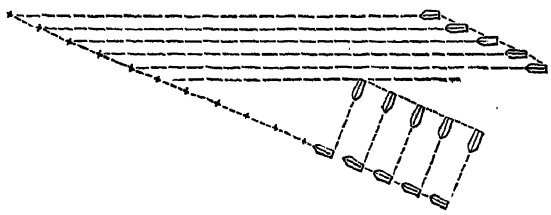


Fig. 38.

If the weather and lee columns interchange, the lee column stands on under a press of sail close hauled, while the centre, under easy sail, bears away two points, and when it reaches the wake of the now van squadron, hauls its

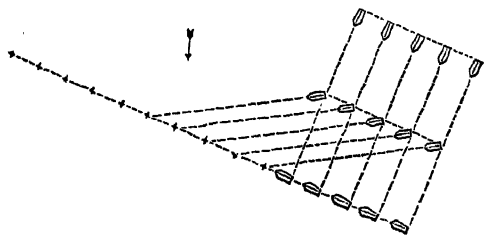


Fig. 39.

wind; and the weather column bears away eight points, hauling up when in the wake of the centre. See fig. 39.

Suppose the centre column to form the van, and the weather the rear division. Here the lee column brings to, while the centre bears away two points, forming the line ahead of the former, now the centre; and the weather column veers away seven points on the other tack, forming the rear squadron. See fig. 40.

Warlike Operations at Sea.

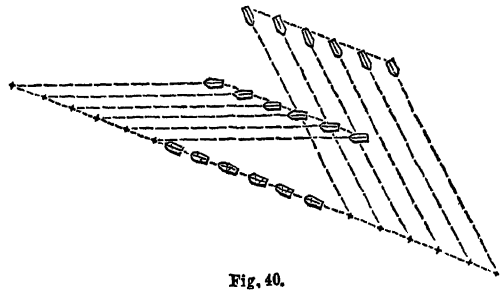


Fig. 40.

To form the line so that the lee column may form the van, and the centre the rear, the lee column is to stand on under a press of sail, while the weather bears away three points under easy sail, and the centre bears away eight points, the ships of each column hauling their wind when in the wake of the now van division. See fig. 41.

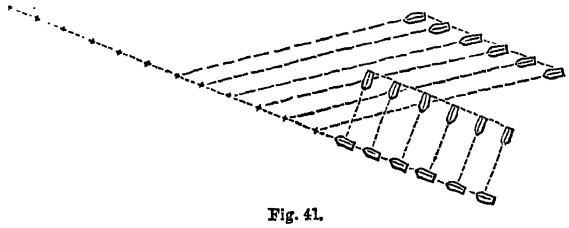


Fig. 41.

If the line of battle is to be formed on the other tack, so that the weather shall form the van division, as in the first case, the ships of the weather column first tack successively, while those of the centre and lee stand on, the former under easy sail, and the latter shortening sail, the leading ships tacking when in the wake of the now van, taking great care that the ships of the centre and lee draw not too near to the sternmost ships of the van, or to each other. See fig. 42.

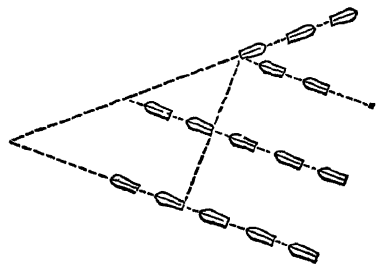


Fig. 42.

To form the line on the other tack, when the centre and weather columns interchange, the weather column brings to, while the centre column stands on, till the leading ship be fully able to clear the weather column, when the ships of the centre tack successively as they reach the wake of the van. The lee column stands on, tacking successively as the ships get into the wake of the van, under moderate sail. See fig. 43.

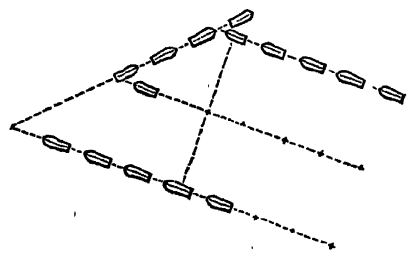


Fig. 43.

In forming the line on the other tack, when the centre and lee interchange, the centre brings to, while the ships of the weather tack under shortened sail, and the lee under a press of sail stands on; the leading ship having gained the wake of the line, tacks, and is followed in succession by

Warlike Operations at Sea.

her division. The centre column fills and stands on, when the first ship of that column, and the last of the lee, bear from each other in a direction perpendicular to that of the wind. See fig. 44.

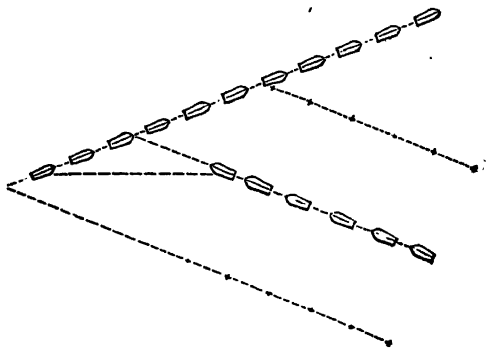


Fig 44.

To form on this same tack, so that the weather and lee may interchange, the weather and centre bring to, while the lee crowds sail till it can pass ahead of the weather column, when the ships tack in succession. As soon as the leading ship of the centre, and the last of the lee, bear from each other in a line perpendicular to the wind, the centre fills, and tacks in succession when in the wake of the now van; and the ships of the weather column do the same when their leading ship and the last of the centre are under similar circumstances. See fig. 45.

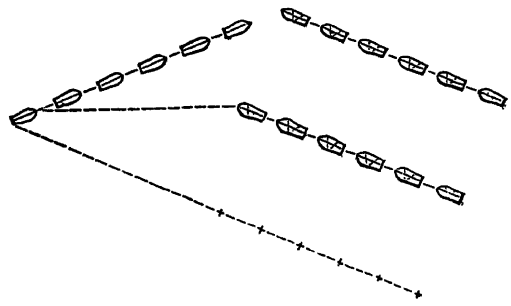


Fig. 45.

Suppose the centre is to form the van, and the weather the rear, in forming the line on the other tack. The weather brings to, while the other columns make sail till they can pass ahead of the former on the other tack, when they tack successively. The weather column, when the others have passed it, fills and tacks to form the rear. See fig. 46.

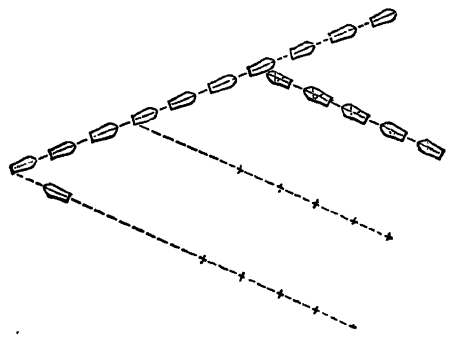


Fig. 46.

Suppose now the lee column is to form the van. The weather and centre bring to, while the lee crowds sail. and tacks when it can pass ahead of the weather column, When the last ship of the now van has passed to windward of the former weather column, the van shortens sail, to give time for the other columns to form, and the weather and centre fill at the same time, to gain the wake of the van, when they tack in succession. See fig. 47.

Warlike Operations at Sea.

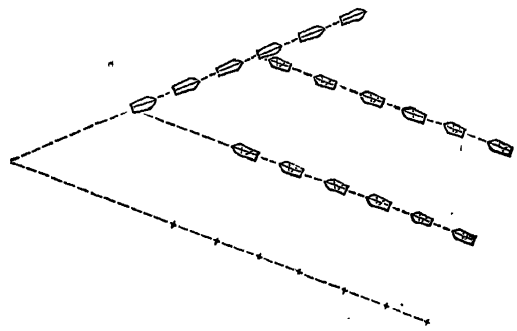


Fig. 47.

It may now be shown how a fleet may be disposed in the principal orders of sailing from the line of battle; and here, as before, we have several varieties.

1. To form the first order of sailing from the line of battle on the same tack, all the ships are to bear away together as many points as the admiral may direct, keeping in the line of bearing for the proper tack. The sternmost first bears away, and the others follow in quick succession, to avoid running foul of each other.

2. If they are to form on the other tack, the leading ship bears away four points to leeward, and the rest follow in succession. The sternmost ship having bore away, the whole haul up, and will be in bearing for the line on the other tack. See fig. 48.

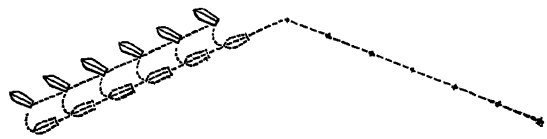


Fig. 48.

3. To form the second order of sailing from the line of battle, the whole fleet is to bear away together ten points, so that when the headmost ship, which first presses sail, shall come abreast of the second ship, the second ship must adapt her sail to keep in this bearing, and so in succession, each taking care to keep the preceding ship in a line with herself, perpendicular to the direction of the wind. The whole fleet will now be before the wind. See fig. 49.

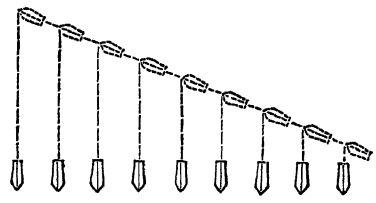


Fig. 49.

4. To form the third order, the whole fleet is to bear away together ten points, the headmost half, including the centre ship, carrying a degree of sail to preserve their line of bearing, while each of the remaining ships is successively to shorten sail, so as to form the other line of bearing with respect to that on which they were before arranged. See fig. 50.

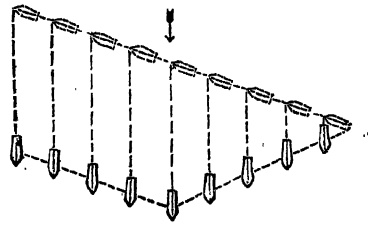


Fig. 50.

5. To change from the line of battle to the fifth order on the same tack. Of this evolution there are several varieties, but we shall mention only two; first, when the van is to form the weather, and the rear the lee column, and the fleet to keep as much as possible to windward. In this case the van and centre tack together, and run close hauled in

Warlike Operations at Sea.

bow and quarter line, while the rear proceeds in its former course under easy sail. When each ship of the centre is abreast of the corresponding ship of the rear, the centre retacks, while the van stands on till the centre and rear come up, when it also retacks, and all the columns regulate their distances. Secondly, when the van is to form the lee, and the rear the weather column, the van bears away under easy sail, and goes at right angles with the line ahead, while the centre runs two points free, each ship steering for that ship of the van which is to be abreast of her when in column. The distance must be determined by the leader of the van, who is not to haul up with her division till she and the sternmost ship of the centre column are in a line at right angles with the wind, when both stand on under easy sail, while the rear crowds sail to pass to windward of both.

6. To form the fifth order of sailing from the line of battle on the other tack. Of this there are also several varieties, but two only will be noticed. First, when the van is to form the weather, and the rear the lee column, the van tacks in succession, while the leading ship of the centre is to tack when the leader of the van passes him exactly to windward, in which she is followed by her division, and the rear manœuvres in the same manner with respect to the centre. Secondly, when the rear is to form the weather and the van the lee column, the van tacks in succession, and when about, either shortens sail or brings to, to allow the other columns time to form. The centre and rear then crowd sail, and tack in succession; the former tacking when its leader has the centre of the lee column in a line at right angles with the wind, or when its centre passes astern of the lee column. When the centre has tacked, it regulates its rate of sailing by the lee, and both wait for the rear to pass to windward. The rear tacks when the leader has the first ship of the lee in a line at right angles with the wind, or when its centre ship passes astern of the centre column.

The preceding descriptions of the several evolutions of a fleet, principally derived from the works of Mr Clerk, are sufficient to explain the nature of naval tactics. At the time they were originally drawn up, every movement of a ship was dependent on the wind, and hence it was the great object of a fleet to get to windward of the enemy, so as to be able to select the most fitting point of attack, and to bear down upon the hostile fleet in the required direction, having in the wind a power at command. If, however, the advantage of a fair wind enabled the one fleet to make choice of the point where it was presumed the most decisive blow could be struck in respect to the action itself, the fleet attacked possessed the same in respect to retreat, and a battle could scarcely be rendered decisive unless fought under circumstances or in a position which rendered defeat decisive by cutting off the possibility of retreat. In these particulars naval warfare closely resembled warfare on land, as facility of retreat enables a defeated army to retire, and, falling back on its reserves to rally, and, when sufficiently reinforced, to resume the conflict. As, then, with a land army, it is necessary in order to obtain a decisive result either to intercept the communication of the enemy with his base of operations, or to bring him to action in a position where retreat, in case of defeat, is cut off by natural obstacles; so also a fleet should, if defeated, be unable to return into port, be forced to separate so as to fall an easy prey to detachments sent in pursuit, or by the very nature of the position obliged to surrender, or to run either ashore or on the rocks. Whilst, therefore, there was always a certain similarity in the principles of war, whether carried on at sea or on land, even when the necessity of having the wind, as a moving power, crippled or restricted most of the movements, it may be now said, that the principles of land and maritime war will be still more assimilated, since steam, having replaced wind, both parties have nearly an equal facility in moving, though even now the wind, when it rises beyond a very moderate limit, will prove a source of advantage or disadvantage to one or other of the parties, and equality will only exist when in a perfect calm there is an absence of all disturbing influences. This change, combined with the wonderful improvement of artillery, will doubtless encourage the use of smaller vessels, which will now be able to act at a distance against large ships, just as batteries do against a fortress. The use of ships as battering-rams, the casing of ships with iron plates so as to resist shot, are amongst the natural results of the introduction of steam as a motive power, and of the great improvement of artillery. Clerk explained well the general principles of naval tactics as suited to the then powers of locomotion, and Nelson carried them out to perfection. The French claim for the gallant Suffren the merit of adopting a similar bold system of naval tactics in the East Indies, and there can be no doubt that he there displayed great nautical skill; but it was reserved for Nelson at Trafalgar to carry naval renown, whether founded on superior seamanship or the characteristic bravery and personal fitness of English sailors, to the highest pitch. The French and Spanish fleet was drawn up in one extensive line, and the English fleet bore down upon it in two columns, one led by Nelson in the Victory, and the other by Collingwood in the Royal Sovereign, and whilst the enemy's line was, almost by compulsion, nearly immovable, the advancing columns, regardless of the enfilade fire of the enemy, came down upon the line, breaking it into distinct sections, and, engaging the ships marked out for attack as each column came up, had the manifest advantage of bringing an overpowering force to bear on the ships engaged, placing them often between two fires, and cutting them off from assistance or support. The glorious victory which followed was dearly purchased by the loss of the unparalleled naval hero Nelson, to whose surpassing merit, as a sailor of genius as well as of valour Rear-Admiral Comte E. Bouët Willammez does ample justice, even whilst paying a just tribute to the valour of his own countrymen.

Warlike Operations at Sea.

Nelson is gone, and some successor to him in fame will doubtless mark out a system of naval tactics more suited to the wants of the present day. It is believed that the superiority of English sailors remains unchanged, and therefore will have its weight in any future engagement, for to be at ease on board ship, a man must be a real sailor; but new systems are necessary for the most efficient application of a new motive power and improved weapons of war. A reference to fig. 51, and a full consideration of the nature of the movements on the great day of Trafalgar will satisfy every one that naval victories cannot now be won, even by British fleets, in the manner they were formerly gained. It is manifest that the success of the bold manœuvre of Nelson was mainly due to the comparative immovability of the French and Spanish fleet. Had the ships of the French line been steamers, they would have changed their position, and not only brought a heavy fire to bear on the advancing columns, but have formed lines exterior to those of the British fleet, so as to have placed the latter between two fires. Naval history records an example of a single ship placing herself between two Spanish ships, and when the engagement had fairly commenced, running ahead and leaving the two Spanish ships to continue firing into each other, unconscious, in the smoke, that the hostile ship was not between them. Such a skilful manœuvre was exceptional, and not likely to be applicable to more than single ships. Indeed, a conversion of the main line such as that suggested would rather lead to the formation of two lines, meeting at an angle in the centre, and embracing the two advancing columns, than to that of two

Warlike Operations at Sea.

distinct lines, as before observed; but in either case it is clear that naval warfare must be carried on in a different

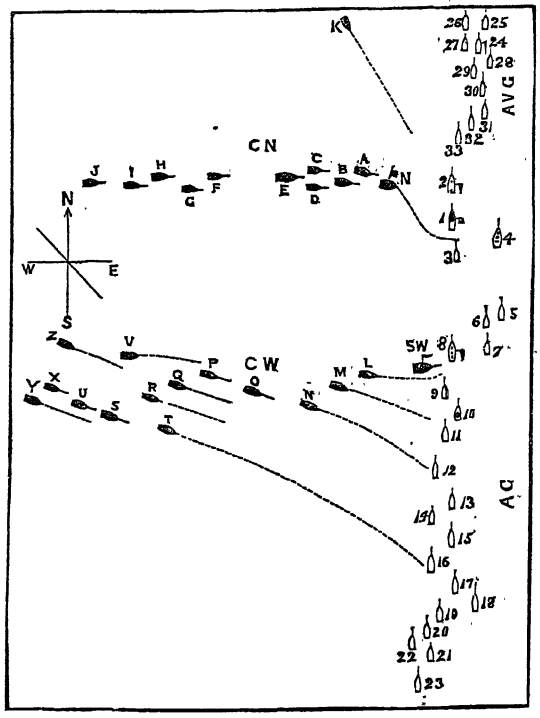


Fig. 51.[1]

way, and that the immense advantage which steam and the improvement of artillery have conferred on small ships, which will now represent in naval warfare the light troops or riflemen of the land service, cannot be overlooked. In any new scheme of naval tactics, the movements of small ships in approaching large must be taken into consideration, as well as the best mode of combining the action of large and small ships—both in attack and defence, in advance and in retreat. Admiral Comte Bouët Willammez has sketched such a scheme of naval tactics, suitable, in his opinion, to steam-ships, and it in principle assimilates the combinations and movements of naval to those of land warfare, a result which was to be expected, now that the power of moving at will, and in any direction, has been conferred by the application of steam. He justly concludes his description by this remark: "A new system of tactics, designed for a new description of fleet, can only be the work of time and of experience; but in order that any work should come to maturity it is necessary that it should have a beginning. Nobody has as yet undertaken the solution of this difficult problem, since the screw steamer has threatened to exclude the sailing vessel from the arena of war, and I have therefore taken the initiative. Eight simple or compound orders, and the numerous operations which flow from them, have been described, but it must not be supposed that all will be in general or even in frequent use, though the sailor should accustom himself to study and to know all the cases which may occur in the conduct of a fleet under all conditions."

Warlike Operations at Sea.

No remarks on the general operation of war can be considered at the present time complete, unless they include some notice of the probable effects upon the art of war of the great improvement in firearms. With the ancients, as the means of projection were inferior, the chief reliance was upon the arms used in close conflict, either the sword or the spear; but even then the sling, the bow, the catapulta, &c., in the hands of cool and skilful men, were capable of producing most important results. Coming to more modern times, the yew-bow of the English archer, and the cross-bow of the Genoese, were recognised as most important weapons, often throwing troops into confusion, and preparing the way for more close attack. It might have been expected that the invention of gunpowder, by supplying a more perfect projecting power, would have given pre-eminence to the weapon invented for firing over that used in the charge; or, when the musket had, by the addition of a bayonet, combined the advantages of a pike with those of a firearm, the former would seldom be resorted to, and that the success of battles would depend almost entirely on the fire of both artillery and musketry, and little on the charge by the bayonet. The imperfect construction of the first firearms, the rude manufacture of the gunpowder, did much to counterbalance the advantages gained by the use of firearms; and though the attention paid to artillery soon made that arm formidable in war, the little instruction given in the art of musket-firing rendered it in practice comparatively so harmless, that Marshal Saxe considered it illusory, and Suwarrow accustomed his soldiers to look upon it as a mere folly, and to trust only to the bayonet. General Warnery strongly complained of the little attention paid to the musketry training of soldiers;

---

[1] *Battle of Trafalgar.*

French and Spanish Ships.
English Ships.
A V G. Advanced Guard of the Franco-Spanish Fleet.
A G. Rear-Guard of the Franco-Spanish Fleet.
C. N. Nelson's Ships.
C.W. Collingwood's Ships.

English Fleet.

N. Victory (Nelson).
S.W. Royal Sovereign (Collingwood).
A. Temeraire.
B. Neptune.
C. Conqueror.
D. Leviathan.
E. Britannia.
F. Agamemnon.
G. Ajax.
H. Orion.
I. Minotaur.
N. Spartiate.
K. Africa.
Z. Prince.
V. Dreadnought.
L. Belle-Isle.
M. Mars.
N. Tonnant.
O. Bellerophon.
P. Colossus.
Q. Achilles.
R. Polyphemus.
S. Swiftsure.
T. Revenge.
U. Defiance.
X. Thunderer.
Y. Defence.

Franco-Spanish Fleets.

(F. marks the French Ships, S. the Spanish.)

1. Bucentaure, F.
2. Santissima-Trinadadà, S.
3. Redoubtable, F.
4. Neptune, F.
5. San-Leandro, S.
6. San-Justo, S.
7. Indomptable, F.
8. Santa-Anna, S.
9. Fougueux, F.
10. Monarca, S.
11. Pluton, F.
12. Algesiras, F.
13. Bahama, S.
14. Aigle, F.
15. Swiftsure, F.
16. Argonaute, F.
17. Montanez, S.
18. Argonauta, S.
19. Berwick, F.
20. Juan-Népomucène, S.
21. San-Ildefonse, S.
22. Achille, F.
23. Prince-des-Asturies, S.
24. Formidable, F.
25. Scipion, F.
26. Neptuno, S.
27. Intrépide, F.
28. Rayo, S.
29. Duguay-Trouin, F.
30. Mont-Blanc, F.
31. San-Francisco, S.
32. San-Augustino, S.
33. Néros, F.

Warlike Operations at Sea.

but even had the attention now bestowed on this subject in our schools of musketry been then displayed, the imperfection of the weapon would have rendered its performances unsatisfactory. M. Léon Marès states, that by experiments at St Omer, in 1846–1849, it was found that at 100 mètres (110 yards) 47 per cent. of the balls fired struck a target 6½ feet high and 22 inches wide, at 192 yards 20 per cent., whilst at 440 yards only 7 per cent., struck a target 6½ feet high and 13 feet wide, so that the common musket was not sufficiently precise to turn to the best account even the skill of a good marksman; and taking into account the probable disturbance of the equanimity of a soldier in the field of battle, the interference of smoke, and the uncertainty as to distance, it was quite unequal to the wants of the soldier; although it cannot be doubted that the fire even of old Brown Bess at 110 yards, in the hands of men whose nerves were unshaken by the sight of an advancing enemy, was and would be very destructive.

The introduction generally into our service of the rifle, or as it is called by the French, an arm of precision, has totally altered the properties of the musket; for whilst with its bayonet it retains its merits as an admirable weapon for close quarters, it has acquired the power of being used with advantage and certainty at distances which would formerly have appeared incredible. The rifle was indeed used with great success in the chase, so far back as the end of the fifteenth century; but it is only recently that the tedious mode of forcing the ball into the barrel by the aid of a mallet and of an iron ramrod, has given way to the ingenious use of the principle of expansion, as applied to a bullet under the influence of the gases produced by the explosion of the charge. The same principle has been applied to cannon; and although the greater weight of the projectiles had before enabled the skilful gunner to attain a high degree of accuracy, the rifling of guns, and the saving of windage consequent on the expansion of the material used as a coating to the ball, have together conferred on cannon an accuracy and an extension of range quite proportionate to that gained by the musket. It might have been supposed that such improvements would have raised the musket in the estimation of soldiers, and so, it is believed, it really has, though some military men still speak disparagingly of it as compared with the bayonet; and the celebrated words of the present Emperor of the French have without doubt tended much to strengthen this delusion. "The new arms of precision are dangerous only at a distance; they will not prevent the bayonet from being, as formerly, the terrible arm of the French infantry."

Let us merely consider what ought to be the conduct of an army waiting in line whilst an enemy is advancing to the attack. Now, supposing the infantry, not at the moment harassed by the fire of artillery, observe the enemy halt and prepare to fire; soldiers selected as being skilful judges of distances, then give the word "sight," and they then calmly fire and reload. This may be repeated at intervals, and in every case with deadly effect. Or the men may be lying down with their muskets sighted to a particular distance, and, warned by the men on look-out, rise and fire at the exact moment. If troops are to fire whilst advancing, they should do so in the same manner, look-out-men giving the order to fire at the exact moment, the muskets being then at once loaded and sighted to a new distance, say 100 or some definite number of yards in advance. All this being made a portion of ordinary drill, it is evident that success in defence, or even in attack, would greatly depend on accuracy of judgment as to distance, and perfect coolness as to action. Much of the effect of the bayonet is moral; and there can be no doubt that if soldiers lose their coolness when they see an enemy advancing to the charge, their last fire, which ought to be decisive, will fail in accuracy and do little harm, whilst they will turn tail, and not wait the enemy to cross bayonets with them. M. Marès rightly observes, that French soldiers ought not to rely on the permanence of this state of things, but should expect that the time may come when they will meet an enemy acting in defence with the same calmness and firmness, as they display boldness in the attack. Doubtless he had English soldiers in his mind when he penned these words.

Warlike Operations at Sea.

By many it is supposed that the improvement of artillery has maintained its superiority to musketry; but there can be little doubt that skilful riflemen, hovering in front of uncovered guns, will find the means of picking off the men and shooting the horses, so as still to do, what they have on other occasions done, hold a battery in check. Reserve guns may indeed act at a distance; but unless they keep light troops in front of them, it cannot be expected that they will be allowed to continue long undisturbed. Napoleon III. would indeed have been right in saying that the new arms of precision would not materially affect the system of war, had he simply meant that the bravest and most skilful soldiers would still be the most successful.

The effect of rifled cannon on naval warfare has been already noticed, in assimilating ships to fortresses, but with this difference, that the ship is totally exposed, whilst the fortress on land is so covered that the fire of guns at a great distance is nearly as harmless as they would have been even when unimproved. In defence, the fortress on land evidently gains by the increased power of guns and accuracy of fire; and there will doubtless be in consequence much modification of the science of fortification. But the really great question is, how far the improvement of firearms conduces to the safety of Great Britain; and that deserves especial consideration. In the first place, it may be considered as demonstrated that the principal force of infantry consists in its fire; and that, however valuable ordinary drill may be to the soldier in accustoming him to move with regularity, and thus to place himself in every required position almost by instinct, the importance of accurate firing has increased with the improvement of the musket, and now far outweighs that of drill. In fact, it may be said that pliability of muscle, flexibility of body, and skill in firing, will tell in the field, when the stiffness and niceties of equipment so rigorously enforced on the parade in the English army, have been, as a matter of necessity, laid aside. It is, however, equally certain that the bayonet exercise ought to be practised diligently by our soldiers as it is by the French, the command of that weapon giving confidence, and enabling a soldier to contemplate the advance of an enemy with composure, if not with contempt.

To render irregular troops or volunteers expert with the bayonet will probably be impossible; but to render them skilful marksmen, just as their ancestors were skilful archers, will be a comparatively easy matter; and there can be no doubt that rifle firing will now become the national pastime. The light infantry movements which are suited to this class of soldiers, require indeed much practice and great intelligence and quickness; but such qualities are just those which may be expected in the volunteers; and there can be no doubt that manœuvres suited to them are, in their character, more independent and less revolting than the stiff and restrained tactics of the line soldier. Should the volunteers be ever required to stand firm on the advance of regular troops, it is by the use of a pistol rather than of a bayonet that they should rely in repelling them. A double-barrelled pistol in his girdle on one side, and a dagger on the other, a brave, collected man, however little drilled, might, after firing his last close discharge with effect, wait coolly the attack of his enemy with a certainty of destroying him.

Warlike Operations at Sea.

We have already commented on the difficulty of artillery, unless covered, maintaining their ground against skilful marksmen, taking advantage of the features of the ground, and creeping up within 800 or 1000 yards of a battery. If artillery be simply obliged to keep their distance, much will be gained, as the eye will be required to aid itself by telescopic sights to ensure that accuracy of which the gun is capable. The fire of cannister has hitherto been the most destructive; but artillery can hardly expect to be brought so near as is necessary for the effective fire of that description of missile; and although the Armstrong projectile has been so contrived as in part to supply the place of the Shrapnell shell, the effect of those fearful discharges of cannister, which were so conducive to the success of many of Napoleon's battles, are far less likely to be witnessed with modern artillery under the altered contingencies of war. It may indeed be said, that the fire of well-trained infantry, armed with the rifled musket, will partake of much of the character of cannister; cavalry will be unable to approach such infantry with any chance of success; and though for foraging, reconnaisances, and especially for pursuit, cavalry must be retained, they will doubtless be made as light, both as regards men and horses, as possible.

M. Léon Marès has concluded his observations on "*Des Nouvelles Armes Rayées* (Paris, 1860), in terms so sensible, that, although not those of a military man, they are deserving the attention of both soldiers and statesmen:—

"From all which has been stated, it may be concluded, that infantry have acquired, from the use of the new arms, an additional importance in fields of battle, more particularly when acting as independent riflemen, provided only that their discipline is sufficient to enable them to act correctly under command, or rather to be under the influence of a guiding authority. Hence it is that militia, volunteers, or national guards, if duly trained to fire well, are a force which will henceforth throw a great weight into the scale of war, and ought therefore to be most carefully organised. Since, indeed, the least accident of ground, or the most simple intrenchment, is sufficient to afford cover to infantry, the rifled musket acquires in action the utmost value, since a small number of discharges, or even a single discharge, well directed, will be sufficient to destroy or cripple an advancing force. Under such an influence, the value of light cavalry will increase, whilst that of heavy cavalry will diminish; and even artillery, whatever may be the precision and increased range of its fire, will never, when uncovered, be able to defend itself against riflemen, unless supported by infantry equally skilled in musketry fire. At greater distances, the fire of artillery against masses of troops will be more formidable than ever, and hence the ground best calculated to shelter the troops, and to facilitate the approach of riflemen intended to hold it in check, should be selected.

"Lastly, it may be asked, what effect this great improvement of the weapons of destruction has had on the moral advancement of mankind? When it is reflected how great must be the advantage in defence of an accurate knowledge of the ground, it may be fairly said that the new arm, when wielded by a skilful hand, confers strength on weakness, and powerfully assists the attacked against the aggressor. The arm which permits infantry to fight with advantage against cavalry and artillery is that expressly fitted for poorer people when contending against richer, for it is the latter who may best incur the cost of the most expensive armaments. The arm which requires more especially for its construction a knowledge of mechanical processes, and for its successful manipulation, contempt of danger, coolness, and intelligence, is the arm of intelligence; and again, the arm which permits the mass of the people, if properly trained, to take an active and effective part in war is the arm of a free people, for it is only the citizens of a free country who can be allowed to remain armed without danger to themselves or their neighbours. It is well, therefore, that weakness should be protected against strength, liberty and independence against despotism."

Such sentiments as these from a Frenchman, unprejudiced by mere military feeling, are most gratifying; and it may be fairly deduced from the maxims of common sense, that though steam has facilitated the transport of troops, and thereby the invasion of our country, the general improvement of the weapons of war has been entirely in favour of the preservation of our liberties and independence. In landing on our coast, boats must be used, and a cloud of small steamers, issuing from all the small ports, and constructed, as many of the ancient galleys were, to run into and sink both small vessels and boats, would either render landing impossible, or throw the troops endeavour to land into such disorder as to render them easy of conquest after landing. Even, however, presuming that they have landed, can it be doubted that a comparatively small number of highly trained soldiers, prepared either to make a stand, or to attack at any moment, and covered on all sides by a cloud of skilled marksmen, would restrain the ardour, and stop the progress of the invading army. The great Napoleon anticipated, as Jomini informs us, that the transports in which troops intended for invasion were embarked, would have been convoyed by a fleet of 60 sail. One of two courses must certainly be adopted in such an enterprise; either the ships of war must precede the transports and fight a battle to clear the way for their advance, or must act as a convoy in the manner supposed by Napoleon, but in either case can we imagine that our channel fleet, even if inferior in number, could fight such a battle without destroying and crippling a large portion of the enemy's ships; and thus, even if not entirely victorious, they would leave the transports and boats open to the attack of gun-boats, and the smaller steamers which have been alluded to, with very little help or support from their larger ships. Such a naval battle could not be fought without calling the attention of artillery, cavalry, and infantry, both regular and volunteer, to the threatened point of landing, where they would be ready to make a first determined effort of resistance, of which the consequences upon the army would be nearly the same as those of the great conflict on the sea upon the enemy's fleet. (C.H.S.) (J.E.P.)

Warasdin ‖ Warburton.

WARASDIN, a fortified town of Austrian Croatia, capital of a county of the same name on the right bank of the Drave, 35 miles N.N.E. of Agram. It is well built, and has many fine edifices and several extensive suburbs. It is the seat of a court of justice and of an administrative board for the county, and has an old castle, nine Roman Catholic churches, a nunnery with girls' school, a Roman Catholic gymnasium, and other schools. The chief manufactures are silk, earthenware, tobacco, and vinegar; and there are extensive vineyards in the vicinity. Pop. (1854) 8607.

WARBURTON, ELIOT BARTHOLOMEW GEORGE, author of the *Crescent and the Cross*, was sprung from an old Cheshire family, who had settled early in the county Galway, Ireland, where he first saw the light in 1810. After graduating at Trinity College, Cambridge, he was called to the bar, but soon ceased to practise. He first became known to the world in 1845 as the author of the brilliant book of Eastern travel entitled the *Crescent and the Cross*. This work had reached the 15th edition in 1859. Since then the author wrote numerous works of more or less note, such as *Prince Rupert and the Cavaliers*; the *Life of Charles Mordaunt, Earl of Peterborough*; *Memoirs of Horace Walpole and his Contemporaries*; *Hochelaga*; *Darien, or the Merchant Prince*, &c. He lost his life in the ill-fated ship Amazon, which was burnt when on her voyage to America, off the Land's End, on the 4th January 1852.

WARBURTON, *William*, a learned and distinguished writer, descended from an ancient family in Cheshire, was the eldest son of George Warburton an attorney at Newark in the county of Nottingham, and was born on the 24th of December 1698. He was first sent to school there under a Mr Twells, but had the chief part of his education at Okeham in Rutlandshire, where he continued till the beginning of the year 1714. He then returned to his native town, and for a short time was under the care of his cousin William Warburton, who had recently been appointed head-master of Newark school. Being destined for the profession which had been followed by his father and grandfather, he was placed as a clerk to an attorney of East Markham in Nottinghamshire, with whom he continued till April 1719, when he was qualified to engage in business on his own account. Having been admitted as an attorney of one of the courts at Westminster, he settled at Newark, where he continued to practise for some years. His father had died about the year 1706, leaving a widow and five children. Warburton's success as a country attorney does not appear to have been very considerable, but he was destined to reach an eminent station in another profession.

He had always expressed a strong inclination to take orders; and the love of letters, which tended to retard rather than forward his progress in the profession chosen for him by his friends, growing every day stronger in him, it was deemed expedient to give way to that inclination. He therefore devoted himself to the studies necessary to fit him for the church, and at length in 1723 he was ordained deacon, and priest in 1727. In 1728 he was presented by Sir Robert Sutton to the rectory of Brand-Broughton, in the diocese of Lincoln, where he spent the greater part of his life, and composed all the great works which will carry his fame down to posterity. During the same year he was put upon the king's list of Masters of Arts, created on his majesty's visit to the University of Cambridge. He had already published some juvenile performances, which displayed genius and reading, and attracted considerable notice; but it was not till the year 1736 that he may be said to have emerged from the obscurity of a private life into the notice of the world. The first publication which rendered him famous now appeared, under the title of *The Alliance between Church and State; or, the Necessity and Equity of an Established Religion and a Test Law; demonstrated from the Essence and End of Civil Society, upon the fundamental Principles of the Law of Nature and Nations.* Warburton.

At the close of the Alliance was announced the scheme of the Divine Legation of Moses, in which he had then made considerable progress. The first volume of this work was published in January 1737–8, under the title of *The Divine Legation of Moses demonstrated on the Principles of a religious Deist, from the Omission of the Doctrine of a future State of Rewards and Punishments in the Jewish Dispensation, in six books.* The arrogance of the author was at least equal to his learning; and this work, as he afterwards observed, was fallen upon in so outrageous and brutal a manner as had been scarcely pardonable had it been "The Divine Legation of Mahomet." It produced several answers, and so much abuse from the authors of *The Weekly Miscellany*, that in less than two months he was constrained to defend himself in *A Vindication of the Author of the Divine Legation of Moses.* His extraordinary merit had attracted the notice of the heir-apparent to the crown, in whose immediate service we find him in June 1738, when he published *Faith working by Charity to Christian Edification, a Sermon.*

Pope's *Essay on Man* had now been published some years; and it has sometimes been supposed that the author had, in the composition of it, adopted the philosophy of Lord Bolingbroke, whom on this occasion he had followed as his guide, without understanding the tendency of his principles. In 1738, M. de Crousaz wrote some remarks on it, accusing the author of Spinozism and naturalism; which falling into Warburton's hands, he published a defence of the first epistle, and soon afterwards of the remaining three, in seven letters; of which six were printed in 1739, and the seventh in 1740, under the title of *A Vindication of Mr Pope's Essay on Man, by the author of the Divine Legation.* The opinion which Pope conceived of these defences, as well as of their author, will be best seen in his letters. In consequence, a firm friendship was established between them, which continued with undiminished fervour until the death of Pope; who, during the remainder of his life, paid a deference and respect to his friend's judgment and abilities, which will be considered by many as almost bordering on servility.

Towards the end of the year 1739, Warburton published a new and improved edition of the first volume of the *Divine Legation:* and in 1741 appeared the second part, which completed the argument, though not the entire plan of that work; "a work," says Bishop Hurd, "in all views of the most transcendent merit, whether we consider the invention or the execution. A plain simple argument, yet perfectly new, proving the divinity of the Mosaic law, and laying a sure foundation for the support of Christianity, is there drawn out to great length by a chain of reasoning so elegantly connected, that the reader is carried along it with ease and pleasure; while the matter presented to him is so striking for its own importance, so embellished by a lively fancy, and illustrated from all quarters by exquisite learning and the most ingenious disquisition, that in the whole compass of modern or ancient theology there is nothing equal or similar to this extraordinary performance."—(See Hurd's *Life of Warburton*, prefixed to his works.)

This is the panegyric of a man reflecting with tenderness on the memory of his friend and benefactor; but it approaches much nearer to the truth than the censures of those cabalistic critics who, fastening upon some weak part of the *Divine Legation*, or perhaps never having looked into it, have ridiculously contended that the author was far from being eminent as a scholar, and that his work is inimical to the cause of Christianity. Putting partiality aside, there is in the *Divine Legation of Moses* abundant

Warburton.

evidence of the malignant folly of this charge, as no man can read and understand that work without being convinced that its author was a Christian, not only sincere, but zealous; that he was what Johnson calls him, "a man of vigorous faculties, of a mind fervent and vehement, supplied, by unlimited and incessant inquiry, with a wonderful extent and variety of knowledge, which had neither depressed his imagination or clouded his perspicacity; and that to every work, and this work in particular, he brought a memory full fraught, with a fancy fertile of original combinations, exerting at once the powers of the scholar, the reasoner, and the wit. But his knowledge was too multifarious to be always exact, and his pursuits too eager to be always cautious."

In the summer of 1741, Pope and Warburton, in a country ramble, took Oxford in their way. The university was naturally pleased at the arrival of two such strangers, and seemed desirous of enrolling their names among their graduates. The degree of D.D. was intended for the divine, and that of LL.D. for the poet. But intrigue and envy defeated this scheme; and the university lost the honour of decorating at the same time the two greatest geniuses of the age, by the fault of one or two of its members. Pope retired with some indignation to Twickenham, where he consoled himself and his friend with the sarcastic reflection—"We shall take our degrees together in fame, whatever we do at the university."

The friendship of this eminent poet was of service to Warburton in more respects than that of increasing his fame. He introduced and warmly recommended him to most of his friends, and among others to Murray, afterwards earl of Mansfield, and Ralph Allen of Prior Park. In consequence of this introduction, we find Warburton at Bath in 1742. There he printed a sermon which had been preached at the Abbey-church on the 24th of October, for the benefit of Allen's favourite charity, the General Hospital or Infirmary. During this year also he printed *A Dissertation on the Origin of Books of Chivalry*, at the end of Jarvis's preface to a translation of Don Quixote; of which Pope tells him he had not got over two paragraphs before he cried out, *Aut Erasmus, aut Diabolus.*

In 1742, Warburton published *A Critical and Philosophical Commentary on Mr Pope's Essay on Man.* It was at this period, when he had the entire confidence of Pope, that he advised him to complete the *Dunciad*, by changing the hero, and adding to it a fourth book. This was accordingly executed in 1742, and the poem was published early in 1743, with notes by Warburton; who, in consequence of it, received his share of the abuse which Cibber liberally bestowed on both Pope and his annotator. In the latter end of the same year he published complete editions of *The Essay on Man*, and *The Essay on Criticism*; and from the specimen which he there exhibited of his abilities, it may be presumed Pope determined to commit to Warburton's care the publication of those works which he should leave behind him. At Pope's desire, he about this time revised and corrected the *Essay on Homer*, as it now stands in the last edition of that translation.

The publication of the *Dunciad* was the last service which our author rendered Pope in his lifetime. After a lingering and tedious illness, the event of which had been long foreseen, this great poet died on the 30th of May 1744; and by his will, dated the 12th of the preceding December, bequeathed to Warburton one half of his library, and the property of all such of his works already printed as he had not otherwise disposed of or alienated, and all the profits which should arise from any edition to be printed after his death: but at the same time directed that they should be published without any future alterations.

In 1744, Warburton turned his attention to the several attacks which had been made on the *Divine Legation*, and defended himself in a manner which, if it did not prove him to be possessed of much humility or diffidence, at least demonstrated that he knew how to wield the weapons of controversy with the hand of a master. His first defence now appeared, under the title of *Remarks on several Occasional Reflections.* This was followed next year by *Remarks on several Occasional Reflections, in Answer to the Reverend Doctors Stebbing and Sykes.* Both these answers are couched in those high terms of confident superiority which marked almost every performance that fell from his pen during the remainder of his life.

Warburton.

On the 5th of September 1745, the friendship between him and Allen was more closely cemented by his marriage with Miss Tucker. At that important crisis, he preached and published three seasonable sermons:—"A faithful Portrait of Popery, 1745." "A Sermon occasioned by the present unnatural Rebellion, &c., 1745." "The Nature of National Offences truly stated, 1745–46." On account of the last of these sermons, he was again involved in a controversy with his former antagonist Dr Stebbing, which occasioned *An Apologetical Dedication to the Reverend Dr Henry Stebbing.*

Notwithstanding his great connections, his acknowledged abilities, and his established reputation, a reputation founded on the durable basis of learning, and upheld by the decent and attentive performance of every duty incident to his station, we do not find that he received any addition to the preferment given him in 1728 by Sir Robert Sutton (except the chaplainship to the Prince of Wales), until April 1746, when he was unanimously called by the Society of Lincoln's Inn to be their preacher. In November, he published "A Sermon preached on the Thanksgiving appointed to be observed the 9th of October, for the Suppression of the late unnatural Rebellion." In 1747, appeared his edition of Shakspeare and his Preface to Clarissa; and in the same year he published "A Letter from an Author to a Member of Parliament concerning Literary Property." "Preface to Mrs Cockburn's Remarks upon the Principles and Reasonings of Dr Rutherforth's Essay on the Nature and Obligations of Virtue, &c." "Preface to a Critical Inquiry into the Opinions and Practice of the ancient Philosophers, concerning the Nature of a Future State, and their Method of teaching by double Doctrine," (by Mr Towne) 1747, second edition.

"In 1749," says Bishop Hurd, "a very extraordinary attack was made on the moral character of Mr Pope, from a quarter where it could be least expected. An insignificant pamphlet, under the name of *A Patriot King*, was that year published by Lord Bolinghroke, or by his direction, with a preface to it, reflecting highly on Mr Pope's honour. The provocation was simply this: the manuscript of that trivial declamation had been intrusted to the care of Mr Pope, with the charge (as it was pretended) that only a certain number of copies should be printed. Mr Pope, in his excessive admiration of his guide, philosopher, and friend, took that opportunity, for fear so invaluable a treasure of patriot eloquence should be lost to the public, to exceed his commission, and to run off more copies, which were found, after his death, in the printer's warehouse. This charge, however frivolous, was aggravated beyond measure, and, notwithstanding the proofs which Lord Bolingbroke had received of Pope's devotion to him, envenomed with the utmost malignity. Mr Warburton thought it became him to vindicate his deceased friend; and he did it so effectually, as not only to silence his accuser, but to cover him with confusion."

About this time the publication of Dr Middleton's *Inquiry concerning the Miraculous Powers of the Christian Church*, gave rise to a controversy, which was managed with great warmth and asperity on both sides, and not much to the credit of either party. On this occasion, Warburton

Warburton.

published, in 1750, an able performance, written with a degree of candour and temper which, it is to be lamented, he did not always exercise. The title of it is "Julian; or a Discourse concerning the Earthquake and fiery Eruption which defeated that Emperor's attempt to rebuild the Temple at Jerusalem." A second edition of this discourse, with additions, appeared in 1751. During this year, he gave the public his edition of Mr Pope's Works, with notes, in nine volumes 8vo; and in the same year he printed *An Answer to a Letter to Dr Middleton, inserted in a Pamphlet entitled "The Argument of the Divine Legation fairly stated, &c.*; and *An Account of the Prophecies of Arise Evans, the Welsh Prophet in the last Century*, annexed to the first volume of Dr Jortin's *Remarks on Ecclesiastical History*.

In 1752, Warburton published the first volume of a course of *Sermons*, preached at Lincoln's Inn, entitled *The Principles of Natural and Revealed Religion occasionally opened and explained*; and this was two years afterwards followed by a second. After the public had been some time promised, it may, from the alarm which was taken, be almost said threatened with, the appearance of Lord Bolingbroke's *Works*, they were about this time printed. The known abilities and infidelity of this nobleman had created apprehensions in the minds of many people of the pernicious effects of his doctrines; and nothing but the appearance of his whole force could have convinced his friends how little was to be dreaded from arguments against religion so weakly supported. Many answers were soon published, but none with more acuteness, solidity, and sprightliness, than *A View of Lord Bolingbroke's Philosophy, in two Letters to a Friend*. The third and fourth letters were published in 1755, with another edition of the two former; and in the same year a smaller edition of the whole; which, though it came into the world without a name, was universally ascribed to Warburton, and was afterwards publicly owned by him. To some copies of this is prefixed an excellent complimentary epistle from the president Montesquieu, dated May 26, 1740.

At this advanced period of his life, that preferment which his abilities might have claimed, and which had hitherto been withheld, seemed to be approaching towards him. In September 1754, he was appointed one of his majesty's chaplains in ordinary; and in the next year was presented to a prebend in the cathedral of Durham. About this time the degree of D.D. was conferred on him by Dr Herring, archbishop of Canterbury. A new impression of the *Divine Legation* being now called for, he printed a fourth edition of the first part of it, corrected and enlarged, divided into two volumes, with a dedication to the Earl of Hardwicke. During the same year appeared "A Sermon preached before his Grace Charles, duke of Marlborough, President, and the Governors of the Hospital for the Smallpox and for Inoculation, at the Parish-church of St Andrew, Holborn, April the 24th, 1755." And in 1756 he published "Natural and Civil Events the Instruments of God's Moral Government; a Sermon preached on the last public Fast-day, at Lincoln's Inn Chapel."

In 1757, Dr Warburton meeting with Mr Hume's tract entitled *The Natural History of Religion*, filled the margin of the book, as well as some interleaved slips of paper, with many severe and shrewd remarks on the infidelity and naturalism of the author. These he put into the hands of his friend Dr Hurd, who, making a few alterations on the style, added a short introduction and conclusion, and published them in a pamphlet, entitled *Remarks on Mr David Hume's Natural History of Religion, by a Gentleman of Cambridge, in a Letter to the Reverend Dr Warburton*. This fierce attack upon Mr Hume gave him so much offence that he thought proper to vent his indignation on the supposed author in the posthumous discourse which he called his *Life*; and thus to do greater honour to Dr Hurd than to any other of his numerous antagonists.

Warburton.

Towards the end of the year 1757, Dr Warburton was promoted to the deanery of Bristol; and in the beginning of the year 1760, he was, through Mr Allen's interest with Mr Pitt, afterwards Earl of Chatham, advanced to the bishopric of Gloucester. That great minister is known to have declared, "that nothing of a private nature since he had been in office had given him so much pleasure as bringing our author on the bench." There was, however, another minister who dreaded his promotion, and thought he saw a second Atterbury in the new bishop of Gloucester; but Warburton, says Bishop Hurd, had neither talents nor inclination for parliamentary intrigue or parliamentary eloquence; he had other instruments of fame in his hands, and was infinitely above the vanity of being caught

"With the fine notion of a busy man."

He was consecrated on the 20th of January 1760, and on the 30th of the same month preached before the House of Lords. In the next year he printed *A Rational Account of the Nature and End of the Sacrament of the Lord's Supper*. In 1762 he published *The Doctrine of Grace*, 2 vols. 12mo; and in the succeeding year drew upon himself much illiberal abuse from some writers of the popular party, on occasion of his complaint in the House of Lords, on the 15th of November 1763, against Mr Wilkes, for putting his name to certain notes on the infamous *Essay on Woman*.

In 1765 he published a new edition of the second part of the *Divine Legation*, in three volumes; and as it had now received his last hand, he presented it to his great friend Lord Mansfield, in a dedication which deserves to be read. It was the appendix to this edition which produced the well-known controversy between him and Dr Lowth, which we have noticed elsewhere as doing no great honour, by the mode in which it was conducted, to either party. In the next year he gave a new and much improved edition of the *Alliance between Church and State*. This was followed, in 1767, by a third volume of Sermons, to which is added, his first triennial Charge to the Clergy of the Diocese of Gloucester; which may be safely pronounced one of the most valuable discourses of the kind that is to be found in our own or any other language. With this publication he closed his literary course; except that he made an effort towards publishing, and actually printed, the ninth and last book of the *Divine Legation*. This book, with one or two occasional sermons, and some valuable directions for the study of theology, has been given to the world in the splendid edition of his works by his friend and biographer the late bishop of Worcester. That prelate confesses that the ninth book of the *Divine Legation* displays little of that vigour of mind and fertility of invention which appear so conspicuous in the former volumes; but he adds, perhaps truly, that under all the disadvantages with which it appears, it is the noblest effort which has hitherto been made to give a *rationale* of Christianity.

While the Bishop of Gloucester was thus exerting his last strength in the cause of religion, he projected a method by which he hoped to render it effectual service after his death. He transferred L.500 in trust to Lord Mansfield, Sir Eardley Wilmot, and Mr Charles Yorke, to found a lecture, in the form of a course of sermons, to prove the truth of revealed religion in general, and of the Christian in particular, from the completion of the prophecies in the Old and New Testament which relate to the Christian church, especially to the apostasy of papal Rome.

It is a melancholy reflection, that a life spent in the constant pursuit of knowledge frequently terminates in the loss of those powers, the cultivation and improvement of which are attended to with too strict and unabated a

Ward ‖ Wardlaw.

degree of ardour. This was the case with Dr Warburton; and it seems probable that the decline of intellectual vigour was aggravated by the loss of his only son, a promising young man, who died of a consumption but a short time before the bishop, who himself closed his career on the 7th of June 1779. In August 1781 his widow married John Stafford Smith, B. D., who had been his chaplain, and who in her right became owner of Prior Park. At her expense, and under the superintendence of Bishop Hurd, a collective edition of Warburton's Works was published in 1788, in seven vols. 4to. In 1794 he added *A Discourse by way of general Preface to the quarto Edition of Bishop Warburton's Works, containing some Account of the Life, Writings, and Character of the Author.* This biographical work is liable to many objections. It is not only meagre and unsatisfactory in many of its details, but is deeply tinctured with the narrow prejudices and even malignity of the writer. He left for publication, after his own death, *Letters from a late eminent Prelate to one of his Friends.* This collection has no tendency to increase our reverence for either Warburton or Hurd. We must not, in conclusion, overlook the singular publication of Dr Parr, entitled *Tracts by Warburton and a Warburtonian, not admitted into the respective collections of their Works,* Lond. 1789, 8vo. (D. I.)

WARD, SETH, an English prelate, chiefly distinguished for his knowledge in mathematics and astronomy, was born at Buntingford in Hertfordshire, and his biographer Dr Pope places his birth in the year 1618. He was admitted of Sidney College, Cambridge, where he applied with great vigour to his studies, particularly to the mathematics, and was chosen fellow of his college. He was much involved in the consequences of the civil war, but he was more fortunate than many of his brethren. He was appointed Savilian professor of astronomy at Oxford; and here in 1654 he took the degree of D.D. In 1659 he was chosen president of Trinity College; but being disqualified for the office, he was obliged to resign it at the Restoration. In 1661 he became dean, and in 1662 bishop, of Exeter. In 1667 he was translated to Salisbury; and in 1671 was made chancellor of the order of the Garter. He was the first Protestant bishop that enjoyed that honour, and he procured its annexation to the see of Salisbury. Bishop Ward was one of those unhappy persons who have had the misfortune to survive their senses, which happened in consequence of a fever. He lived to the period of the Revolution without knowing anything of the matter, and died at Knightsbridge on the 6th of January 1689. He had rendered himself odious by the severities which he exercised against the nonconformists. He published various works on theology, philosophy, mathematics, and astronomy.

WARDEIN. See GROSSWARDEIN.

WARDLAW, RALPH, D.D., was born at Dalkeith, Edinburghshire, December 22, 1779. A great-grandson of Ebenezer Erskine, minister of Stirling, with whom originated the Secession Church, he was educated for the ministry in connection with the Burgher branch of that Church; but toward the conclusion of his studies he began to have doubts as to taking the formula required of its preachers, ministers, and elders, and he, with most of his immediate relatives, connected themselves with the Congregational body, which began at that time to spring up in Scotland. Of that body he became in the course of time one of the main pillars and brightest ornaments. In 1803 he was ordained pastor of a newly formed Congregational church in Glasgow; and of that church he continued pastor to the end of his life, a period of full half a century. In 1811 an institution was established in Glasgow by the Congregational churches for the education of young men for the ministry, and Mr Wardlaw was appointed the theological tutor, an office which he also held to the end of his life. He subsequently received invitations to a similar office in Hoxton Academy, London; in Rotherham College, Yorkshire; in Spring-Hill College, Birmingham; and in the Lancashire College, near Manchester, four of the colleges of the Independent churches in England; but though considerable temptations were held out to him, he, to his honour, declined them all. In 1814 he published *Discourses on the Socinian Controversy,* in 1 vol. 8vo, a very able and valuable work, and which may be said to have laid the foundation of his fame as a theological writer. He had previously published some smaller pieces, and this was followed in subsequent years by numerous other works, on a great variety of subjects, chiefly of a theological nature. After his death his lectures on *Systematic Theology* were published in 3 vols. 8vo. In the controversies of the day he often mingled; and he was distinguished above most men not only by the ability, but by the candour, good temper, and Christian feeling with which he wrote and spoke. After a highly honourable and useful life, he died December 17, 1853, within a few days of completing the seventy-fourth year of his age. See Dr L. Alexander's *Memoir of Ralph Wardlaw,* D.D.

Ware ‖ Waren.

WARE, a market-town of England, county of Hertford, on the left bank of the Lea, here crossed by a fine iron bridge erected in 1845, 2 miles E.N.E. of Hertford, and 20 miles from London. It consists chiefly of one main street, nearly a mile in length, and lined in general with well built houses. The parish church is a large cruciform edifice, mostly in the decorated and perpendicular styles, and lately restored. It contains several fine monuments. There are also several dissenting places of worship. Ware has a free grammar school, and a collegiate seminary for the education of Roman Catholic clergymen, in connection with which an elegant gothic chapel has recently been erected. It has also a number of charitable institutions. There are some remains of an ancient priory. The making of malt is largely carried on, this being one of the principal seats of that manufacture in England; and it has an active trade in corn, malt, &c. Pop. (1851) 4882.

WAREHAM, a municipal and parliamentary borough of England, county of Dorset, on an eminence between the rivers Frome and Piddle, about a mile above their mouths, in the Wareham branch of Poole Harbour, and 15 miles E.S.E. from Dorchester. It consists of two main spacious streets, intersecting each other at right angles, and several smaller ones. The Frome is crossed by a stone bridge of five arches, and the Piddle by a similar one of three. The former is navigable for small craft up to the town. Wareham was formerly a place of much more importance than at present, and is said to have had seventeen churches; but these are now reduced to three, of which only one is used for public service. It is a large and ancient edifice, originally belonging to a priory, and is in the early English style, with a handsome tower, and contains some old monuments. There are also Independent, Methodist, and Unitarian chapels in the town. Wareham is surrounded by an ancient earthen rampart, the space between which and the town is now occupied by market gardens. The principal trade of the town is in a fine clay obtained in the neighbourhood and in demand for the Staffordshire and other potteries; and in vegetables for Poole, Portsmouth, &c. Many of the inhabitants are employed in the making of shirt-buttons, straw-platting, and stocking-knitting. It is governed by a mayor, 7 aldermen, and 21 councillors; and with Corfe Castle, Bere Regis, &c., returns one member to Parliament. Pop. of parliamentary borough (1851) 7218.

WAREN, a market-town of North Germany, grand duchy of Mecklenburg-Schwerin, on Lake Müritz, 54 miles E.S.E. of Schwerin. It has manufactures of woollen

Warendorf || Warrington.

and linen stuffs, brandy, leather, and shoes; and carries on some trade. Pop. 5000.

WARENDORF, a town of Prussian Westphalia, capital of a circle of the same name in the government of Munster, 14 miles E. of the city of Munster. There are several churches, a monastery, Latin school, lunatic asylum, &c. It has extensive linen and cotton manufactures, and is a chief seat of the Munster linen trade. Pop. 4647.

WARKWORTH, a small village of England, county of Northumberland, on the right bank of the Coquet, at a short distance from its mouth, and 14 miles N.N.E. of Morpeth. It stands amidst beautiful scenery, contains several good modern houses, and has a handsome parish church and places of worship for Presbyterians and Methodists. On an eminence close to the town are the magnificent ruins of Warkworth Castle, one of the strongholds of the Percys. Pop. (1851) 834.

WARMING. See SANITARY SCIENCE.

WARMINSTER, a market-town of England, county of Wilts, on the Willey, at the western extremity of Salisbury Plain, 21 miles N.W. of Salisbury. It consists chiefly of one main street, nearly a mile in length, wide, clean, and well paved. The parish church is a spacious and handsome structure, in the perpendicular style, with a square central tower. There is also a new church, built partly by subscription in 1830; a chapel of ease, and several dissenting places of worship. The town-hall is a handsome building in the Elizabethan style, rebuilt in 1831 by the Marquis of Bath, and contains elegant halls for public meetings, assemblies, &c. There are a free grammar school and other educational institutions in the town. A very extensive trade in corn is carried on here, and the making of malt and haircloth-weaving are the chief branches of industry. Warminster is supposed to have been a Roman station, and numerous antiquities have been found in the vicinity. Pop. (1851) 4220.

WARP, in the manufactures, a name for the threads, whether of silk, wool, linen, hemp, &c., that are extended lengthwise on the weaver's loom, and across which the workman, by means of his shuttle, passes the threads of the woof, to form a cloth, riband, fustian, or the like.

WARP, a small rope employed occasionally to remove a ship from one place to another, in a port, road, or river. And hence *to warp* is to change the situation of a ship, by pulling her from one part of a harbour, &c., to some other, by means of warps, which are attached to buoys, to anchors sunk in the bottom, or to certain stations upon the shore, as posts, rings, trees, &c.

WARRANTY (*Warrantia*), in *Law*, a promise, or covenant by deed, made by the bargainer for himself and his heirs, to warrant and secure the bargainee and his heirs against all men for enjoying the thing agreed on or granted between them.

WARRINGTON, a parliamentary and municipal borough and market-town of England, in the county of Lancaster, 17 miles E. by S. of Liverpool, and about the same distance W. of Manchester. It is a place of so great antiquity that hundreds of years ago it was spoken of as "Old Warrington." Numerous Saxon, Roman, and early British remains have been found here. It is placed on the river Mersey, over which a bridge was erected in 1496 by the first Earl of Derby, to facilitate the progress of King Henry VII. to the north of England. As the best passage over the river, it was the scene of frequent conflicts during the civil war in the reign of Charles I. In 1643 the town was twice taken by storm by the parliamentary forces. In 1648 the Scottish army made a stand here, but were defeated by General Lambert, who also here repulsed the troops under Charles II. on his way to Worcester in 1651; and in 1745 the centre arches of the bridge were broken down to impede the progress of the Highlanders under the Pretender. The old bridge having been frequently repaired, was replaced in 1812 by an elegant and convenient new erection. The town consists of several streets, narrow and irregularly laid out; and it contains many quaint old houses, mingled with others of more modern date and character. There was founded here in 1757 an establishment for the education of one class of dissenters, which had some men of celebrity for tutors; among others, Dr Priestley, Dr Enfield, Dr Aikin, and Gilbert Wakefield. It did not continue long, but was dissolved in the year 1783. There are three churches, one of which, dedicated to St Elphin, has lately been rebuilt at a cost of L.8000. Two ancient chapels still remain, in one of which are some modern monuments of the Patten family; in the other the magnificent tomb of Sir Thomas Boteler and his lady. There are two other churches in the town, three in other parts of the parish, and places of worship for Methodists, Independents, Baptists, Quakers, Unitarians, and Roman Catholics. The schools are numerous, among which are pre-eminent the free school founded and endowed in 1526 by the Boteler family, and the blue-coat school, which is a flourishing and richly endowed institution. There are also National, British, and Sunday schools, a school of arts, a mechanics' institute, dispensary, almshouses, and many other charitable institutions. Among the public buildings, the most prominent are the market-house, built in 1857 at a cost of L.12,000, and the Free Museum and Library, erected in 1856. There are, besides, a town-hall, two cloth-halls, assembly-rooms, and a theatre. The Mersey is navigable up to the bridge. Warrington is a place of great manufacturing industry. Cotton goods are largely made; as also pins, files, and glass. It likewise supplies large quantities of malt, and has several breweries. It is a station on the London and North-Western and on the Lancashire and Cheshire railways. It has a well supplied market weekly, where much corn is sold. By the reform bill, Warrington acquired the right of returning one member to the House of Commons; and it gives the title of earl, in addition to that of Stamford, to the Grey family. The population of the parliamentary borough amounted in 1851 to 23,363, and that of the municipal borough to 22,894.

Warsaw.

WARSAW (Polish *Warszawa*, Germ. *Warschau*, Fr. *Varsovie*), the capital, formerly of Poland, and now of the Russian province of Warsaw, on an eminence gradually rising from the left bank of the Vistula, N. Lat. 52. 14., E. Long. 21. 2. The view of the city, as approached from St Petersburg, is very fine; a series of splendid buildings, rising one above another all along the sides of the hill, with the immense imperial palace in the centre, excelling in height and extent all the adjacent edifices. It is defended by ramparts and a fosse; and to the north, close upon the Vistula, is a citadel which commands the whole of the town. The entire circuit is about ten miles; but the large area thus enclosed is to some extent occupied with gardens and open ground, and includes several suburbs, besides the city proper, consisting of an old and a new town. In the older portions the streets are narrow, irregular, and ill-paved, and the houses for the most part meanly built, in many cases only of wood; but in the more modern parts, many of the streets are broad, and lined with handsome houses; so that on the whole Warsaw may be considered one of the finest cities in Europe. Besides about one hundred private palaces belonging to the Polish nobility, there are several of a public character. Among the latter, the *Zamek*, as it is called, which was formerly the residence of the Polish monarchs, is conspicuous for its immense size. It contains the national archives of Poland, and the hall where the diet used to meet; but the valuable library and splendid collection of paintings, formerly here, have been removed to St Petersburg. The Saxon palace, in which the Saxon kings resided, stands in one of the

Warta ‖ Warton.

principal squares, and has large and beautiful gardens behind it. The government palace, formerly that of the Krasinski family, is a beautiful modern building in the Italian style, and contains the government offices and superior courts of law. The palace of Casimir, which is adorned with a statue of Copernicus, was formerly occupied by the university, which was suppressed in 1834. Another fine edifice is the Marsenville bazaar, built after the model of the Palais Royal at Paris, and containing the exchange, custom-house, post-office, mint, arsenal, and barracks, besides several ranges of shops. Many of the churches of Warsaw, of which there are in all twenty-nine, are very fine. The principal is the Roman Catholic cathedral of St John, a fine Gothic edifice, founded in 1260. The church of the Capuchins contains a black marble monument to John Sobieski, erected by the Emperor Nicholas in 1829. The Dominican church and that of the Holy Cross are also handsome; and the Lutheran church is a stately building, surmounted by the loftiest tower in Warsaw. In the squares of the city there are many statues, the most remarkable of which are the colossal one of Sigismund III., and the equestrian figure of Poniatowski, one of the finest works of Thorwaldsen. The city has fourteen monasteries and four nunneries, several charitable establishments, three theatres, two colleges, a theological seminary, gymnasiums, elementary schools, public libraries, and literary associations. It is the principal seat both of the manufactures and trade of Poland. The manufactures are many and various, including those of tobacco, leather, saddlery, coaches, musical instruments, cloth, hats, hosiery, gold and silver wares, &c. Much-frequented fairs are held here twice a year, lasting each time for three weeks; and the trade is very extensive, being facilitated not only by the navigable river Vistula, which connects the city with Cracow on the one hand and Dantzig on the other, but also by the railways, which form a rapid means of communication with St Petersburg and Vienna. The Vistula is here crossed by a bridge, which leads to the suburb of Praga on the other side. To the south of the town, but inside the fortifications, are the imperial country-seats of Belvedere and Lazienki, the latter of which was occupied for a time by Louis XVIII. of France during his exile. Further off is the castle of Willanow, the favourite retreat of John Sobieski, containing his private apartments just as he left them. North of the city is Bielany, a fine park with a fashionable promenade. Warsaw is the seat of the general Viceroy of Poland, and of the Archbishop of Warsaw, who is primate of Poland. The principal events in the history of the city being intimately connected with that of the state of which it was the capital, are narrated in the article POLAND. Pop. (1857) 158,120, of whom upwards of 40,000 were Jews.

WARTA, or WARTHA, a large river of Poland and Prussia, rises near the S.E. corner of Poland, 36 miles N.W. of Cracow. It flows in an irregular course through a flat country, at first towards the N. as far as Kolo in Poland, then turning westward, it enters the Prussian dominions, passes Posen, and falls into the Oder at Küstrin, after a course of about 420 miles. It receives from the right the Vidawka and the Netze, the latter connected by means of a canal with the Vistula; and from the left the Obra and the Prosna. The Warta is navigable for a considerable distance.

WARTON, JOSEPH, an elegant poet and critic, was born in the year 1722, in the house of his maternal grandfather, Joseph Richardson, rector of Dunsford in Surrey. His father, Thomas Warton, B.D., fellow of Magdalene College, and professor of poetry at Oxford, and afterwards vicar of Basingstoke in Hampshire, and of Cobham in Surrey, was descended from an ancient and honourable family of Beverley in Yorkshire. The son was for a short time sent to New College school, but was chiefly educated by his father till he reached the age of fourteen, when he was admitted on the foundation of Winchester College. He was at this early period distinguished by his love of poetry, and one of his schoolfellows was William Collins. In September 1740, being superannuated, he was removed from Winchester; and as no vacancy occurred in New College, he was entered of Oriel, when he prosecuted his studies with diligence and success. In 1744 he took the degree of A.B., and was ordained to his father's curacy at Basingstoke, and officiated in that church till February 1746. He next removed to Chelsea, and afterwards to Cobham. Warton.

His father died in the year 1745, leaving two sons and a daughter in circumstances far from affluent. Joseph, his elder son, published by subscription a volume of *Poems on several occasions by the Rev. Mr Thomas Warton*, Lond. 1748, 8vo. This volume is closed by two poems on the death of the author, one by his daughter Jane, the other by the editor. He had previously published a small collection of his own, entitled *Odes on various subjects*, Lond. 1746, 4to. In 1748 the Duke of Bolton presented him to the rectory of Winslade; and although this provision was but scanty, he immediately married Miss Daman, a young lady to whom he had for some time been enthusiastically attached. In 1751 he accompanied the same nobleman on a tour to the south of France. For this arrangement, as Dr Wooll very coolly informs us, the duke had two motives, "the society of a man of learning and taste, and the accommodation of a protestant clergyman, who immediately on the death of the duchess, then in a confirmed dropsy, could marry him to the lady with whom he lived, and who was universally known and distinguished by the name of Polly Peachum." (Wooll's *Biographical Memoirs of the late Rev. Joseph Warton, D.D.*, p. 15, Lond. 1806, 4to.) This, it must be admitted, was a very miserable commission for any protestant clergyman to undertake, nor did Warton earn the wages of his iniquity; for some unexplained reason induced or compelled him to revisit England before the duchess died; and when, on her demise, he solicited the duke's permission to return, he had the mortification to learn that the worthy pair had been joined in wedlock by the chaplain to the embassy at Turin.

Before this period he had undertaken a translation of the *Eclogues* and *Georgics* of Virgil; and having associated with it Pitt's translation of the *Æneid*, he added the original text, and accompanied the whole with his own notes, Lond. 1753, 4 vols. 8vo. The book is elegantly printed; but Dr Harwood remarks that the Latin text, especially in the *Georgics*, is extremely incorrect. A second edition followed in 1778. Warton added three essays, on pastoral, didactic, and epic poetry. This publication laid the foundation of his literary celebrity. Soon after its appearance, he was requested to assist Dr Hawkesworth in the *Adventurer*, which was commenced in 1752. The invitation was conveyed to him by Dr Johnson, who stated that the department destined for him was that of criticism. To this periodical work he contributed twenty-four papers, of which the greater part relate to critical subjects, and all of them are creditable to his talents and taste.

In 1754 he was instituted to the rectory of Tunworth; and in the following year he was elected second master of Winchester school. In 1756 Lord Lyttelton presented him with a chaplain's scarf. He now published the first volume of *An Essay on the Writings and Genius of Pope*, Lond. 1756, 8vo. This is a very elegant and interesting piece of criticism. The work, which appeared without the author's name, is dedicated to Dr Young. In 1759 the university of Oxford conferred upon him by diploma the degree of A.M. In May 1766 he became head-master of Winchester school. For this situation he possessed several qualifications. He was a man of polished manners; nor could his pupils fail to imbibe some portion of his refined

Warton. taste and love of literature. He was not, however, without defects. Though an elegant scholar, he was not sufficiently able as a philologist. "He held verbal criticism cheap, and, as a natural consequence, frequently encountered insurmountable difficulties in Greek authors; while the expedients to which he resorted in order to conceal the fact were easy of detection, and excited much amusement among the elder boys. . . . But Warton wanted other qualities essential to the head-master of a public school. He was inconsistent in his plans, and deficient in moral courage; often conceding with respect to points of discipline upon which he ought to have been inflexible. These defects paved the way for what was afterwards called *the Row*, when the school was in such a state of rebellion that the interference of the magistrates was required, and upwards of thirty of the boys were expelled. Burgess had left the school before this catastrophe occurred; but he used to tell, among other proofs of the insubordination which prevailed even in his time, that a riotous boy had the audacity, on one occasion, to hurl a Latin dictionary at Warton's head." (Harford's *Life of Thomas Burgess, D.D., late Lord Bishop of Salisbury*, p. 5, Lond. 1840, 8vo.)

On being placed at the head of this great school, Warton repaired to Oxford, and accumulated the degrees of B.D. and D.D. In 1772 he lost his wife, by whom he had six children. Such a loss was severely felt; but he found himself helpless without the superintending care of a domestic companion; and in the course of the following year he married the daughter of Robert Nicholas, Esq., a descendant of Dr Nicholas, formerly warden of Winchester. From his scholastic toils he was accustomed to seek a relaxation in fashionable as well as literary society. His vacations were frequently spent in London. Like his brother, he became a member of the famous Literary Club; and being conspicuous for the vivacity and pleasantry of his conversation, the circle of his acquaintance was at once brilliant and extensive. His dignified friends did not, however, advance him to any eminent preferment. In 1782 Bishop Lowth conferred upon him a prebend of St Paul's, and the living of Thorley in Hertfordshire, which he was permitted to exchange for Wickham. In the course of the same year he published the second volume of his *Essay on Pope*. In 1788 the interest of Lord Shannon procured him a prebend at Winchester; and to Lord Malmesbury he was indebted for the rectory of Easton, which, before the close of the year, he exchanged for Upham. The amount of these preferments was not inconsiderable, but they came too late to be of much avail to his family. He was sixty years of age before he had any benefice except the small livings of Winslade and Tunworth, and nearly seventy before he obtained those which afterwards fell to his share.

On the 23d of July 1793 he resigned his office of head-master, and afterwards retired to his rectory at Wickham. His literary ardour was not yet extinguished, and a liberal offer from the London booksellers encouraged him to undertake a new edition of the works of Pope, which was published in the year 1797 in nine volumes 8vo. For such a task he possessed many qualifications, but his edition did not escape the sharpness of critical reprehension. It was assailed with sufficient virulence by Mathias in his *Pursuits of Literature*. He next undertook an edition of Dryden, and about the year 1799 he had completed two volumes, which were afterwards published. At a much earlier period of his life he had projected a history of the revival of learning; and about the year 1784 he issued proposals for publishing *The History of Grecian, Roman, Italian, and French Poetry*, in four parts. In this work, which was to occupy two quarto volumes, he however appears to have made little or no progress. All his labours and projects were terminated by an incurable disease in his kidneys, and he died on the 23d of February 1800, in the seventy-eighth year of his age. His widow survived till 1806. Besides three daughters, of whom the youngest was by his second wife, he left a son, John Warton, D.D., who published a work entitled *Deathbed Scenes*. Warton.

Dr Warton was a very elegant rather than a very profound scholar; and with his classical learning he united much knowledge of modern literature, Italian and French as well as English. On subjects of criticism he was an agreeable and instructive writer. His poems, which are but few in number, appear in the collection of Chalmers. He is a skilful versifier, and is not destitute of poetical fancy. (D. I.)

Warton, *Thomas*, the brother of Dr Warton, was born at Basingstoke in the year 1728. He was distinguished by his very early love of letters; and a tetrastich which he wrote at the age of nine has been preserved by his biographer. He remained under the domestic tuition of his father till he was prepared for the university. On the 16th of May 1743, he was admitted a commoner of Trinity College, Oxford, and was soon afterwards elected a scholar of that house. He continued to cherish a love of poetry; and in 1747 he published without his name *The Pleasures of Melancholy*, written two years before. On the appearance of Mason's *Isis, an Elegy*, which contains reflections on the Jacobitical principles then prevalent at Oxford, Warton was encouraged by Dr Huddesfield, president of his college, to repel this attack. He accordingly published, in 1749, *The Triumph of Isis, occasioned by Isis, an Elegy*. This poem, written at the age of twenty-one, extended his reputation. The principal of St Mary Hall, who is highly extolled for his Roman eloquence, sent the young author a present of five pounds. The same individual is likewise extolled for his patriotism. From the *Political and Literary Anecdotes of his own Times*, published long after his death, it is evident that Dr King was deeply implicated in the schemes of the Jacobites; and we may thus ascertain the value of the commendation bestowed upon such a "patriot's fire." Warton took the degree of A.M. on the first of December 1750, and in the course of the following year succeeded to a fellowship. He was thus placed in a situation well adapted to his character and pursuits. Though not rich, he was easy and independent, and had abundant leisure for the cultivation of those elegant studies in which he delighted. About this period he published various poems, either in a separate form or in some of the miscellaneous collections of the day. He was the editor of *The Union, or select Scots and English Poems*, first printed at Edinburgh in 1753. This collection, of which there are three editions, includes several of his own poems; two of which, an ode and a pastoral, he has chosen to describe as written by a gentleman formerly of the university of Aberdeen. He afterwards published a work which evinces great knowledge of English literature, and a very sound spirit of criticism, *Observations on the Fairie Queene of Spenser*, Lond. 1754, 8vo. An edition, in two volumes octavo, followed in 1762. The first edition was attacked in a scurrilous pamphlet bearing the title of *The Observer observed*, Lond. 1756, 8vo. This pamphlet, which appeared without the author's name, was written by Huggins, the unpoetical translator of Ariosto.

In 1757, on the resignation of Hawkins of Pembroke College, he was elected professor of poetry. For this office, which is only tenable for ten years, he was eminently qualified by his taste as well as his learning; and we are informed that he exerted himself to fulfil its duties by a constant recommendation of the elegance and simplicity of the classic poets. His lectures are said to have been remarkable for elegance of diction and justness of observation. A specimen may be found in his dissertation *De Poesi Bucolica Græcorum*, which was originally delivered as one of

Warton. these lectures, and having afterwards been enlarged, was prefixed to his edition of Theocritus.

His next publication was an elegant little collection entitled *Inscriptionum Romanarum Metricarum Delectus. Accedunt notulæ*, Lond. 1758, 4to. The ancient are mixed with a few modern inscriptions. One of these, by Dr Jortin, had been printed as an ancient relique, in the *Miscellaneous Observations on various Authors*. Warton, who apparently entertained a doubt of its genuineness, has commended it as "conditissimum carmen." It however contains one very unhappy pentameter:

Utque tuus rursum corpore sim posito.

The editor has inserted four inscriptions written by himself, numbers 41, 44, 45, and 47, which he pretends were transmitted to him from Italy by a learned friend. This was evidently a mode of ascertaining his own proficiency as an imitator of ancient simplicity and elegance; but whether such a device is altogether excusable, may perhaps admit of some doubt.

To Dr Johnson's *Idler* he contributed three papers, Nos. 33, 93, and 96; but Dr Mant has erroneously stated that he was likewise a contributor to the *Connoisseur*, published by Colman and Thornton. In 1760 he printed two little works without his name. One of them is *A Description of the City, College, and Cathedral of Winchester*. The other is entitled *A Companion to the Guide, and a Guide to the Companion*. This facetious production speedily reached a third edition, and it was again printed at Oxford in 1806. He afterwards published *The Life and Literary Remains of Ralph Bathurst, M.D.*, Lond. 1761, 8vo. This volume, though chiefly interesting to the members of his own college, is not without its attractions to those who delight in the history of literature and its professors.

Reverting to his classical pursuits, he prepared for the press *Anthologiæ Græcæ*, Oxon. 1766, 8vo. Warton has contributed an elegant preface, together with some brief annotations The Latin version, the elaborate account of the poets, and the six indices, are reprinted from Reiske's edition. After an interval of four years, he published a more elaborate work: *Theocriti Syracusii quæ supersunt*, Oxon. 1770, 2 tom. 4to. This edition is elegantly and correctly printed; and, in a letter to the editor, Toup described it as "the best publication that ever came from the Clarendon press." In compliance with the recommendation of the delegates, it was printed without accents, although Dr Foster, eight years before, had made a solemn remonstrance against a practice so heretical. (Foster's *Essay on the different Nature of Accent and Quantity*, p. 226, Eton, 1762, 8vo.) The scholia are not conveniently disposed for the purpose of reference; and, in the opinion of Harles as well as Brunck, the editor has not to the full extent availed himself of all the valuable materials that were within his reach. But an edition of a Greek poet by a scholar so accomplished, and possessing so much elegance of taste, is not very frequently recorded in the annals of classical literature.

On the 7th of December 1767, he had taken the degree of B.D.; and on the 22d of October 1771, he was instituted to the small living of Kiddington in Oxfordshire, on the presentation of the Earl of Lichfield, then chancellor of the university. From April 1755 to April 1774, he served the curacy of Woodstock, except during the long vacation. His pulpit oratory does not appear to have had any peculiar recommendation; but it was stated by an anonymous writer in 1803, that many were still alive who spoke of him with more regard and affection than any other person who ever officiated at Woodstock. He likewise augmented his income by taking pupils; and Mr North, afterwards earl of Guildford, was placed under his care in 1774.

His situation in the university led to his next literary undertaking, *The Life of Sir Thomas Pope, Founder of Trinity College, Oxford*, Lond. 1772, 8vo. This work, of which the original sketch was inserted in the *Biographia Britannica*, was reprinted in the year 1780. It extends to an ample volume, and is written with his usual elegance. The author's model is Bishop Lowth's *Life of William of Wykeham*; and both works afford very favourable examples of this species of biography, in which the details of the antiquary are rendered graceful by the taste of the scholar. Warton.

This was followed by a more important publication, viz.: the first volume of *The History of English Poetry, from the close of the eleventh to the commencement of the eighteenth century. To which are prefixed two Dissertations: 1. On the Origin of Romantic Fiction in Europe: 2. On the Introduction of Learning into England*, Lond. 1774, 4to. A second edition of this volume was speedily required. The second volume was published in 1778, and the third in 1781. To this last he prefixed *A Dissertation on the Gesta Romanorum*. The impression of the work extended to 1250 copies; and the copyright is said to have been purchased for L.350. He did not live to complete the plan which his title announces; for he only descended to the reign of Elizabeth. Although he survived the publication of the third volume for nine years, he had only printed eleven sheets of the fourth; nor does he appear to have left any additional portion of it in a state of preparation. At the end of an edition of his *Poems*, published in 1791, we find this announcement: "Speedily will be published, by the same author, the fourth and last volume of the *History of English Poetry*; in which the subject will [be] carried down to the commencement of the present century." It was the intention of Dr Warton to complete his brother's great work; but there is no evidence of his having made any progress in such an undertaking.

The *History of English Poetry* experienced a very favourable reception, and greatly contributed to extend the reputation of the author. With very extensive and varied research Warton combines much knowledge of ancient and modern literature; and he enlivens the most unpromising disquisitions with many flowers of an active fancy and a refined taste. The book is written in an excellent English style, generally elegant and often graceful, never descending too low or rising too high. With these impressions of his great and conspicuous merit, we hold it to be impossible to acquiesce in the averment, that "his history has been found so dry and oppressive as to subdue the eagerness of the generality of readers." Such readers must certainly be in a very inadequate state of preparation. Soon after the appearance of his third volume, he was assailed in an anonymous pamphlet, entitled *Observations on the three first volumes of the History of English Poetry, in a familiar Letter to the Author*, Lond. 1782, 4to. This familiar letter was the production of Ritson, and is plentifully furnished with his inexhaustible virulence. Warton, like every other man who has published a work in three volumes, has exhibited errors and mistakes; but those which his rabid censor has detected are neither so numerous nor so important as to warrant any great severity of reprehension. In spite of such critics as these, the work has steadily maintained as much popularity as could reasonably have been anticipated. A valuable edition, "carefully revised, with numerous additional notes by the late Mr Ritson, the late Dr [Mr] Ashby, Mr Douce, Mr Park, and other eminent antiquaries, and by the editor," was published by the late Richard Price, a man eminently qualified for the undertaking. Lond. 1824, 4 vols. 8vo. His preface, extending to 113 pages, is very able and elaborate; and the same remark is applicable to many of his annotations. Warton's transcripts from old manuscripts having too frequently been hasty and inaccurate, many of his errors are corrected by the editor. This edition, with additional notes by Sir

Warton.

Frederic Madden and other antiquaries, was reprinted in three volumes in the year 1840.

During the progress of his great work, he published a collection of his *Poems*, Lond. 1777, 8vo. A second edition appeared in 1778, a third in 1779, a fourth in 1789, and a fifth in 1791. This was followed by a more complete edition of *The Poetical Works of the late Thomas Warton, B.D.*, Oxford, 1802, 2 vols. 8vo. The editor, Dr Mant, late bishop of Down, accompanied it with memoirs of his life and writings, and with notes critical and explanatory. His *Poems* are reprinted in the great collections of Dr Anderson and Mr Chalmers.

Warton took some share in the famous controversy respecting the poems produced by Chatterton. He published *An Inquiry into the Authenticity of the Poems attributed to Thomas Rowley; in which the Arguments of the Dean of Exeter and Mr Bryant are examined*, Lond. 1782, 8vo. His opinion, it may easily be supposed, coincided with that of Tyrwhitt. He had now formed the plan of preparing a history of the county of Oxford. As a specimen, he had printed for the inspection of his friends, twenty copies of the *History of the Parish of Kiddington*; and an edition of it was afterwards published, Lond. 1783, 4to. In 1782 he was presented by his college to the donative of Hill Farrance in Somersetshire. In 1785 he was elected Camden professor of ancient history, on the resignation of Dr Scott, afterwards Lord Stowell. He had been a candidate for the same office in 1768, when one Vivian was preferred. On the 5th of May 1786, he read an inaugural lecture, written in his usual style of terse Latinity; but this seems to have been the full extent of his labours in his new department. In the course of the year 1785, he had succeeded Whitehead in the office of poet laureate; an office which, till a very recent period, continued to be held by a tenure sufficiently abject. The barbaric exaction to which the laureate was so long subjected is not very creditable to the taste of the first three sovereigns of the Hanoverian dynasty. Soon after his appointment, Warton was treated with some degree of witty freedom, in a publication entitled *Probationary Odes for the Laureateship*. But he had too much good nature to be easily annoyed; and, as his brother has stated, "he always heartily joined in the laugh, and applauded the exquisite wit and humour that appeared in many of these original satires."

The last of his literary labours was an edition of *Poems upon several occasions, English, Italian, and Latin, with Translations, by John Milton: viz., Lycidas, L'Allegro, &c. With Notes, critical and explanatory*, Lond. 1785, 8vo. A second edition, with many alterations and large additions, was published in 1791. One of these editions is an appendix containing *Remarks on the Greek Verses of Milton*, by Dr Burney. It was the design of the editor to publish a second volume, comprehending *Paradise Regained* and *Samson Agonistes*. The notes exhibit a great variety of illustration, drawn from ancient as well as modern literature. Dr Mant observes that "he has in one or two instances been guilty of an oversight, of which a remarkable example occurs in the note on the twenty-second verse of *Mansus*, where he attributes the life of Homer to Plutarch instead of Herodotus, and describes Mycale as a mountain in Bœotia instead of Asia Minor." The bishop evidently was not aware that there is one life of Homer ascribed to Plutarch and another to Herodotus. In the other part of his criticism he is more accurate; and Warton was apparently led into this small error by recollecting a passage of Ovid, where Mycale is grouped with a mountain of Bœotia:

Et Mycale, natusque ad sacra Cithæron.

He had now approached the termination of his distinguished career. Till he reached his sixty-second year, he had continued to enjoy vigorous and uninterrupted health. Having then been seized with the gout, he repaired to Bath, where he persuaded himself that a favourable change had taken place; but on his return to Oxford, his appearance did not convey the same impression to his friends. On the 20th of May 1790, he passed the evening in the common room of the college, and for some time was more cheerful than usual; but between ten and eleven o'clock, when only two of the fellows remained with him, he was suddenly affected with paralysis. He continued speechless, and only survived till two o'clock on the following day. His remains were deposited in the college chapel, with the highest academical honours; the ceremony being attended not only by the members of his own college, but likewise by the vice-chancellor, heads of houses, and proctors.

Warwick.

The personal character of Thomas Warton presented many amiable aspects. In his manners, he was remarkably simple and unassuming. In the company of strangers, particularly those of a literary class, he was inclined to be shy and reserved; but within the circle of his friends, his conversation was easy and gay, enriched with anecdote, enlivened with humour, besprinkled with puns, and sparkling with wit. His temper is described as habitually calm, his disposition as gentle, friendly, and forgiving. His resentments, where he could be supposed to have any, were expressed rather in the language of jocularity than anger." Of Ritson's abuse, he only expressed his sense by calling him a black-letter dog. If he had possessed as much worldly wisdom as many of his brethren, he might probably have attained to much higher preferment in the church; but, apparently contented with his moderate provision, he continued to lead a tranquil and studious life, little infested with the cares of this world, and alike free from envy and ambition.

As a writer he has displayed varied excellence. He was an accurate as well as an elegant classical scholar; and to his masterly knowledge of English literature he added an extensive acquaintance with the polite literature of France and Italy. He was no mean poet, nor are his Latin inferior to his English verses. As a classical critic, he is advantageously known by his edition of Theocritus. Most of his publications are replete with varied learning; but the great foundation of his fame is the *History of English Poetry*, a work which in its own department is unrivalled in English literature. (D. I.)

WARWICK, the county town of Warwickshire, is built on a tract of rocky land, rising sharply from the river Avon. It is 20 miles from Birmingham, 10 from Coventry, and about 92 from London by road, and 107 by railway. The town is governed by a mayor, 6 aldermen, and 18 councillors, has a recorder and court of quarter sessions, is a county court subdistrict, and is the place of nomination of the candidates for South Warwickshire. The assizes and county quarter-sessions are also held here, in the county hall, a handsome and spacious building, to which is attached a commodious house for the judges. The population of Warwick in 1811 was 6497, which in 1851 had increased to 10,973.

The ecclesiastical buildings of Warwick include four churches, and Roman Catholic, Independent, Wesleyan, Baptist, and Unitarian chapels. The principal church, St Mary's, was founded before the Conquest. The original building was replaced by a Norman structure in 1123, which, in its turn, was supplanted by a new building in 1394, erected by the Beauchamps, then earls of Warwick. In 1694 this edifice was partly destroyed (in a fire which burnt more than 250 houses), and the repairs were executed in a most barbarous mixture of Gothic and Italian. Happily the Beauchamp Chapel (one of the most perfect specimens of the architecture of its period) was preserved. This chapel contains several remarkable tombs of the Beauchamp family; and in the chapter-house (the church

Warwick-shire.

was once collegiate) is to be seen the monument of Fulke Greville, "the friend of Sir Philip Sidney." The chapel and the chancel of the church have lately been restored. The houses of the dean and canons of the church now form a free grammar school, called the College School. Leicester's Hospital, formerly the guild hall of Warwick, was erected by Dudley, earl of Leicester, into an hospital for "twelve impotent men." The number of brethren is now twenty-two, who have apartments and L.80 a-year each; and there is a master with L.400 a year. The hospital is a quaint half-timbered building, with a hall (now used as a storeroom), in which James I. was entertained in 1617 by Sir Fulke Greville. Attached to the hospital is a handsome chapel, built over one of the gates of the town. Warwick numbers likewise amongst its institutions an excellent museum of antiquities and natural history, a library, various educational societies, a savings bank, and theatre. The town is well paved and lighted; and, for the most part, the principal streets are handsomely built.

The principal object of interest to strangers is the castle, one of the noblest baronial residences in the kingdom. Popular tradition assigns its foundation to Roman, or at least to Saxon times; and though these stories are manifestly fables, it would be difficult to convince the neighbouring peasantry that Guy, the famous but fabulous Saxon champion, was not concerned in the building of the castle. His porridge pot (a huge iron vessel), part of his armour, and one of the ribs of the celebrated dun cow killed by him, are shown to the curious in the porter's lodge. It would appear that Henry de Newburgh, a follower of William the Conqueror, was the real founder of Warwick Castle, which was extended and strengthened by his son and grandson. In 1265, the castle, excepting the towers, was destroyed, but repaired by the first earl of the Beauchamp family, in the reign of Edward III. In the reign of Edward IV., the castle passed into the hands of Richard Neville (the king-maker), and by the marriage of his daughter Isabel with George of Clarence, it came into possession of the crown. Edward VI. gave it to John Dudley, whom he created Earl of Warwick; it again reverted to the crown on his attainder, but was restored by Queen Elizabeth to Dudley's son, who dying without issue, the castle was granted by James I. to Fulke Greville, in whose family it has ever since remained. The successive possessors have spent enormous sums in beautifying it, and storing it with untold treasures of art, so that in process of time it has come to stand almost without a rival amongst buildings of its class. The state apartments of the castle form a suite 333 feet long; the great hall is 62 feet by 37, and the towers are very lofty, that called Cæsar's Tower (the oldest portion of the edifice) rising to the height of 147 feet, and Guy's Tower (built 1394) being 128 feet high. The cellars, cut out of the solid rock, exhibit some remarkable specimens of groining; and the approach to the castle is by a long carriage-drive, also hewn out of the rock. The grounds of the castle are very extensive, and exquisitely beautiful; and in one of the greenhouses stands the famous Warwick vase.

In the neighbourhood of Warwick are many places of great historical interest and natural beauty. Amongst these are Guy's Cliff, the fabled hermit's cell of the great Warwickshire hero; and Blacklow Hill, the place where the barons executed Edward II.'s favourite, Piers Gaveston. Stratford and Kenilworth lie within easy distances, and Leamington is so close to Warwick, that the two places are nearly united. (J. T. B.)

WARWICKSHIRE, a county occupying almost the very heart of England, and the centre and highest point of the great district of midland table-land. It is bounded on the extreme N. by Derbyshire; N. and N.W. by Staffordshire; W. by Worcestershire; S.W. by Gloucestershire; S. and S.E. by Oxfordshire; E. by Northamptonshire; and N.E. and N. by Leicestershire. The county measures 58 miles in greatest length, and 32 miles in greatest breadth, and has an area of 881 square miles, or 563,946 acres. The population in 1851 was 475,013 — namely, males, 232,411; females, 242,602; and the number of inhabited houses was 96,731, uninhabited 4596, and building 972; total, 112,299; giving a density of 539 persons and 110 houses to a square mile, 1·2 person to an acre, and 4·9 persons to a house. In 1801 the population was only 206,798; in 1811, 228,906; in 1821, 274,482; in 1831, 336,645; in 1841, 401,703. Between 1801 and 1851, therefore, the increase of the population has been at the enormous rate of 130 per cent. This was mainly owing to the rapid development of the manufacturing towns of Birmingham and Coventry, and the creation of the fashionable watering-place of Leamington, which in 1801 was a mere village, but in 1851 was a thriving town of upwards of 15,000 inhabitants. In 1851 the births in Warwickshire were 19,610 (of which 1112, or about 1 in 17½ were illegitimate); and the deaths, 13,025, giving an excess of births over deaths of 6585. The average death rate for the ten years, 1841–50, was 23 in the thousand. The marriages in 1858 were 4463, of which 3892 were celebrated according to the rites of the Church of England.

Warwick-shire.

The county, which originally formed part of the diocese of Lichfield and Coventry, was in 1836 transferred to the see of Worcester, in which it is now comprised. There are about 260 benefices in the county. In 1851, there were in the county 593 places of worship, affording 208,713 sittings. Of these 278, affording 123,624 sittings, belonged to the Church of England; Roman Catholics, 26 places, 6577 sittings; Independents, 64 places, 21,938 sittings; Baptists, 50 places, 15,830 sittings; various branches of Wesleyan Methodists, 133 places, 25,213 sittings; Society of Friends, 7 places, 1564 sittings; Unitarians, 10 places, 4504 sittings; Presbyterians, 1 place; Mormons, 5; Irvingites, 3; Jews, 1; and miscellaneous sects, 12.

The Education Returns showed a total of 1101 day schools, with 51,161 scholars; 27,385 males and 23,776 females. Of these schools 337 were public (with 34,295 scholars) and 764 private (with 16,866 scholars). 210 of the public day schools were supported by religious bodies, and of these 162 belonged to the Church of England. There were 19 collegiate and grammar schools, and 73 other endowed schools. Of the former class the principal schools are those at Rugby, King Edward the Sixth's School, Birmingham, and the grammar school, Coventry. The *Sunday schools* in 1851 numbered 418, with 49,411 scholars, 24,867 males and 24,544 females), and 5113 unpaid and 332 paid teachers. 224 of these schools, with 24,571 scholars, belonged to the Church of England; and next stood the Wesleyans, with 76 schools and 8021 scholars. The 12 literary institutions in existence in 1851 have received several additions to their number, and the Free Libraries Act has within the present year been put into operation in Birmingham, a rate of nearly L.4000 annually being levied on the town for the establishment and maintenance of libraries and museums.

The "Judicial Statistics" issued annually from the Home Office, show that the police force of Warwickshire amounts to 595 men, maintained at a total cost of L.39,435. These amounts include Birmingham, which has a force of 366 men, costing L.24,892. The number of crimes ascertained by the police to have been committed in 1859 was 2658, and the number of persons apprehended for these offences was 896. The number of thieves and other persons known to be living by dishonest means is 7800,—males, 5200; females, 2600. Warwickshire is included in the Midland Circuit, the assizes being held at Warwick, the county town, near which has been lately erected a large jail, on the

Warwick-shire.

separate system, in lieu of the former prisons at Coventry and Warwick, which were conducted on the principle of association. Birmingham has a borough jail of its own. There are three reformatory institutions in the county—one capable of receiving 100 boys, at Saltley, near Birmingham; one for boys at Weston, near Leamington; and one for girls near Coventry. The reformatory at Stretton-upon-Dunsmore—the parent of all institutions of its class—has been abandoned. Warwickshire forms a county court division of itself, but is included in the Birmingham and Nottingham district of the court of bankruptcy. For political and petty-sessions purposes, the county is divided into north and south; the former (north) including the Hundreds of *Hemlingford:* divisions—Atherstone, Coleshill or Birmingham, Solihull, and Tamworth (part of which town is in Warwickshire, though it is usually reckoned with Staffordshire); *Knightlow* Hundred: divisions—Kirby and Rugby. The latter (south) comprises *Barlichway* Hundred; divisions—Alcester, Henley-in-Arden, Snitterfield, and Stratford-upon-Avon; *Kington* or *Kineton* Hundred: divisions—Brailes, Burton Dassett, and Warwick; *Knightlow* Hundred: divisions—Kenilworth and Southam. These divisions are again subdivided into petty-sessions districts, in which justice is administered by 147 acting magistrates. The county returns ten members to parliament—two each for the northern and southern divisions, and two each for Birmingham, Coventry, and Warwick.

The industry of Warwickshire is partly agricultural and partly manufacturing,—the latter predominating in the northern, and the former in the southern division. Besides the vast and varied works in metal and hardware carried on at Birmingham (described under the head of that town), there are extensive ribbon factories at Coventry, which is also one of the chief seats of the watch trade, although both in this manufacture and in that of ribbons the city has recently considerably declined; and in the hope of restoring its ancient prosperity, efforts are being made to introduce the trade of cotton-weaving, to which the habits of the artisans are well adapted. At Warwick and Atherstone there are important manufactories of hats. The ribbon trade is carried on extensively at Chilvers Coton, Foleshill, Bulkington, and Nuneaton; and in the neighbourhood of the last named place and of Bedworth there are important collieries. Comb-making is practised to a considerable extent at Kenilworth, and that town is likewise famous for its extensive tannery establishments. The manufacture of hardware and agricultural tools is also carried on at Sutton Coldfield. At Studley and Alcester there are manufactories of needles and fish-hooks.

The rivers of Warwickshire, though numerous, are unimportant, and, with the exception of a portion of the Avon, are not navigable. The principal streams are the Avon, which rises at Naseby in Northamptonshire, and flows thence for nearly 60 miles through Warwickshire, sweeping westward by Brownsover, Rugby, Ryton-on-Dunsmore, and thence by Stoneleigh, Warwick, Barford, Charlecote, and Stratford to Harvington. There are also the Sowe, the Itchen, the Leam, the Tame, the Stour, the Arrow, the Swift, the Blythe, the Bourne, and the Anker. But although poor in navigable rivers, Warwickshire is admirably supplied in regard to railways and canals; and to the abundance of these means of communication much of its prosperity is attributable. The Warwick and Birmingham Canal commences at Birmingham, and is continued past Solihull and Knowle to Warwick, where it joins the Warwick and Napton Canal, and terminates in the Oxford Canal at Napton. The Birmingham Canal opens up a water communication with the north of England; the Birmingham and Worcester connects the former with the Severn, and during its course forms a junction with the Dudley Canal, which opens up the south Staffordshire district. The Stratford-upon-Avon Canal connects the Worcestershire and West Warwickshire districts with the Avon at Stratford. There are also the Fazeley, the Coventry, the Ashby-de-la-Zouch, the Oxford, and the Grand Junction Canals, which either commence in this county, or run through it during some portions of their course. The county is likewise traversed by a gigantic network of railways, all having their centre at Birmingham, or branching from trunk lines which have their termini in that town. The Oxford and Birmingham (Great Western) passes Solihull, Knowle, Warwick, Leamington, and thence turns southward, leaving the county close to Banbury. It has branches to Rugby, and from Hatton to Stratford-upon-Avon. The London and North Western line runs from Birmingham across the county to Coventry and Rugby, with connecting lines to Kenilworth, Warwick, Nuneaton, Stamford, and Leicester, and by the Trent Valley Railway from Rugby to Stafford. The Midland line joins the London and North Western line at Hampton, and by another branch connects itself with the Derby line near Coleshill, and thus forms a junction with the Trent Valley at Tamworth. The western side of the county is supplied by the Birmingham and Gloucester line; the north-west by the South Staffordshire and the Stour Valley; and the Oxford, Worcester, and Wolverhampton (which throws out a branch to Stratford), runs alongs the south-west. A railway is also in progress from Birmingham to Sutton Coldfield. Coach roads to all parts of the kingdom intersect the county at various points; but they are now very little used excepting as means of local communication.

Warwick-shire.

The natural features of Warwickshire are remarkable rather for quiet beauty than for picturesque character or rugged grandeur. There are few elevations worthy of being called hills, yet the entire surface is gently undulated; and though there are scarcely any woods remaining, almost every district is so well timbered, chiefly with oaks and elms, that the county presents the appearance of being richly wooded. There still exist at Lord Aylesford's seat at Packington the remains of the famous forest of Arden, which even yet contains numerous oaks, for size and beauty unsurpassed in the kingdom. Coal, iron, limestone, and freestone are amongst the minerals of the county, and the oolitic formation occasionally yields some rare fossils. In the new red sandstone at Coton End, near Warwick, there have been discovered the fossil remains of an extinct species of animal, which Professor Owen has described as a gigantic batrachian reptile of the frog or toad family. He has bestowed on this species the title of *Labyrinthodon.* The new red sandstone spreads over the greater part of the county, occupying the whole of the northern and central portions, with the exception of the coal-fields, to be hereafter mentioned. On the south it meets the lias, at a line drawn across the county from a point a mile south of Dunchurch, through Long Itchington, and thence to Friz Hill, a little to the south of Stratford-upon-Avon. At Kenilworth, and thence to Coventry, the soil rests upon a sandstone rock. Generally throughout this tract there is an abundance of gravel. The course of the lias may be traced from the neighbourhood of Edge Hill, where its upper beds of black shale, with bands of blue and grey limestone, overlie the marlstone. At Harbury its lower beds are composed of blue clay and shale, traversed by beds of limestone. The total thickness of the lias, in the midland counties, is 500 feet. The Warwickshire coal-field stretches from the east of Tamworth, along the borders of Leicestershire to Nuneaton, and then on each side of the road to within 2 miles of Coventry. The coal measures preserve a breadth of about 3 miles. Large masses of compact "greenstone," known as Hartshill stone (from the place where they are quarried) are found in this district, and are largely used for mending roads.

The agriculture of Warwickshire is not in so advanced a state as it should be, considering the great facilities afforded by the streams for irrigation, and by the canals for the carriage of manures. A large part of the county, especially in the southern division, is devoted to grazing. The sheep in greatest request are the long-woolled, generally crossed with the Southdown. The cattle chiefly bred are Herefords and short-horns, the long-horn indigenous to Warwickshire having nearly disappeared. In some places, however, attention is being again paid to its breeding, and prizes are offered for this breed at local cattle shows, though it is doubtful whether it will ever regain its ancient popularity. The breeding and fattening of pigs is not carried on to a great extent. The average rental of land throughout the county is L.1. 5s. 6d. per acre, the average of England being 19s. 2d. In the neighbourhood of Birmingham L.4, and even L.5 an acre is, in some instances, given for land, used chiefly for market-gardens, or as "accommodation" land for the reception of cattle. Leases are not common, nor are the farms small: as a rule they range from 300 to 500 acres. Labourers' wages are high, as compared with many other counties. In the valley of the Tame, near Birmingham, they are about 13s. per week and two quarts of beer daily. In other districts they are 12s. to 13s. weekly, and men in the house are paid from L.10 to L.12 per year. Labourers' cottages let at from 1s. to 1s. 6d. weekly. There is very little waste land; and the commons, once remarkably numerous, are now almost entirely enclosed, and cultivated or used for grazing. The largest enclosed common, not put to these uses, is the chase or park of Sutton Coldfield, extending over 3500 acres, and composed of tracts of woodland and moorland, interspersed with numerous pools. This chase belongs to the inhabitants of Sutton, to whom it was given, in the reign of Henry VIII., by a native of the town, Vesey, bishop of Exeter, to which see it formerly belonged. In connection with the natural history of the county, it should be mentioned that mineral springs, in considerable numbers, exist at Leamington, and are held in much repute.

The history of Warwickshire, its antiquities, its historical associations, and the famous men to whom it has given birth must be very briefly sketched. At the time of the Roman invasion the county was inhabited partly by the Cornavii, and partly by the Wigantes or Wiccii. Under the Romans it formed part of the province of Flavia Cæsariensis. Roman roads, Ikenield Street, the Foss Way, and Watling Street, passed through parts of the county; and Roman remains are still perceptible at Alcester, Mancetter, Chesterton, and other places. At Castle Bromwich there is a large tumulus, supposed to be of the British period. Under the Saxons, the county was included in the kingdom of Mercia, whose rulers occasionally resided at Warwick, Tamworth, and Kingsbury. Under Alfred it passed into the dominion of the West Saxons. After the Conquest, the powerful families, the Newburghs, Beauchamps, and Nevilles, who held the earldom of Warwick, involved the county in all the great civil wars recorded in English history. In the troubles in Henry the Third's reign, Kenilworth stood a long siege by the royal forces; in the Wars of the Roses, the city of Coventry warmly embraced the Lancastrian, and the town of Warwick the Yorkist cause; and in the war between Charles the First and his parliament, Warwickshire was torn by the contending factions, who made special head in the neighbourhood of Birmingham. Charles slept at Aston Hall, near that town, on his march through Warwickshire in 1642, and two days afterwards the first great battle of the civil war was fought on the borders of the county at Edge Hill. Swords and other weapons, used in the battle, are still occasionally turned up by the ploughshare. It would be impossible to furnish within our space a notice of the monastic and other ecclesiastical and castellated buildings formerly existing in this county, and in many cases still traceable by their ruins. At the period of the dissolution of the monasteries, Warwickshire contained fifty-seven religious houses, in which all the principal orders of the Roman Church were represented. The chief remains are Maxstoke Priory, Stoneleigh Abbey, the priory at Warwick (now a dwelling-house), and Kenilworth Priory. Of the castles the most famous are Warwick (see WARWICK) and Kenilworth, the latter memorable for the princely manner in which its then owner, Robert Dudley, earl of Leicester, entertained Queen Elizabeth there. The ruins of Kenilworth, both for beauty and extent, are justly accounted amongst the most beautiful in the kingdom. Maxstoke Castle (inhabited) is externally a remarkably perfect specimen of the fortified residences of the period of the fourteenth century: internally it has been greatly modernised.

Of celebrated men of letters, born in or closely connected with Warwickshire, it must be sufficient to mention our greatest poet and dramatist, William Shakspeare; the most eminent English antiquary (next to Camden), Sir William Dugdale; the famous Dr Priestley; and the almost equally famous printer, Baskerville. Of soldiers, statesmen, and divines, the names must be sought in the history of the country.

The titles of nobility derived from the county are Earl of Warwick, Earl of Coventry, Lord Leigh (Stoneleigh), and Lord Arden (in the peerage of Ireland). It may be observed under this head, that of families holding knightly rank, before the commencement of the sixteenth century, there now exist only ten,—namely, Shirley of Eatington; Compton of Compton Wyniate (Marquis of Northampton); Chetwynd of Grendon; Feilding of Newnham Paddox (Earl of Denbigh); Staunton of Longbridge; Ferrers of Baddesley Clinton; Mordaunt of Walton; Biddulph of Birdingbury; and Skipwith of Harborough. Of *gentle* families extant at the same period there remain only four,—namely, Shuckburgh of Shuckburgh; Throckmorton of Coughton; Gregory of Styvechall; and Greville of Warwick Castle (Earl of Warwick). (See *Noble and Gentle Men of England*, by E. P. Shirley, M.P., 1859.)

The principal seats of noblemen and gentlemen are,—Warwick Castle; Compton Verney, Lord Willoughby de Broke; Combe Abbey, Earl Craven; Compton Wyniate, Marquis of Northampton; Packington Hall, Earl of Aylesford; Guy's Cliff, Hon. C. Bertie Percy; Walton Hall, Sir C. Mordaunt, Bart., M.P.; Arbury, Mr Newdegate, M.P.; Merevale Hall, Mr W. S. Dugdale; Hams, Right Hon. C. B. Adderley, M.P.; Maxstoke Castle, Mr W. Fetherston Dilke; Stoneleigh Abbey, Lord Leigh; Charlecote, Mr Lucy; and Aston Hall, lately the residence of the son of the celebrated James Watt, and now used as a public place of recreation.

The market-towns in Warwickshire with populations (in 1851) of more than 2000, are,—Warwick, 10,973; Alcester, 2027; Bedworth, 3012; Kenilworth, 3140; Leamington, 15,692; Nuneaton, 4859; Rugby, 6317; Stratford, 3372; Coventry, 36,208; and Birmingham, 232,841. (J. T. B.)

WASH, THE, an arm of the German Ocean, on the E. coast of England, between Norfolkshire and Lincolnshire, about 25 miles long by 15 broad. It receives the rivers Ouse, Nen, Welland, and Witham, flowing through the flat and fenny country on its shores. The wash contains many shoals, which are dry at low-water; and measures have been recently adopted for draining and reclaiming a great part of it. There are two channels, called respectively the Boston deeps and the Lynn deeps, marked out by buoys, and having from 4 to 12 fathoms of water.

WASHINGTON, GEORGE.

Washington. In the family record contained in a Bible which belonged to the mother of Washington, and which is now in the possession of George Washington Bassett, of Hanover County, Virginia, who married a grandniece of Washington, the following entry is found:—"George Washington, son to Augustine and Mary his wife, was born ye 11th day of February 173½, about ten in the morning, and was baptized the 3rd of April following; Mr Beverly Whiting and Captain Christopher Brooks, godfathers; and Mrs Mildred Gregory, godmother."

Birth and genealogy. George Washington was accordingly born on the 22d of February 1732, new style, in the county of Westmoreland, in the parish of Washington (so called from the family, whose seat it had been for three generations), on Pope's Creek, a small tributary to the Potomac, and at the distance of about half a mile from its junction with that river. The house in which he was born was destroyed before the American Revolution, but a stone with a suitable inscription was placed upon the spot a few years since, by the late George Washington Parke Custis, the grandson of Mrs Washington. This spot has lately been ceded to the State of Virginia.

The county of Westmoreland,—famous as the birthplace not only of Washington, but of several other eminent persons, such as Richard Henry Lee, who moved the resolution for declaring independence in the Congress at Philadelphia in 1776; his three brothers, Thomas, Francis, and Arthur, and his kinsman, General Henry Lee, all distinguished in their day; James Monroe, the fifth President of the United States; and Bushrod Washington, a nephew of the general and a justice of the Supreme Court,—lies between the Potomac and Rappahannoc rivers, in what is called the northern neck of Virginia. Notwithstanding the notoriety of the facts, a statement is sometimes made in British publications, and has been repeated by a respectable writer within the past year (1858), that George Washington was born in England.[1]

Augustine Washington, the father of the General, was twice married. His first wife was Jane Butler, by whom he had three sons and a daughter, viz., Butler, who died in infancy, Lawrence, Augustine, and Jane, the last named of whom also died in childhood. His second wife was Mary Ball, to whom he was married on the 6th of March 1730. By this marriage he had six children, viz., George, Betty, Samuel, John, Augustine, Charles, and Mildred, the last of whom died in infancy.

George Washington was the great-grandson of John Washington, who, with a brother named Lawrence, emigrated to Virginia in 1657. They were the great-grandsons of Lawrence Washington, sometime mayor of Northampton, and the first lay proprietor of the manor of Sulgrave, in Northamptonshire, which was granted to him in 1538. The eldest brother, Sir William Washington, married a half-sister of George Villiers, the famous Duke of Buckingham. This connection indicates, if it did not cause, a leaning of the family toward the Royal side in the civil wars. Another of the name, Sir Henry Washington, a relative though not a brother, signalised himself for his persevering gallantry in sustaining the siege of Worcester against the Republican forces. Of the two brothers who came to Virginia, Lawrence had been a student at Oxford; John had resided on an estate at South Cave, in Yorkshire, which gave rise to an erroneous tradition among his descendants that their ancestor came from the north of England.

There is no doubt that the politics of the family determined the two brothers, John and Lawrence, to emigrate to Virginia, that colony being the favourite resort of the Cavaliers during the government of Cromwell, as New England was the retreat of the Puritans in the period which preceded the Commonwealth. John Washington and his brother took up lands, and became successful planters in Virginia. The former, soon after his arrival, rose to the rank of colonel in the Indian wars, and gave his name to the parish in which he lived. He married Ann Pope, by whom he had two sons, Lawrence and John, and a daughter. Lawrence, the eldest son, married Mildred Warner, of the neighbouring county of Gloucester, and had three children, John, Augustine, and Mildred. The second son, Augustine, was the father of George Washington. Washington.

About fifty years before the emigration from England, the family removed from Sulgrave to Brington (near Althorpe), in Northamptonshire. The name of Washington may still be seen on the grave-stones in the church of that and other parishes in the county. The original grantee of Sulgrave was probably born at Warton, in Lancashire, where his father is known to have lived. In the next generation after the emigration to America, another of the family, perhaps a brother, passed to the Continent and established himself in Bavaria, where the descendants, bearing the family name, and somewhat resembling General George Washington in personal appearance, are still found.

It may be mentioned as a somewhat striking fact, and one, we believe, not hitherto adverted to, that the families of Washington and Franklin—the former the great leader of the American Revolution, the latter not second to any of his patriotic associates—were established for several generations in the same central county of Northamptonshire, and within a few miles of each other: the Washingtons at Brington and Sulgrave, belonging to the landed gentry of the county, and in the great civil war supporting the Royal side; the Franklins at the village of Ecton, living on the produce of a farm of thirty acres, and the earnings of their trade as blacksmiths, and espousing, some of them at least, and the father and uncle of Benjamin Franklin among the number, the principles of the Nonconformists. Their respective emigrations—germs of great events in history—took place, that of John Washington, the great-grandfather of George, in 1657 to loyal Virginia; that of Josiah Franklin, the father of Benjamin, about the year 1685 to the metropolis of Puritan New England.

The genealogy of George Washington is a matter of greater importance to the memory of his ancestors than to his own; he throws back far greater glory than he can inherit. Nevertheless it may be a matter of curiosity to note, that the family and name are traced by genealogists to the twelfth century, and to the county of Durham. Among those who held manorial estates in that region, in the period succeeding the Norman Conquest, was William de Hertburn, so called from his estate, probably the modern Hartburn on the Tees. This estate was exchanged by him for Wessynton, and with it the family name, which afterwards passed into that of Washington. From this person thus designated, the family of Washington in its various branches, and now widely spread in England, on the continent of Europe, and in the United States, is descended. For further details on this subject, the reader is referred to the appendix to the first volume of Mr Sparks' admirable edition of the *Writings of Washington*, and to

[1] The editor of the *Cornwallis Papers*. The error was corrected in an *erratum*.

Washington. the first volume of his *Life*, by the late honoured and lamented Nestor of American literature, Mr Washington Irving. General Washington's own feelings on the genealogy of his family are intimated in his answer to a letter from Sir Isaac Heard, Garter King-at-Arms, in 1792. Sir Isaac having addressed a letter to Washington, at that time President of the United States, making inquiry about his genealogy, the President in his reply says,—"This is a subject to which I confess I have paid very little attention. My time has been so much occupied in the busy and active scenes of life from an early period of it, that but a small portion of it could have been devoted to researches of this nature, even if my inclination or particular circumstances should have prompted to the inquiry."

Shortly after the birth of George Washington, his father removed his family from the county of Westmoreland to that of Stafford, and established himself on an estate upon the eastern bank of the Rappahannoc river, opposite Fredericksburg, where he died in 1743, leaving a valuable landed property to his widow and five children. To his eldest son, Lawrence, he gave an estate near Hunting Creek, on the Potomac river, afterwards called Mount Vernon; to George, the eldest son of the second marriage, the estate opposite Fredericksburg; and to each of the other sons a plantation of 600 or 700 acres; the income of the whole being left within the control of the mother till the sons respectively should come of age.

Education. The mother was a woman of superior intelligence and energy, and ruled her family and household with a firm hand. The means of education at that time, compared with the present day, were scanty in all the Anglo-American colonies, but especially at the South, where a larger portion of the inhabitants lived on their landed estates, and the population was less compact. The sons of affluent planters were sometimes sent "home," as it was called, and placed at the English schools and universities, and afterwards at the inns of court; but for others who, for any cause, were unable to avail themselves of these advantages, the instruction to be had at the local schools in the southern colonies did not extend beyond the ordinary branches of an English education. George Washington was taught reading, writing, book-keeping, and at a later period surveying,—an important occupation at that time, being liberally compensated, and affording facilities for finding out and entering valuable ungranted lands in the almost boundless wilderness which lay west of the settled parts of the country. Some of the manuscript books kept by him at school are still preserved. They are marked by neatness, method, skill in the use of figures, in the construction of tables, and in the delineation of plans; in a word, by the display of the favourite tastes which he carried through life, and manifested in the business details of military and civil affairs of importance.

According to still existing traditions, he evinced in his boyhood the military taste which seems to have been hereditary in his family. The self-elected but willingly obeyed leader of his comrades, he formed them into companies for their juvenile battles. His early repute for veracity and justice, with his athletic prowess beyond his years, made him the chosen umpire of their disputes. He wrestled, leaped, ran, threw the bar, and rode with the foremost. A spot is still pointed out where, in his boyhood, he threw a stone across the Rappahannoc; he was proverbially strong of arm; in manhood he had one of the largest hands ever seen;[1] and was through life a bold and graceful horseman.

Among his manuscripts still in existence, there is one written when he was under thirteen years of age, which deserves to be mentioned, as containing striking indications of early maturity. The piece referred to is entitled "Rules of Civility and Decent Behaviour in Company and Conversation." These rules are written out, in the form of maxims, to the number of one hundred and ten. "They form," says Mr Sparks, who gives a considerable specimen of them, "a minute code of regulations for building up the habits of morals, and manners, and good conduct in very young persons." Whether they were taken in a body from some manual of education, or compiled by Washington himself from various books, or framed from his own youthful observation and reflection, is unknown. The first is perhaps the more probable supposition. If compiled by a lad under thirteen, and still more, if the fruit of his own meditations, they would constitute a most extraordinary example of early prudence and thoughtfulness. Some of the rules which form a part of this youthful code of manners and morals, had their influence over Washington, and gave a complexion to his habits through life.

Washington's early education did not extend beyond his own language, nor was that taught grammatically, either in England or America, a hundred years ago. The grammatical rules of the English tongue were first learned from the study of the Latin language. Washington gave some attention to the French in after life, when the armies of Count de Rochambeau were placed under his command; but he never attempted to speak or write it. By long practice, attentive reading of good authors, and scrupulous care in the preparation of his letters and other compositions, he acquired a correct and perspicuous English style.

While he was still at school, a project was formed by some of his relatives and friends, which, if it had taken effect, would have changed the entire course of his life. His eldest brother, Lawrence, had been an officer in the war lately waged to avenge the loss of "Captain Jenkins' ears." He had served as captain on the Spanish main, and formed friendly relations with General Wentworth and Admiral Vernon. Observing the military turn of his brother George, he naturally thought he should promote his advancement in life by placing him in the British service. A midshipman's warrant was obtained for him, no doubt through Admiral Vernon's interest; but the prophetic heart of the mother rebelled at the last moment, and the project was abandoned, although his luggage, it is said, had been sent on board a ship of war lying in the Potomac.

Influence of his mother. Washington is unquestionably to be added to the list of eminent men whose characters have been moulded by a mother's influence. The control of their children's property, devolved upon her by the will of her husband, shows his confidence in her discretion and energy; and tradition represents her as a woman of vigorous character, fully equal to the trust. The modest dwelling in Fredericksburg in which she brought up her family is still standing, and in its unpretending style and dimensions forms a striking contrast with the ambitious, half-finished monument over her grave. She educated her children in habits of frugality, diligence, and virtue. Books at that time were few—the luxuries, not the daily food of the mind, even among persons of fortune and leisure. With those in narrower circumstances, the range of reading did not extend much beyond the Bible, manuals of devotion, the sermons of some standard divine, and books of practical piety. Among the few books belonging to the elder generation, and still preserved at Mount Vernon, is a well-worn copy of Sir Matthew Hale's *Contemplations*,—a volume which had belonged to George Washington's father, and in which the names of his two wives, Jane and Mary, are written,

[1] The late Hon. Timothy Pickering, who was secretary of state under Washington and the elder President Adams, said in our hearing, that General Washington was the only man whom he ever knew that had a larger hand than himself.

Washington. each in her own handwriting, on the blank page. It would not be difficult to point out, in the character of Washington, some practical exemplification of the maxims of the Christian life, as laid down by that illustrious magistrate.

It is worthy of remark that, although he had not himself received a college education, Washington entertained decided opinions of its utility. He appropriated the shares in the Potomac and James River Canal, presented to him by the Legislature of Virginia, for the endowment of collegiate institutions, and recommended, in his last annual message to Congress, the foundation of a national university at the seat of the general government.

We have now reached the period in the life of Washington when he may be considered as passing from boyhood to youth, and when the serious though unconscious training for his great public career began. His elder brother, Lawrence, who stood to him in many respects in the place of a parent, had removed to the estate near Hunting Creek, to which he gave the name of Mount Vernon, in honour of his friend the "gallant Vernon," the commander of the naval expedition against the Spanish Main, commemorated in Thomson's *Seasons*. George had ever been a favourite with his brother Lawrence; and on leaving school went to reside at Mount Vernon. His time was passed, in the pleasant season of the year, in the usual round of plantation employments, visiting, and sports; and in the winter, was devoted to his favourite study of surveying. By way of practice, accurate plans were taken by him of Hunting Creek and the neighbouring estates, some of which are still preserved among his papers.

His brother Lawrence had lately married the daughter of Mr William Fairfax, the proprietor of the neighbouring property of Belvoir, and the near relative of Lord Fairfax, who was at that time his guest at that plantation. Lord Fairfax was the owner of immense domains in Virginia. He had inherited through his mother, the daughter of Lord Colpepper, the original grantee, a vast tract of land originally including the entire territory between the Potomac and Rappahannoc rivers. The grant was probably intended to be bounded on the west by the Blue Ridge. But the geography of the interior of the American continent was but little known; grants were made in the early charters of all the lands lying between certain rivers (supposed in all cases to run due east and west from the mountains to the sea), or between certain parallels of latitude from ocean to ocean. The land-agents of Lord Fairfax were not slow in making the discovery, that the upper waters of the Potomac penetrated the Blue Ridge, and that consequently his lordship's possessions might be construed to extend far into the valley of the Shenandoah. By way of confirming his claim to these extensive territories, he left the residence of his kinsman at Belvoir, built a substantial stone-house in the valley called Greenway Court, and there established himself in a kind of baronial state in the wilderness.

Lord Fairfax was a man of cultivated mind, educated at Oxford, the associate of the wits of London, the author of one or two papers in the *Spectator*,[1] and an *habitué* of the polite circles of the metropolis. A disappointment in love is said to have cast a shadow over his after life, and to have led him to pass his time in voluntary exile on his Virginian estates; watching and promoting the rapid development of the resources of the country; following the hounds through the primeval wilderness, and cheering his solitary hours by reading and a limited society of chosen friends. George Washington had early attracted his notice as a frequent visitor at Belvoir. Washington.

About the time that George came to reside at Mount Vernon, George William Fairfax, the son of the proprietor of Belvoir, had married the daughter of Colonel Carey of Hampton, on James River, and had brought home his bride and her sister to his father's house. Washington's boyish manuscripts betray the secret of a youthful but not successful passion for a person whom he does not name, but whom he describes in prose and verse as a "lowland beauty," and whom tradition represents as Miss Grimes, who afterwards married a Colonel Lee, and became the mother of General Henry Lee, of the Revolutionary War, at all times a favourite of Washington, perhaps on the mother's account. The confidential letters of Washington to his young friends represent him as finding solace at Belvoir in the society of the bride's sister for the still lingering regrets of his boyish "lowland" disappointment.

But his residence at Mount Vernon and his visits at Belvoir were productive of much more important results, and formed a very important link in the chain of events which decided his fortunes for life. The vast possessions of Lord Fairfax were as yet unsurveyed, and "squatters" (as settlers without title are called in the United States) were rapidly seating themselves on the choice of his lands. There was at this period no general system of public surveys executed by authority, and the individual proprietor, after obtaining his grant, was obliged to procure the survey of his lands by licensed surveyors on his own responsibility. Lord Fairfax had formed so favourable an opinion of young Washington, that he determined to employ him on the important service of surveying his extensive estates; and he set off on his first expedition just a month from the time he had completed his sixteenth year, accompanied by young Fairfax, the son of the proprietor of Belvoir. Commences life as a surveyor.

The best idea of the nature of the service in which he was now engaged will be formed from an extract from one of his own letters:—"Your letter," says he to his correspondent, "gave me the more pleasure as I received it among barbarians and an uncouth set of people. Since you received my letter of October last, I have not slept above three or four nights in a bed; but after walking a good deal all the day, I have lain down before the fire upon a little hay, straw, fodder, or a bear-skin, whichsoever was to be had,—with man, wife, and children, like dogs and cats; and happy is he who gets the berth nearest the fire. Nothing would make it pass off tolerably but a good reward. A doubloon is my constant gain every day that the weather will permit my going out, and sometimes six pistoles. The coldness of the weather will not allow of my making a long stay, as the lodging is rather too cold for the time of year. I have never had my clothes off, but have lain and slept in them, except the few nights I have been in Fredericksburg."

The hardships of this occupation will not be fully comprehended by those who are acquainted with the surveyor's duties only as they are practised in old and thickly settled countries. In addition to the want of accommodation, and the other privations alluded to in the letter just cited, the service was attended with serious peril. In new countries of which "squatters" have begun to take possession, the surveyor is at all times a highly unwelcome visitant, and sometimes goes about his duty at the risk of his life. Besides this, a portion of the country traversed by Washington formed a part of that debateable land, the disputed right of which was the original moving cause of the Seven Years' War. The French were already in motion both from Canada and Louisiana, to preoccupy the banks of the Ohio,

[1] In Chalmers' *Biographical Dictionary* we read:—"The biographer of Lord Fairfax informs us he was one of the writers of the *Spectator*, but the annotators on that work have not been able to ascertain any of his papers." He may have been the author of some of the anonymous communications sent to the "Letter-box," to which Steele often had recourse in making up a Number.

Washington.

and the savages in their interest roamed the intervening country up to the settlements of Virginia.

Washington was employed in the survey of Lord Fairfax's lands for three years, passing the pleasant season in the wilderness, and spending his winters at Fredericksburg and Mount Vernon. The outdoor active life fortified his health and strengthened his frame. His surveys were executed in part, in the very region which became the theatre of his campaigns in the Seven Years' War. While engaged in the field he saw something of life and manners among the friendly Indians. He probably availed himself of opportunities to inspect valuable tracts of ungranted land, which he afterwards turned to good account. At a time when the minds of men were but little awakened to the future of the then unsettled West, he learned from actual observation to appreciate its vast importance. He soon became distinguished for the accuracy of his surveys, and obtained the appointment of a public surveyor, which enabled him to enter his plans as legally valid in the county offices. The imperfect manner in which land surveys at that time were generally executed led in the sequel to constant litigation; but an experienced practitioner in the western courts pronounced in after years, that of all the surveys which had come within his knowledge, those of Washington could alone be depended upon. (Everett's *Orations*, vol. iii. p. 440.)

His experience in border life prepared him for his military education, which was now about to commence. No military schools existed at that time even in the mother country; as late as the last generation, the Duke of Wellington was sent to a military school at Angers in France, for want of institutions of that kind at home. The restlessness of the French and Indians on the frontier, to which allusion has just been made, had as early as 1751 begun to create uneasiness in several of the Anglo-American colonies.

First military appointment.

The Assembly of Virginia divided that province into several military commands or districts; and in one of them Washington, now nineteen years of age, received the appointment of adjutant-general, with the rank of major. His duty was to assemble and exercise the militia, inspect their arms, and train them for active service in the event of a rupture. In connection with these duties, he gave his time and thoughts to his own preparation for the field. He read military treatises, acquainted himself with the manual exercise, and through the instructions of his brother and other officers of the late war whom he met at Mount Vernon, became expert in the use of the sword.

In these occupations he was interrupted by a painful domestic occurrence. His brother Lawrence, naturally of a feeble constitution, had suffered in his health from the effects of the campaign on the Spanish Main. He became consumptive, and was ordered to the West Indies. George was selected to accompany him. They sailed for Barbadoes in September 1751, and arrived after a five weeks' voyage. Experiencing no permanent relief in that island, the invalid determined to remove to Bermuda in the spring, and George was sent back to Virginia, to conduct the wife of Lawrence to the last-named island. He arrived in February, after a most tempestuous voyage, but the rapidly declining health of his brother caused the other portion of the arrangement just mentioned to be abandoned. While in Barbadoes in the autumn of 1751, George took the smallpox in the natural way. He had it severely, but owing to the mildness of the climate, the strength of his constitution, and good medical aid, he recovered in three weeks. He was, however, slightly marked through life. His journals kept at Barbadoes evince the spirit of accurate observation which was so prominent a feature of his character. The very first campaign of the Revolutionary War gave proof that his having had the smallpox in his youth was one of the providential events of his life. That loathsome disease, not yet robbed of its terrors by vaccination, made its appearance in the besieging army before Boston; but the life of its commander was safe.

Washington.

His brother Lawrence returned home in the summer of 1752; he had derived no material improvement from his voyage, and died in a short time at the age of thirty-four, leaving a large fortune to an infant daughter. George was appointed one of the executors of his will, by which, in the event of the daughter's decease, Mount Vernon was bequeathed to him. Although the youngest of the executors, in consequence of his more thorough knowledge of his brother's affairs, the responsible management of his extensive estates devolved upon him. He did not, however, allow these private engagements to interfere with his public duties. As the probability of a collision on the frontier increased, greater attention was paid to the military organization of the province. On the arrival of Governor Dinwiddie in 1752, it was divided into four military districts; and Washington's appointment was renewed as Adjutant-General of the Northern Division, in which several counties were included. The duties devolving upon him, under this new commission, in attending the reviews of the militia and superintending their exercises, were performed with a punctuality and zeal which rapidly drew toward him the notice and favour of the community.

Adjutant-general of the northern division.

Commencement of settlements in the West.

We now approach the commencement of Washington's public career, and of a train of events of great magnitude and interest; a service which, though on a small scale, and performed at the age of twenty-one, developed much of the mature strength of his character. The struggle of France and England for the exclusive possession of the eastern portion of the American continent (for the vast region lying west of the Mississippi was as yet unknown to both), was a principal cause of the European wars of the last century. England had established her prosperous colonies along the Atlantic coast. France had entrenched herself at the mouth of the St Lawrence and the Mississippi, and aimed, by a chain of posts drawn north and south through the interior, to prevent the progress of the English colonists westward, and to confine them within constantly reduced limits, hoping, no doubt, ultimately to drive them from the continent. This struggle postponed the civilization of America for a hundred years. It was the great national drama of the eighteenth century. In its progress it subjected the entire frontier to all the horrors of a remorseless border and savage war, and it resulted in the expulsion of the French from the North American continent; in reducing the British dominions to a portion of the territory (the Canadian provinces) which had been wrested from France; and in the establishment of the independence of the United States of America. Everything which preceded the treaty of peace at Aix-la-Chapelle in 1748 may be considered as preliminary to the grand series of events on which we now enter, and in which Washington is immediately to perform a conspicuous, and, eventually, the most important part.

Up to this time the fertile region west of the Alleghany Mountains, and now containing nearly half of the population of the United States, was, with the exception of a few scattered French trading posts and missionary stations, unoccupied by civilized man. In the western part of the State of Maine, in the entire State of Vermont, and in the Western portions of New York, Pennsylvania, and Virginia, in Kentucky, and the states south of it, in the rear of the Carolinas and Georgia, in the entire territory northwest of the Ohio and west of the Mississippi, a region now inhabited by fifteen millions of people, there did not, in the middle of the last century, arise the smoke of a single hamlet inhabited by the descendants of Englishmen. On the return of peace between France and England in 1748 the Ohio Company was formed. Its object was the occu-

Washington.

pation and settlement of the fertile country south-east of the Ohio, and west of the Alleghany Mountains. It consisted of a small number of gentlemen in Virginia and Maryland, with one associate in London, Mr Thomas Hanbury, a distinguished merchant of that city. Lawrence Washington was largely interested and actively engaged in the enterprise. A grant of 500,000 acres of land was obtained of the Crown, by the terms of which the company was obliged to introduce a hundred families into the territory within seven years, and to build a fort and furnish a garrison adequate for their defence. Out of this germ of private enterprise grew the Seven Years' War, and by no doubtful chain of cause and effect, the war of American Independence.

The Ohio Company proceeded to fulfil the conditions of their grant. Preparations for Indian trade were made; a road across the mountains, substantially on the line of that constructed in after years by the authority of the United States, was laid out, and an agent sent to conciliate the Indian tribes. In 1752 a treaty was entered into between the Commissioners of Virginia and the Indians, by which the latter agreed not to molest any settlements which might be formed by the company on the south-eastern side of the Ohio. On the faith of this compact, twelve families of adventurers from Virginia, headed by Captain Gist, proceeded to establish themselves on the banks of the Monongahela.

These movements were viewed with jealousy by the French colonial government in Canada. Although Great Britain and France had recently concluded a treaty of peace, emissaries were sent from Canada to induce the Indians on the Ohio to break up the friendly agreement just entered into with Virginia. Some of the traders, it was said, were seized and sent to France, and by orders of the French government a fort was immediately commenced on a branch of French Creek, about 15 miles south of Lake Erie, as a position from which the Indians could be controlled and the Virginians held in check. These proceedings were promptly reported to Governor Dinwiddie by the servants of the Ohio Company, and the Governor immediately determined to make them the subject of remonstrance addressed to the French commandant, rather, it may be supposed, with a view to ascertain precisely the facts of the case by a special messenger, than on a supposition that movements of this kind could be arrested by anything less than the interference of the supreme authority at Paris and London.

It was no easy matter to transmit an official message in the state of the country at that time, from the banks of James' River to the shores of Lake Erie. The distance to be travelled was between 500 and 600 miles, the greater part of the way through a wilderness. Mountains were to be climbed and rivers crossed; tribes of savages occupied a considerable portion of the intervening space, and all the hazards of an Indian frontier, in a state of daily increasing irritation, were to be encountered. To all these difficulties the season of the year (it was now November) added obstacles all but insuperable in the absence of artificial communications. It is not to be wondered at, that some persons to whom Governor Dinwiddie first proposed the service should excuse themselves. It was offered to Major Washington, and by him promptly accepted, although the decease of his brother had thrown upon him domestic duties, which would have furnished an honest excuse for shrinking from the laborious and dangerous commission. But Washington never shrank from the performance of a duty. He received his instructions, and started from Williamsburg on the 30th of November 1753.

He was joined at Captain Gist's settlement on the Monongahela by that brave pioneer of civilization. At Logstown he held a conference with Tanacharison, who was the chief or half-king of the friendly Indians seated there, and who, with two or three others of the natives, accompanied Washington and Gist, first to Venango, a post on the French Creek, and then to the head-quarters of M. de St Pierre, the French commandant, a short distance further to the north. Here Washington performed his errand, by delivering his despatches, and receiving the reply of the commandant; carefully noting the character and strength of the place, and gaining such information as he was able of the extent of the military operations in progress. The return journey was a series of the severest exposures and the most imminent perils. Their wearied horses were sent by land back to Venango; while Washington and his associates, in a canoe, descended the river, swollen by wintry rains, and at best of hazardous navigation. At Venango they had reason to suspect hostile intentions from the French and savages, and Washington and Gist, with a single Indian guide, in order to hasten their return to the settlements, started through the wilderness on foot, with their packs on their shoulders and guns in their hands. They were dogged through the woods by Indians in the French interest. Their guide exerted all the arts of savage cunning, after leading them out of their path in the forest, to get possession of Washington's gun, but without success. Baffled by their wariness, and perceiving them at nightfall to be fatigued by the weary march, he turned upon them, and, at a distance of 15 feet, fired with his double-barrelled rifle, but without injuring either of them. Gist would have put him to death on the spot, but Washington insisted upon sparing his life, justly as it had been forfeited. After detaining him to a late hour, they allowed him to escape; and in order to forestall an attack from such confederates as he might have lurking in the woods, they pursued their own journey, weary as they were, through the long December's night.

Washington.

Washington's perilous position at Venango.

Not doubting that the savages would soon be on their trail, they dared not stop till they reached the Alleghany river, a clear and rapid stream, which they hoped to be able to cross on the ice, their only consolation under the stinging severity of the weather. The river unfortunately was neither frozen across nor wholly open, but fringed with ice for 50 yards on each shore, and the middle stream filled witl cakes of ice furiously drifting down the current. With "one poor hatchet," to use Washington's own expression, they commenced the construction of a raft, which it took them all day to complete. They launched it upon the river, but were soon so surrounded and wedged in by drifting masses of ice, that they expected every moment that their raft would go to pieces, and they themselves be hurled into the water at the extreme peril of their lives. Washington put out his pole to stop the raft, till the fields of ice should float by; but the raft was urged with so much violence upon his pole, that he himself, holding to it, was thrown into the river where it was 10 feet deep. He saved his life by clinging to a log; but unable to force the raft to either shore, they were compelled to leave it, and passed the night on an island in the middle of the river. So intense was the cold, that the hands and feet of Captain Gist, an experienced woodsman, were frozen. Happily the river froze wholly over during the night, and they were enabled to cross to the opposite bank in the morning on the ice. To this circumstance they were indebted, no doubt, for their escape from the tomahawk of the pursuing savages.

The foregoing adventure has been given in some detail from Washington's official report, which was sent by Governor Dinwiddie to London, and there published. It throws light on traits of his character, which in after life have been somewhat overlooked, in consequence of the habitual circumspection and prudence which were forced upon him by circumstances during his revolutionary career.

Washington.

This dangerous errand was undertaken by Washington through an unsettled wilderness infested by savages, at a season of the year when the huntsman in his log-cabin shrinks from the storm; and this not by a penniless adventurer, taking desperate risks for promotion and bread, but by a young man allied by blood and connected by friendship with the most influential families in the colony, possessed of property in his own right, with large presumptive expectations. In this, his first official service, undertaken under these circumstances, he displayed the courage, the presence of mind, the fortitude, the endurance, the humanity (in a small scale indeed, but at the risk of his life in preserving that of a treacherous savage), which throughout his career never failed to mark his conduct.

Duties of Washington during the war.

Although war was not formally declared between France and England till May 1756, hostilities broke out the following year (1754) along the frontier of the Anglo-American colonies. Preparations, of which the promise was greater than the reality, were made by the provincial assemblies and governors. The Ohio Company commenced a fort at the confluence of the Monongahela and the Alleghany, and a regiment, feeble in numbers, "self-willed and ungovernable," of which Washington was second in command, was sent to their support. The movements of the French were more prompt and formidable; a large force of Europeans and savages in their interest came down from Venango; the servants of the Ohio Land Company were driven from the work which they had commenced at the junction of the rivers; and Fort Duquesne was erected on the spot. This was the first blow struck in the great Seven Years' War, and it is a memorable incident in the life of Washington, then but twenty-two years of age, and accidentally in command of a trifling force in the unsettled region beyond the Alleghanies, that it devolved on him to repel it. He immediately sent despatches to the neighbouring governors requesting aid, but, without waiting for the greatly needed reinforcements, pushed on through the wilderness to the defence of the frontier. Receiving intelligence from the friendly Indians that a party of the enemy was lurking in the woods, Washington, ignorant of their strength, and in order to be prepared for an emergency, threw up a slight work at a place called the Great Meadows, and which he described "as a charming field for an encounter." Having here received more particular information from Captain Gist and the friendly Indians of the whereabout of the enemy, he came upon them by surprise, after a forced march by night, with a company of picked men. In the conflict that ensued, ten of the French, including their leader, Jumonville, were killed, and twenty-one made prisoners.

By the death of Colonel Fry at Will's Creek, on the way to join the little army, Washington became its commander-in-chief. Reinforcements were put in motion, but none arrived, with the exception of an independent company from South Carolina, about a hundred strong, who reached the Great Meadows, under Captain Mackay. The main body of the French at Fort Duquesne, with their Indian allies, were believed greatly to outnumber the Anglo-Americans. Aware that as soon as the fate of Jumonville should become known to the French commandant, a formidable force would be sent against him, Washington strengthened his position at the Great Meadows, by an intrenchment and palisade, and called the work "Fort Necessity." Burdened by the Indians, who crowded his camp with their families, and harassed by the claims of precedence on the part of Captain Mackay, he made an advance movement, by a very laborious march, with a large portion of his force to the Monongahela. So difficult was the country for artillery, that ten days were required for a distance of thirteen miles. Arrived at Gist's settlement, he received intelligence from deserters and Indians that Fort Duquesne had been strongly reinforced by troops from Canada, and savages under the French influence. Apprehending an attack he ordered up Captain Mackay, who had been left with the reserve at the Great Meadows, to his support, who promptly obeyed the summons. It was decided, however, by a council of war, that it would be unsafe to risk a battle in the open field, and a retreat to Fort Necessity was determined on. This was effected with difficulty in two days; and as the troops, from fatigue and want of provisions, were unable to pursue the march, it was concluded to make a stand, and await the enemy within their entrenchments. The fort was soon invested by the French and Indians, who were able on one point to command the interior of the work. A severe action commenced on the 3d of July, which was prolonged till late in the evening.

Washington.

Capture of Fort Duquesne.

A capitulation was then proposed by the French commander, and accepted by Washington. It was drawn up in a drenching rain at night, after a hard fought day, in the French language, and signed by Washington, not knowing that, through the fraud or ignorance of his interpreter, Van Braam, the death of Jumonville was called in the act of capitulation, an "assassination;" a circumstance which was made a futile subject of reproach to Washington in France at the time, and has been occasionally revived since. The following day, the 4th of July, he led out his little force from the stockade, and conducted them in safety through ill-restrained bands of savages to Fort Cumberland.

The following year serious efforts were made, both by France and England, to strengthen themselves on the banks of the Ohio. Two regiments were sent from England, under the brave but self-sufficient, obstinate, and unfortunate Braddock. New orders came with them relative to precedence, which disgusted the provincial officers. Washington threw up his commission, but strongly attached to the profession of arms, he gladly accepted an invitation from General Braddock to join his military family as a volunteer. Great delays attended the collecting of supplies and forwarding of troops. Washington fell dangerously ill, and was of necessity left behind, determined however to rejoin the army at the first moment of convalescence. The general, inexperienced in the warfare of the wilderness, neglected the measures necessary to conciliate the Indians, and the precautions requisite to prevent surprise. Washington arrived at camp but the day before the catastrophe. He was accustomed in after life to describe the appearance of the army, as they crossed the Monongahela on the 9th of July, and moved forward in confident expectation of reducing Fort Duquesne the following day, as the most magnificent spectacle he had ever beheld. A few hours only passed before they fell into an ambuscade; the forest rang with the war-whoop of the Indians; the advance under Colonel Gage (afterwards the last royal governor of Massachusetts) was driven back on the main body, which was thereby thrown into confusion; officers and men dropped on every side under the murderous fire of the enemy, concealed in the woody ravines right and left; and at length the whole force, panic-struck and disorganized, after a terrific and deadly struggle of three hours, in which the loss of the enemy was trifling, suffered a total defeat. They ran before the French and Indians, says Washington, "like sheep before dogs." Of 1460 in Braddock's army, officers and privates, 456 were killed outright, and 421 were wounded; a greater proportion of killed and wounded than is reported in any of the celebrated actions of the present day. The General himself was mortally wounded, and brought off with difficulty from the field.

Washington acted as the general's aid throughout the engagement, and after the other aids, Orme and Morris, were disabled, the perilous duty devolved exclusively on him. It was performed by him, according to his brother-

Washington. officer Orme, who witnessed his conduct, "with the greatest courage and resolution." "By the all-powerful dispensations of Providence," he writes to his brother, "I have been protected beyond all human probability or expectation, for I had four bullets through my coat and two horses shot under me, yet I escaped unhurt, though death was levelling my companions on every side." His friend and physician, Dr Craik said, "I expected every moment to see him fall." A very curious anecdote has also been preserved on the authority of Dr Craik, who relates that when Washington, fifteen years later, made a journey to the great Kenhawa, he was approached by the chief of a band of Indians, who said that he had come a long distance to see Washington, at whom he had aimed his rifle many times in the battle of the Monongahela, but without effect. A seal of Washington, with his initials, probably shot away from his person, was found after a lapse of eighty years on the field of battle, and is now in the possession of a member of the family. So prevalent was the impression of his almost miraculous escape from the perils of this disastrous day, that President Daveis of New Jersey College, but at that time a clergyman in Virginia, in a sermon preached in the month of August following, before a company of volunteers, after commending the patriotic ardour which had been manifested in the colony, added, "as a remarkable instance of this, I may point out to the public that heroic youth, Colonel Washington, whom I cannot but hope Providence has hitherto preserved in so signal a manner for some important service to his country."

There is certainly something extraordinary in the brilliant reputation with which Washington, a young officer holding no higher position in the army than that of a volunteer aid to its unfortunate chief, returned from this disastrous campaign. His preservation, as we have just seen, was ascribed to nothing less than providential interposition. The exposed state of the frontier thrown open to the enemy required immediate measures of protection. A provincial force of 2000 men was immediately voted by the Assembly, and though the governor was supposed to favour another candidate, the command was given by him to Washington. He received this appointment in four weeks after his return from the battle of Monongahela. He immediately established his head-quarters at Winchester, then one of the most advanced settlements, and from that point superintended the operations of the Virginia frontier for the rest of the war. These, with the exception to be presently mentioned, were of a defensive character. No important expeditions were attempted; no great battles fought; but a line of feeble settlements, extending for several hundred miles, was to be protected from roving bands of savages, countenanced by the French commandants, emboldened by the events of 1755, and stimulated to plunder and bloodshed by outcasts from the colonies.

The task of the youthful commander-in-chief, responsible for the peace of the frontier, but with very inadequate means at his command, was arduous in the extreme. A reluctant and undisciplined militia was to be retained in the ranks by personal influence; without pay, without clothes, and very imperfectly armed. Contradictory and impracticable orders were continually received from Governor Dinwiddie, who was wholly unskilled in military matters, but obstinately insisted on directing everything. Greedy and dishonest contractors played their ancient game of fraud. The arrogant pretensions of a subaltern officer, bearing a royal commision, kept Fort Cumberland in an unsettled state, and compelled Colonel Washington in mid winter to go to Boston for a solution of the difficulty by Governor Shirley, then the commander-in-chief of the Royal forces on the continent. Wholesale desertions on the approach of danger weakened his little force; and the intrigues of rivals aspiring to his place, and seeking to gain it by traducing his character, outraged his feelings. In his official correspondence for 1756 and 1757, all these sources of embarrassment and annoyance are set forth, and we are struck with the similarity of the state of things then existing with that to which we shall presently have occasion to advert in the Revolutionary War. While nothing can be conceived more harassing, it must be admitted that it formed the best imaginable school of preparation for the more momentous scences in which he was hereafter to act a leading part. It was not, however, unattended with personal danger. The fatigues and anxieties which he underwent again brought on a severe illness, with which he suffered for four months at the close of 1757 and the beginning of 1758. Washington.

The campaign of 1758 was devoted to an important military expedition from Pennsylvania and Virginia against Fort Duquesne, in which Washington, as commander of the Virginia contingent, took a leading part. The whole force destined for the expedition was placed under the command of General Forbes, and in consequence of his illness at Philadelphia, the loss of time in opening a new road into the wilderness (contrary to the advice of Washington), and the usual tardiness of military operations in colonies remote from the seat of power, it was late in the autumn before the army took the field. Washington, at his earnest solicitation, led the advance, to scour the forest and open the roads. It was, however, far in November before they reached the neighbourhood of Fort Duquesne, and the commander, after a serious check, was on the point of abandoning the enterprise for that year. The report brought by deserters of the weakness of the garrison determined him at the last moment to make the advance, and on the 25th of November 1758, he arrived at the fort, and found that it had been abandoned and burned by the enemy. The English and provincials erected a temporary work on the spot, to which, in honour of the great minister who had infused his spirit into the conduct of the war, they gave the name of Fort Pitt, still preserved in that of Pittsburg. The power of France was thus finally subverted on the Ohio, and the Anglo-Saxon race for ever established on "the beautiful river." The fall of Quebec the following year, and the provisions of the treaty of 1763, extinguished the French dominion in North America.

Retirement from the army. The health of Washington, as we have seen, had suffered severely in the progress of the war. He had made repeated attempts to obtain a commission in the Royal army; but although possessing in the highest degree, as a military man, the confidence of Governor Dinwiddie, General Braddock, and his successors, those attempts were unsuccessful. Commissions were monopolized by younger sons and the favourites of power at home. Thus was the wish of Washington to enter the Royal service baffled a second time. By what narrow chances the fate of empires is determined! Having no prospect of advancement in his favourite profession, and having, in the fall of Fort Duquesne, seen the great object of the contest obtained, as far as Virginia, Maryland, and Pennsylvania were concerned, he determined to retire from public life, and devote himself to the care of his property, which had suffered by neglect, and the duties of a private citizen.

Marriage. Having in the course of the preceding year paid his addresses successfully to Mrs Martha Custis, the widow of Colonel John Custis of Virginia, he was married to that lady on the 6th January 1759. There is a constant tradition that three years before he had been a suitor to Mary Phillipse, the sister-in-law of Colonel Beverley Robinson of New York, whose guest he was on his journey to and from the eastern colonies in 1756. On this occasion, Colonel Morris, his associate in arms at Braddock's defeat, and his companion in the excursion to the east, having lingered in New York after the return of Washington to the army,

Washington. proved a successful rival and became the husband of the lady. She was the heiress of a large landed property in the State of New York, and her family adhered to the Royal side in the Revolution. This lady is said to have died in England at the age of ninety-four, having survived Washington about twenty-five years. One cannot but bestow a passing thought on the question, What might have been the effect on the march of events, if Washington, at the age of twenty-four, and before the controversies between the mother country and the colonies had commenced, had formed a matrimonial alliance with a family of wealth and influence in New York, which adhered to the Royal cause, and left America, as loyalists, when the war broke out? It is a somewhat curious fact, that Washington's headquarters during a part of the compaign of 1776 were established in the stately mansion of the Morrises on Harlem River. (Lossing's *Mount Vernon and its Associations*, p. 46.)

His connection with Mrs Washington was in all respects fortunate. She was the mother of two children by her former marriage; she brought him a large accession of fortune for those days, and by her solid virtues, cheerful disposition, and simple and amiable manners, relieved him from the cares of domestic life, strengthened the attachment of his friends, and adorned the high public stations to which he was successively called. He remained childless, but he adopted her children as his own, and superintended their education and managed their fortunes with parental care. The daughter died in early life; the son became an aid to Washington during the Revolutionary War, but died in 1781, leaving three daughters and a son. The youngest daughter, who afterwards married Lawrence Lewis, Esq., and the son, George W. Parke Custis, who died at Arlington in Virginia, in the year 1857, were adopted by Washington, and brought up at Mount Vernon.

Election to the House of Burgesses. Washington, though absent with the army, had been elected to the Virginia House of Burgesses in 1757. After his retirement from the service, he took his seat, and continued a member of that body under repeated re-elections, till the commencement of the Revolutionary War. He was remarkably diligent and punctual in the performance of his duties as a legislator and a representative, but seldom took part in debate properly so called, and never made a long speech. In this respect he resembles two others of the foremost leaders of the American Revolution, Franklin and Jefferson, men who, in general intellectual culture and political training, had the advantage of Washington, but who, like him, had never formed themselves to the habit of debate. His recommendation to a nephew, on being chosen a member of the House of Burgesses, may be taken as the indication of his own rule of conduct,—"If you have a mind to command the attention of the house, the only advice I will offer is, to speak seldom but on important subjects, except such as particularly relate to your constituents; and in the former case make yourself perfectly master of the subject. Never exceed a decent warmth, and submit your sentiments with diffidence. A dictatorial style, though it may carry conviction, is always accompanied with disgust."

Such was the habit of Washington himself; it was the only course consistent with his natural disposition and peculiar balance of mental qualities. There is no doubt that in this, as in some other respects, the possession of more brilliant qualities would have marred the symmetry of his character and lessened his influence. Shining powers of debate, for instance, had he possessed them, would, by the necessity of that talent, have fixed him as a partizan, and consequently have impaired that influence through which he controlled all parties. As it was, no one possessed greater ascendency in all deliberative bodies of which he was a member. On the return to Virginia of the delegates to the first continental Congress at Philadelphia, Patrick Henry, himself generally regarded as the first of American orators, was asked who was the greatest man in the assembly. His reply was, "If you speak of eloquence, Mr Rutledge of South Carolina is by far the greatest orator; but if you speak of solid information and sound judgment, Colonel Washington is unquestionably the greatest man on the floor." Washington.

Shortly after his marriage, Washington established his permanent home at Mount Vernon, and gave himself up to the usual routine of plantation life, as pursued in those days. Tobacco was then the great staple product of this part of Virginia, and Washington was in the habit of shipping his crops directly to London, to Liverpool, and to Bristol. All supplies of manufactures for clothing, implements of husbandry, and matters of taste and luxury, were derived by direct importation from England, usually twice a year. All the business connected with the cultivation of his estates, and the exportation of his crops on the one hand, and the orders for his return supplies on the other, were superintended by him in person. His letters were written and copied, and his account-books kept by himself in mercantile order, and with extreme neatness and precision. In the course of these transactions, the minutest details of domestic economy necessarily received his attention, down to the most trifling article of clothing for the children. While he gave his hours of labour to these humble occupations, he found a much cherished relaxation in the sports of the field. He was a bold rider, and followed the fox-hounds, sometimes two or three times a week, with untiring spirit. It is related that, at the battle of Princeton (where, as he told the painter Trumbull, he was in greater danger than ever before in the course of his life, being at one time between the fire of both armies), perceiving a regiment of the enemy in full retreat down the hill, he leaped his favourite roan hunter over a stone-wall which crowned the summit, gave the view halloo, and said to his aids, "A perfect fox-chase!" Business habits.

In the year 1770 Washington revisited the scenes of his youthful adventure and service. Accompanied by Dr Craik, who shared with him the hazards of Braddock's field, and a party of friends and servants, he went on horseback to Pittsburg, then in its infancy, and descended the Ohio River from that place to the mouth of the Great Kenhawa in Virginia. A net of railroads now covers the region through which they rode, and hundreds of steamers ply the waters of the Ohio. Washington and his party floated down the river in an open boat, exposed to the savages on the right bank, on which, at that time, there were no white settlements, and obliged to land at night and encamp in the woods. Having reached the Kenhawa, they ascended that stream, and made valuable selections of fertile lands. It was on this occasion that the interview with the Indian chief took place, which has been already described.

Controversy with the mother country. The contest of legislation had been for some years in progress, which preluded the great scene of Washington's services and fame, the American Revolution. With a view to American revenue, the Stamp Act was passed. It was repealed, but with the assertion of a right to tax America; and this theory carried out in practice by the enactment of the duties on tea, glass, and painters' colours, of which the first-named was persistently retained when the others were rescinded, brought on the war. These ill-advised measures, which we have grouped in a sentence, were spread over eight years of irritation, disaffection, and ripening revolt. Washington, by nature the most loyal of men to order and law, whose rule of social life was obedience to rightful authority, was from the first firmly on the American side; not courting, not contemplating even till the eve of the explosion, a forcible resistance to the mother

Washington. country, but not recoiling from it, when forced upon the colonies as the inevitable result of their principles. An impression has existed in some quarters, on the other side of the Atlantic, that Washington originally leaned to the Royal side in the great conflict of opinion and feeling that preceded the Revolutionary War. His correspondence, not less than his public course as a member of the House of Burgesses, shows this impression to be utterly groundless. It may have had its origin in the fact, that, not being a public speaker or writer, he was less frequently and prominently brought before the public as an open champion of the cause, than some of the other leaders of the Revolution. The spurious letters bearing his name, and which were industriously published in a volume at London during the war, in order to shake the faith of his countrymen in his integrity, contributed no doubt to strengthen this impression. It is matter of surprise that the title of a fabrication of this kind, which one is pleased to think would, at this time of day, be deemed unworthy a place among the instruments of honourable warfare, should be admitted as a genuine publication into a respectable literary manual.[1] Washington was the near neighbour and confidential friend of George Mason, who drew the plan of the association not to import British manufactures in 1774, and in the absence of Mason from the House of Burgesses, and as chairman of the meeting at which the resolves were adopted, he presented it to the Assembly. There is not the slightest trace of dissent on his part from any of the measures of the popular leaders, except that he deemed it wrong to forbid the export of American produce to England, as this was the only fund out of which the colonies were able to pay their debts to the British manufacturer. His name is found in conjunction with those of the most constant patriots, in the anxious years that preceded the appeal to arms; and when the House of Burgesses was dissolved by the royal governor in the summer of 1774. Washington was a member of the convention chosen to take its place, and was, with five associates, elected delegate to the first continental Congress, which met in Philadelphia in the autumn of that year. Of his position in that assembly, the estimate formed by Patrick Henry, one of the most fervid of patriots, has already been given. A letter written by him from Philadelphia to one of his former companions in arms—Captain Mackenzie, then stationed at Boston—exhibits the state of Washington's mind at this period, as of that of the class of men whom he represented. The following extract will suffice:—"I think I can announce it as a fact, that it is not the wish nor the interest of the government of Massachusetts, or any other government upon this continent, separately or collectively, to set up for independence; but this you may rely upon, that none of them will ever submit to the loss of those valuable rights and privileges which are essential to the inhabitants of every free state; and without which life, liberty, and property, are rendered totally insecure." The object of holding the congress, as expressed in the resolution of the convention of delegates in Virginia, by which Washington and his associates were elected, was declared to be, "to consider the most proper and effectual manner of so operating upon the commercial connection of the colonies with the mother country, as to procure redress for the much injured province of Massachusetts Bay, to secure British America from the ravage and ruin of arbitrary taxes, and speedily to procure the return of that harmony and union so beneficent to the whole empire, and so ardently desired by all British America."

The Congress met at Philadelphia on the 5th of September. Washington's letter to Captain Mackenzie was written on the 9th of October, and the petition to the King, which closes the journal of the session, terminates with the following loyal aspirations: "That your majesty may enjoy every felicity, through a long and glorious reign, over loyal and happy subjects; and that your descendants may inherit your prosperity and your dominions, till time shall be no more, is and always will be our sincere and fervent prayer!" Washington.

Before we enter upon a brief survey of the career of Washington, as the great military leader of the American Revolution, we cannot but reflect upon the adaptation of the first portion of his life as a school of preparation for the sequel. His great vocation may be considered as commencing with the Revolutionary War. He was the providentially appointed leader of that great contest, whose results, direct and remote, are of equal moment to the Old World and the New. We can scarcely imagine a course of life better fitted to train him for his arduous work than that which he led from the age of sixteen, when he entered the wilderness as a surveyor of unsettled lands, to his retirement from the army eleven years afterwards. In this period he had received a thorough athletic training, and had studied the art of war, not on the black board at military schools, but in actual service, and that of the most perilous and trying kind, under rigid disciplinarians of the best school of that day; for Braddock had been selected for the command, as an experienced and thoroughly accomplished officer.

But military command was but one part of the career which awaited Washington. Almost all the duties of government centred in his hands, under the inefficient administration of the old Congress. A merely military education would have furnished no adequate preparation for the duties to be performed by him. It was accordingly a most auspicious circumstance that from the year 1759 to the Revolution, he passed fifteen years as a member of the House of Burgesses, where he acquired a familiar knowledge of civil affairs and of politics. The ordinary legislation of a leading colonial government, like that of Virginia, was no mean school of political experience; and the state of affairs at the time was such as to expand and elevate the minds of men. Everything was inspired with an unconsciously developed, but not the less stirring revolutionary energy, and many of his associates were men of large views and strenuous character.

While his public duties, civil and military, prepared him, in this way, for the positions he was to fill in war and in peace, the fifteen years which he passed in the personal management of a large landed estate, and the care of an ample fortune, furnished abundant occasion for the formation of the economical side of his character, and gave a thoroughness to his administrative habits which has not been witnessed in the career of many very eminent public men in Europe or America. It will not be easy to find another instance of a great military and political leader, who, to the same degree, has been equal to the formation and execution of the boldest plans, and to the control of the most perplexed combinations of affairs, and yet not above the most ordinary details of business, nor negligent of minute economics. But it was precisely this union of seemingly inconsistent qualities of mind and character which was most needed from the time he took command of the Revolutionary army to the close of his presidential service.

To do full justice to the character of Washington, as the great leader of the American Revolution, would require a detailed history of the war by which the independence of the United States was established. A very brief sketch of those events in which he was directly concerned is all

[1] Lowndes' *Bibliographers' Manual.*

Washington.

that can be attempted. It may first be observed, that it would be unjust to Washington to place his military reputation on ordinary strategical grounds. He had an army to call into being, as well as to conduct; the entire *matériel* of war to create; supplies to raise, without credit or the power of taxation, from a small and scattered population, subject to separate state governments, and not yet organized under one efficient central authority. At no period of the war was he supported by a strong civil power, for Congress acted only by recommendations addressed to the States; he was never furnished with a well-supplied military chest (there was a moment in the disastrous campaign of 1776, when he wrote to Mr Morris at Philadelphia, that L.100 would be of great service to him); and he never was at the head of what, at the present day, would be called an efficient force, unless we except the allied American and French army at Yorktown, and there he achieved a brilliant success. It would of course be unreasonable, under these circumstances, to compare his military operations with those of the great captains of Europe, who, in the service of rich and powerful governments, and at the head of immense bodies of veteran troops, with the aid of experienced subalterns in every rank of the army, and with a boundless supply of all the *matériel* of war, gain the victories which fill the pages of history, and earn for themselves immortal fame.

Commencement of the war.

The actual commencement of hostilities in the war of the American Revolution might be said to be accidental. A series of ill-judged and oppressive measures, on the part of the British Parliament, aimed principally at the province of Massachusetts Bay (as it was then called), had produced a great degree of irritation there, in which the other colonies cordially sympathized. Military preparations had been going on for a year or two in Massachusetts, and small stores of powder and arms had been collected. A few field-pieces had been procured at Concord, a village lying about 18 miles west of Boston; and this fact coming to the knowledge of General Gage, the royal governor and commander-in-chief in Boston, he despatched a considerable force into the country, on the night of the 18th of April 1775, with the twofold object of destroying the provincial stores, and, as was supposed, of arresting Hancock and Adams, who had been proscribed by name, and who were then at Lexington, a village situated on the road to Concord. This rash movement brought on a collision at Lexington and Concord on the morning of the 19th, between the Royal force and the militia of those places and others on the line of march and in the vicinity. Blood was shed on both sides; the alarm spread with great rapidity through the neighbouring towns; and the Royal force was saved from annihilation only by a disorderly and tumultuous retreat to Boston. Here they were immediately blockaded by 15,000 or 20,000 men of the militia of Massachusetts and the other New England colonies, who, as the news of the commencement of hostilities spread through the country, had poured in from every side. As Massachusetts was the seat of the war, the control of this force, and the conduct of the struggle, thus *improvised*, devolved by the necessity of the case, and by tacit understanding, upon the provincial Congress (as it was called) of that colony; an extra constitutional body called into existence by the exigency of the times, and assimilated as nearly as possible to the assembly organized under the colonial charter. Major-General Ward of Massachusetts thus became, by acquiescence, the commander-in-chief of the forces hastily assembled around Boston. The second session of the continental Congress commenced at Philadelphia, about three weeks after the events at Lexington and Concord, and measures were immediately adopted for recognising the forces already concentrated round Boston as a continental army, and for raising additional troops in the other States.

Washington.

Chosen commander-in-chief.

Early in June 1775 the question of an appointment of a commander-in-chief came up. Colonel Washington, as has been seen, was one of the delegates from Virginia to the Continental Congress. His distinguished services in the Seven Years' War were still freshly remembered; and he had acquired in the intervening period, in the Virginia Assembly, a substantial reputation for prudence, energy, and practical wisdom. Combined with this reputation, his large fortune, his attractive and imposing personal appearance and manners, and general weight of character, gave him influence; and motives of patriotic expediency inclined the delegates from Massachusetts, and especially their ardent and eloquent leader, John Adams, afterwards the second President of the United States, to waive whatever claim that colony might be supposed to possess, and to give their support to the accomplished Virginia colonel as commander-in-chief of the continental armies. Washington was unanimously elected, and in accepting the appointment, which he did in person in his place in Congress, he modestly avowed his "consciousness that his abilities and military experience might not be equal to the extensive and important trust," and added, "Lest some unlucky event should happen unfavourable to my reputation, I beg it may be remembered by every gentleman in the room, that I this day declare, with the utmost sincerity, that I do not think myself equal to the command I am honoured with." The compensation of the commander-in-chief having, before the election, been fixed at five hundred dollars per month, he declined to accept any salary, but stated that he should keep an exact account of his expenses, not doubting that these would be reimbursed to him by Congress. This account is in existence, wholly made out in Washington's handwriting. It has been lithographed in *fac-simile*, and is a document of great curiosity and interest. Washington's commission passed Congress on the 17th of June 1775, the day on which the memorable battle of Bunker Hill was fought. The news of that battle reached him on his way to join the army before Boston, and on learning that the militia had sustained themselves gallantly in a conflict with regular troops, he declared that the cause of America was safe.

He arrived in Cambridge, Massachusetts, on the 2d of July, and on the following day presented himself at the head of the army. His head-quarters remained at Cambridge,[1] till the evacuation of Boston by the Royal forces on the 17th of March 1776. The position of affairs was one of vast responsibility and peril. The country at large was highly excited, and expected that a bold stroke would be struck and decisive successes obtained. But the army was without organisation and discipline; the troops unused to obey; the officers for the most part unaccustomed, some of them incompetent, to command. A few of them only had had a limited experience in the Seven Years' War. Most of the men had rushed to the field on the first alarm of hostilities, without any enlistment, and when they were enlisted it was only till the end of the year. There was no military chest; scarce anything that could be called a commissariat. The artillery consisted of a few old field-pieces of various sizes, served, with a very few exceptions, by persons wholly untrained in gunnery. There was no siege train, and an almost total want of every description of ordnance stores. Barrels of sand represented as powder were from time to time brought into the camp, to prevent the American army itself from being aware of its deficiency in

[1] Washington's head-quarters at Cambridge were established in the house now owned and occupied by Mr Longfellow, then belonging to the loyalist family of Vassall.

Washington.

that respect. In the autumn of 1775, an alarm of small-pox was brought from Boston, and the troops were subjected to inoculation. There was no efficient power either in the Provincial Assembly or the Congress at Philadelphia by which these wants could be supplied and these evils remedied. Such were the circumstances under which General Washington took the field, at the head of a force greatly superior in numbers to the Royal army, but in all other respects a very unequal match. Meantime the British were undisputed masters of the approaches to Boston by water.

Washington's letters disclose extreme impatience under the inaction to which he was condemned; but the gravest difficulties attended the expulsion of the Royal forces from Boston. It could only be effected by the bombardment and assault of that place, an attempt which must in any event have been destructive to the large non-combatant population, that had been unable to remove into the country, and which would have been of doubtful success for the want of a siege train, and with troops wholly unused to such an undertaking. Having in the course of the year received some captured ordnance from Canada, and a supply of ammunition taken by privateers at sea, Washington was strongly disposed to assault the town as soon as the freezing of the bay on the western side of the peninsula would allow the troops to pass on the ice. The winter, however, remained open longer than usual, and a council of war dissuaded this attempt. He then determined to occupy Nook's Hill (an eminence at the extremity of Dorchester "Neck," as it was called, separated from Boston by a narrow arm of the harbour), and Dorchester Heights, which commanded Nook's Hill and the town itself. In this way, the Royal forces would be compelled to take the risk of a general action, for the purpose of dislodging the Americans, or else to evacuate the town. The requisite preparations having been made with secrecy, energy, and dispatch, the heights were covered with breastworks on the night of the 4th of March 1776, as "by enchantment;" a partial movement undertaken by the Royal army to dislodge the Americans was frustrated by stress of weather, and on the 17th of March, in virtue of an agreement to that effect with the municipal government, the town and harbour of Boston were evacuated by the British army and navy without firing a gun. Thus, without a battle and without the destruction of a building in Boston, the first year of the war was brought to a successful and an auspicious close.

Dorchester heights fortified.

Boston evacuated by the Royal forces.

The British army, under General Howe, after evacuating Boston, sailed for Halifax; but in the course of the summer a general concentration of the Royal forces took place in the vicinity of New York, Staten Island being the head-quarters. There the landing of the British was effected on the same day on which the independence of the United States was declared at Philadelphia. General Howe was reinforced at Staten Island by the troops under Clinton and Cornwallis, who had been despatched to the South, and who had been repulsed in an attack upon Sullivan's Island, which was defended with signal valour and success by General Moultrie. A naval armament, with a large reinforcement of German mercenaries, also arrived at New York, under Lord Howe, the brother of the General, who was clothed with full powers as a commissioner, and who brought unavailing overtures for pacification. These he addressed at first to "George Washington, Esq.;" afterwards, with melancholy pertinacity but equal want of success, enlarging the superscription with a thrice repeated *et cetera*. No man could care less than Washington for the empty parade of titles, but he did not, of course, choose to acquiesce in the intentional refusal to recognise him in the only capacity in which Lord Howe was warranted to communicate with him at all.

Washington.

By the several accessions alluded to, the British army was swelled to between twenty-five and thirty thousand well appointed troops. The American army in the aggregate was numerically of almost equal size, but reduced, by sickness, detachment, and absence on leave, to about eleven thousand men fit for duty, and those not to be compared with efficient veteran soldiers. It was necessary that this small army should be widely distributed. A considerable force was stationed at Brooklyn on Long Island, and the residue at various posts and forts on New York Island and the North and East Rivers. The head-quarters were in the city of New York. General Greene commanded on Long Island, but this able officer falling ill, his place was taken by General Sullivan. The British began to land detachments of troops on Long Island on the 22d of August, but it remained uncertain for some days where he would strike the main blow. On the 25th, General Putnam was ordered with a strong reinforcement to Brooklyn, where the following day was spent by the Commander-in-chief in the necessary arrangements for the expected battle. On the 27th, a general action was fought, with greatly superior forces on the part of the British. The Americans were defeated with heavy loss, Generals Sullivan and Lord Stirling being among the prisoners. General Howe encamped for the night in front of the position of the Americans, expecting, no doubt, to follow up his success the next day by their total rout. He probably overrated their strength; the day was rainy, and no forward movement was made by the British army on the 28th. In the course of that day an activity prevailed on Staten Island, which was thought to threaten an attempt on the city; and during the night, under cover of a dense fog, a masterly retreat, conducted by General Washington in person, was commenced, and before morning the entire American force on Long Island was brought off in safety. The battle of Long Island was one of the most disastrous events of the war; and the undiscovered retreat of the troops, within hearing of the hostile sentries, one of its most brilliant achievements. On these two eventful days, Washington was for nearly forty-eight hours in the saddle, during which he did not close his eyes.

Battle of Long Island.

The greatly superior numbers of the Royal army, and the control of the waters on which New York stands, compelled the retreat of the Americans successively from the city and island of New York; and at the close of October, Washington occupied an intrenched camp at White Plains, a strong position about midway between the Hudson and East River. Here a pretty severe but partial action took place, which resulted favourably to the British. A general engagement seemed in prospect, but Sir William Howe (lately decorated with the order of the Bath) thought the position of Washington, who had withdrawn to higher grounds too strong to be forced, and concentrated his own troops at Harlem and on the Hudson, with the evident design of crossing into New Jersey and marching on Philadelphia. To anticipate this movement, Washington, after despatching Heath with a detachment to hold the Highlands, and leaving Lee in command near White Plains, crossed into New Jersey with the troops belonging to the States west of the Hudson. Lee, in whose military capacity and fidelity to the American cause too much confidence was reposed, was directed to remain at White Plains, or to follow the Commander-in-chief as the exigencies of the service might require.

Fort Washington, a strong post on the Hudson, commanded by Colonel Magaw, was immediately invested by the British, and the garrison, amounting to over three thousand men, capitulated. This was another most disastrous blow to the American cause. Lord Cornwallis was immediately despatched into New Jersey with six thousand men; and to prevent Sir William Howe from marching on Phila-

Washington.

Retreat to Philadelphia.

delphia with his entire army, Washington was compelled to retreat from river to river through that state. His numbers were much reduced by the loss of the garrison at Fort Washington, by the detachment of Heath to the Highlands, and the unpardonable tardiness of Lee in obeying the repeated orders of the Commander-in-chief to join the main body of the army. The further pernicious effects of his insubordination were prevented, after his arrival at Morriston in New Jersey, by his surprise and capture in the night, by a party of the enemy, who had received a hint of his whereabout. This event, discreditable to himself, was hardly to be regretted by Washington, whom he was secretly plotting to undermine, and whom he omitted no opportunity to disparage. The Commander-in-chief crossed the Delaware river with barely four thousand troops. He was soon joined by other detachments of the army, but was in no condition to defend Philadelphia, if Sir William Howe, at the head of a large and well appointed army, should, as soon as the Delaware was frozen, cross the ice, and attempt the city by assault.

The state and prospects of the American army and cause were at this time more gloomy than at any other period of the war. The army, feeble and poorly provided at best, was on the point of dissolution, by the expiration of its term of enlistment. The year 1776 and the campaign were closing amidst universal despondency. Washington almost alone remained unshaken, and on one occasion declared that if the enemy succeeded in obtaining possession of the whole of the Atlantic States, he would retreat behind the Alleghanies, and bid them defiance there. But it was precisely at this juncture that he struck the boldest stroke of the war, and, in less than two weeks, not only changed the entire face of affairs, and retrieved the fortunes of the campaign, but established his own reputation as a consummate chieftain.

A detachment of the Royal army, consisting principally of the Hessian mercenaries, but with a squadron of British dragoons, had been pushed to the Delaware river, and occupied Trenton. Smaller bodies of Royal troops were stationed at other points down the river; a still larger force was posted at Brunswick. Washington conceived the plan of crossing the Delaware and surprising the Hessians at Trenton, and the other corps at Burlington and Bordentown. This was to be effected by dividing his own small force into three parties, which should pass the river above and below Trenton, headed respectively by himself, Cadwalader, and Ewing. On the night of the 25th of December, when the Delaware, a broad and rapid stream, was filled with floating ice, under a driving storm alternately of snow, rain, and sleet, and with the weather so cold that two of his men froze to death by the way, his own part of the movement was successfully accomplished. Trenton was surprised by him about eight o'clock in the morning, and after a brief action, with nominal loss to the Americans, a thousand Hessians were taken prisoners,—their commander, Colonel Rahl, being killed. The dragoons escaped down the river, and owing to the impossibility of crossing it, the masses of drift ice having become too fixed for the boats to pass through, the other portions of the plan failed. Washington recrossed the Delaware in safety with his prisoners, who were nearly half as numerous as his own detachment, and after an interval of two or three days, returned with his disposable force to the left bank of the river, to resume the offensive.

Gains the battle of Princeton.

Lord Cornwallis, who was on the eve of sailing for England, considering the campaign as closed, was detained by Sir William Howe, and sent in haste to Trenton, to arrest the progress of Washington. The latter, who had stationed himself behind the Assanpink, knowing the great inferiority of his force, decamped in the night from the bank of that river, and, forcing a march on Princeton, surprised a detachment of the Royal army, which was on the way to reinforce Cornwallis at Trenton. A sharp action ensued, in which Washington, as has been stated, informed Colonel Trumbull, who painted a picture of the scene, that he was in greater personal danger than on any other occasion in his life, not excepting Braddock's defeat. The Royal force was defeated with great loss both in killed and prisoners. Many also fell on the American side; among them the gallant and lamented Mercer.

Washington.

By these bold and successful operations the fortune of the war was completely reversed. All thoughts of moving on Philadelphia were for the present abandoned by Sir William Howe, and he confined himself for the rest of the winter to the positions occupied by his troops at New York, Amboy, and Brunswick. General Washington went into winter quarters at Morristown, and the authority of Congress was restored throughout New Jersey, except in the places in the actual occupation of the British troops. These brilliant results, achieved at the moment of accumulated disaster and almost of despair, revived the confidence of the country, and earned for Washington a brilliant reputation as a strategist in the estimation of Europe.

Campaign of 1777.

With the opening of the campaign of 1777, Sir William Howe, at the head of a vastly superior force, in vain endeavoured to draw Washington into a general engagement. Burgoyne entered Canada, and the American commander was for some time at a loss what might be Sir William's ulterior plan of operations. It soon appeared that Philadelphia was his object; but not deeming it safe to march through New Jersey with the American army on his flanks and rear, Sir William hastily embarked his troops at Staten Island, and went round by sea to Chesapeake Bay. As soon as the news reached Washington that the Royal fleet was seen at the Capes of Delaware, he moved on Germantown, and thence to Chester.

It was at this time that Lafayette was introduced to the Commander-in-chief; and notwithstanding the caution with which foreigners were necessarily received, he was immediately taken into the confidence of Washington, which he justly retained to the end of his life. Serving as the medium of communication between the two countries, and possessing influence with both, the connection of Lafayette with the American Revolution contributed materially to its successful issue.

Battle of Brandywine.

Sir William Howe ascended the Chesapeake Bay, and landed his army at the head of Elk. Washington met him on the Brandywine with inferior numbers, and after a severe action, in which Lafayette was wounded, the Americans were compelled to retreat. Notwithstanding this reverse, Washington succeeded for eight or ten days, by skilful manœuvring and avoiding a general action, in keeping the Royal army occupied; nor was it till the 22d of September that Sir William Howe was able to enter Philadelphia. A considerable detachment of his forces was stationed at Germantown. Washington, notwithstanding the suffering condition of his army, after a forced night-march of seventeen miles, on the 4th of October attacked the Royal troops at Germantown, and at first with decided success. The fortune of the day, in consequence of untoward circumstances, turned against him; but the fact that he was able so soon to resume the offensive was regarded both at home and abroad as a proof of his unbroken spirit, and was so spoken of by the Count de Vergennes, in his communications with the American Commissioners at Paris.

Capitulation of Burgoyne.

In the meantime, the success of Stark at Bennington, in Vermont, on the 16th of August, had been followed by the capitulation of the army of Burgoyne at Saratoga, which took place a few days after the affair at Germantown. This capitulation was an all-important event in its influence on the progress of the war; but its immediate effect was unpro-

Washington.

pitious to the reputation of the Commander-in-chief, who was compelled, at the close of the year, to place his army, in a state of almost total destitution, in winter quarters at Valley Forge. The brilliant success of General Gates at Saratoga, in contrast with the reverses which had befallen the American army under the immediate command of Washington, encouraged the operations of a cabal against him, which had been formed by certain disaffected officers of the army, and was countenanced by a party in Congress. The design was, by a succession of measures implying a want of confidence, to drive Washington to retire from the service in disgust, and, when this object was effected, to give the command of the army to General Gates, who lent a willing ear to these discreditable intrigues. A foreign officer in the American army of the name of Conway was the most active promoter of the project, which was discovered by the accidental disclosure of a part of his correspondence with Gates. Washington bore himself on this occasion with his usual dignity, and allowed the parties concerned in the army and in Congress to take refuge in explanations, disclaimers, and apologies, by which those who made them gained no credit, and those who accepted them were not deceived.

A part of the machinery of this wretched cabal was the publication in London, and the republication in New York, of the collection of forged letters already mentioned bearing the name of Washington, and intended to prove his insincerity in the cause of the Revolution. Nothing perhaps more plainly illustrates his conscious strength of character than the disdainful silence with which he allowed this miserable fabrication to remain for twenty years without exposure. It was only in the year 1796, and when about to retire from the Presidency, that he filed in the department of state a denial of its authenticity.

Campaign of 1778.

The French alliance.

The year 1778 was one of great moment. Early in May intelligence was received by Congress (which sat at Yorktown, in Pennsylvania, during the occupation of Philadelphia by Sir William Howe) that the American Commissioners in Paris had negotiated treaties of alliance and commerce with France. It would be easy to prove, from the diplomatic correspondence of the day, that whatever credit is due to the skill with which the negotiations at Paris were conducted by Franklin, the confidence reposed by the French government in the character of Washington was a very great inducement for hazarding a step which involved as its first consequence a war with Great Britain.

Sir William Howe had gained nothing by the campaign of 1777, though it had resulted in the temporary possession of Philadelphia. The occupation of that city was barren of results; the Ministry were dissatisfied with his conduct of the war, and he resigned his command. Sir Henry Clinton was appointed in his place; and an expedition against the French possessions in the West Indies being determined upon by the Ministry, a strong force was detached for that purpose from the Royal army in America. The evacuation of Philadelphia, after eight months' occupation, was the first step in the new plan of campaign. Having shipped his cavalry, his German troops, the American loyalists, and his heavy baggage, to go round by sea, Sir Henry marched for New York, with the main body of his troops, across New Jersey. Washington immediately started with his newly organized army in pursuit, and in six days was on the left bank of the Delaware. He was desirous of bringing the Royal army to a general engagement; but the council of war called by him was divided on the expediency of the measure. General Lee, who had been exchanged for the British general Prescott and was now second in command, vehemently opposed it. Washington, however, determined to assume the responsibility of the measure, and having overtaken Sir Henry near Monmouth, sent forward Lafayette, and afterwards Lee, with a strong advance to engage the Royal army. Hastening himself to their support, he encountered Lee in full retreat, at the head of 5000 men. This retrograde movement was arrested by Washington, and the engagement vigorously renewed. The close of the day put an end to the conflict; but Washington passed the night with his army on the field, determined to renew the action the following morning. Sir Henry, however, continued his march undiscovered during the night, and in the morning was out of reach. This engagement, though hardly to be called a victory, was a decided advantage on the part of Washington. In his own words, "from an unfortunate and bad beginning, it turned out a glorious and happy day." His loss was far inferior to that acknowledged by Sir Henry Clinton. The British army pursued its march to New York, and Washington, crossing the Hudson, resumed his former position at White Plains.

The British evacuate Philadelphia.

Washington.

The day after the battle of Monmouth, a correspondence took place between Lee and Washington, which resulted in the trial of the former by a court-martial. The charges were disobedience of orders; an unnecessary, disorderly, and shameful retreat; and language disrespectful to the Commander-in-chief. The court spared him the epithet of "shameful," but found him guilty of the rest of the charges, and suspended him from his command for a twelvemonth. He left the army never to return, and died before the close of the war at Philadelphia. Washington's heroic patience was never more signally displayed than in tolerating, as he did from public motives for three years, the arrogant pretensions of this coarse and empty braggart, whom recent discoveries have proved also to have been a concealed traitor to the American cause. In the course of the summer the Count d'Estaing, with 14 sail of the line, arrived in the American waters, and a combined expedition was undertaken, but without success, against the Royal forces in Newport. Causes of dissatisfaction arose between the American officers in command in Rhode Island and the Count d'Estaing; but the mediating influence of Washington was exerted with consummate skill to avert the consequences. His head-quarters were established at Fredericksburg in New York, about thirty miles from West Point, and the campaign closed without further events of importance.

Campaign of 1779.

The year 1779 passed without any general engagement of the main army of Washington. A very extensive expedition against Canada had been projected in Congress, but it was not favoured by the French Government, and was wholly discountenanced by Washington. The summer was employed by the British army in predatory excursions. On the American side a brilliant success was gained by General Wayne at Stony Point. The British fleet followed Count d'Estaing to the West Indies. Sir Henry Clinton sailed with a strong detachment to the southern States, and at the close of the season the army of General Washington went into winter quarters. In the course of the year a visit was made to the Commander-in-chief at his head-quarters by M. Gerard, the French minister, who, in his report of their conference to the Count de Vergennes, uses the following language:—"I have had many conversations with General Washington, some of which have continued for three hours. It is impossible for me briefly to communicate the fund of intelligence which I have derived from him. . . . . I will now say only that I have formed as high an opinion of the powers of his mind, his moderation, his patriotism, and his virtues, as I had before conceived from common report of his military talent, and of the incalculable services which he has rendered his country."

Campaign of 1780.

Before the end of April 1780, Lafayette returned to the United States from France, with the news that an auxiliary army would be despatched to the assistance of the Americans. On the 10th of July, the first division of the French fleet arrived at Newport, under the Chevalier de Ternay, having on board an army of 5000 men, commanded by the

Washington.

Count de Rochambeau. A second division was to follow, but was blockaded at Brest. The superiority both by land and by sea accordingly remained on the side of the British, by whom Count de Rochambeau's army was blockaded in Newport. In consequence of this state of things, no expedition of magnitude was attempted by the allies in the course of the year 1780.

It was during the absence of Washington at Hartford, to confer with the Count de Rochambeau on a plan of operations for the ensuing campaign, that the treason of Arnold was discovered, and the arrest and execution of the unfortunate Major André took place. It would exceed the limits of this biography to enter into a narrative of this event, or to engage in the defence of Washington against the reproaches cast upon him for approving the sentence of the court by which the case was adjudicated. It is sufficient to say that this unfortunate officer was condemned as a spy by a court of thirteen officers, native and foreign, some of them the most intelligent in the service. Those who condemn Washington for not placing his veto on their sentence, should ask themselves what would probably have been the fate of an English officer who should have been discovered in a citizen's dress within the lines of the French army at Boulogne in 1803; or of a French officer who, under similar circumstances, should have been caught within the English lines at Gibraltar in time of war, plotting with a traitor for the surrender of an important post. It may be doubted whether retribution in either case, would have awaited the slow motions of a court. André's execution as a spy has been condemned on the ground that, at the time of his arrest, he had a free pass from an American general, as if it were an apology for a spy that he was in conspiracy with a traitor. Imperfectly as the law of nations was developed in antiquity, it placed a secret conference with the enemy on a level with treason. Cicero, speaking in the person of Cato, classes together "Patriæ proditionis, rerumpublicarum eversiones, *clandestina cum hostibus colloquia*." Personally, General Washington was the most humane of men, and it is well known that it cost him a painful struggle with his feelings to allow the sentence of the court to be executed on the accomplished prisoner; but with respect to him, it is scarcely necessary to say that there was nothing in his errand to increase the respect and sympathy inspired by his personal qualities and unhappy fate.

Campaign of 1781.

But the great struggle was drawing to a close more rapidly than was anticipated. The year 1781 witnessed the last military operations of decided importance. The Count de Grasse having arrived in the Chesapeake from the West Indies, with a commanding fleet and a considerable reinforcement of troops, Washington and Rochambeau immediately marched from the Hudson to Virginia, to join forces with Lafayette, who was stationed at Williamsburg, to watch the movements of Lord Cornwallis. On the approach of the combined French and American armies, Lord Cornwallis entrenched himself at Yorktown. That place was invested in form on the 30th of September by the allied army. The outposts were in a few days carried by assault, and on the 19th of October the army of Cornwallis, rather more than 7000 strong, capitulated to the united and greatly superior forces of the allies.

This brilliant success put an end to the contest, and General Washington had the satisfaction of seeing the war brought to a close under his own immediate auspices and command. Negotiations for peace commenced at Paris in the summer of 1782, and the articles of a provisional treaty were signed in November of that year. Attempts were made by further negotiation, in the course of the ensuing year, to enlarge the stipulations agreed upon; but the definite treaty was eventually signed at Paris on the 3d of September 1783, in the words of the provisional articles.

Provisional articles of peace signed, November 1782.

After the surrender of Yorktown and the departure of Count de Rochambeau's army, General Washington established his head-quarters at Newburgh, on the Hudson river. Here the American army, in the now certain prospect of peace, justly dissatisfied with the want of all provision to give effect to the resolution of October 1780, by which half-pay for life was promised to the officers, endeavoured, by a new appeal to Congress, to obtain a definitive settlement of their claims by an equitable commutation. Congress was divided on the expediency of the measure; and, if it had been unanimous, possessed no power to give effect to its recommendations. Vague promises were made, but nothing effective done. Great irritation arose on the return of the delegates to head-quarters. A meeting of the officers was called, and an inflammatory appeal to the army was circulated, celebrated as *the Newburgh Address*, "in which the troops were exhorted not to allow themselves to be disbanded till justice was obtained." It was a moment of great alarm and real danger, but the influence of the Commander-in-chief, official and personal, was promptly called into action, and moderate counsels prevailed.

Washington.

So tardy were communications across the Atlantic at that time, that official information of the provisional treaty was not received in the United States till the spring of 1783, when it came by the way of Cadiz, and it was first officially proclaimed to the army on the 19th of April 1783, the anniversary of the day on which, eight years before, the war commenced at Lexington and Concord. Furloughs were freely granted to officers and men from that time forward, and on the 18th of October the army was formally released from service. New York was surrendered by Sir Guy Carleton to General Washington on the 25th of November, and on the 4th of December the Commander-in-chief took an affectionate and pathetic leave of his brother-officers. Repairing to Annapolis, to which place Congress had adjourned, General Washington, on the 23d of December, made his formal resignation, in an address of surpassing beauty and dignity, which we quote at length:—

Resigns his commission.

"Mr President,—The great events on which my resignation depended having at length taken place, I have now the honour of offering my sincere congratulations to Congress, and of presenting myself before them to surrender into their hands the trust committed to me, and to claim the indulgence of retiring from the service of my country.

"Happy in the confirmation of our independence and sovereignty, and pleased with the opportunity afforded the United States of becoming a respectable nation, I resign with satisfaction the appointment I accepted with diffidence; a diffidence in my abilities to accomplish so arduous a task, which, however, was superseded by a confidence in the rectitude of our cause, the support of the supreme power of the Union, and the patronage of Heaven.

"The successful termination of the war has verified the most sanguine expectations; and my gratitude for the interposition of Providence, and the assistance I have received from my countrymen, increases with every review of the momentous contest.

"While I repeat my obligations to the army in general, I should do injustice to my own feelings not to acknowledge, in this place, the peculiar services and distinguished merits of the gentlemen who have been attached to my person during the war. It was impossible the choice of confidential officers to compose my family should have been more fortunate. Permit me, sir, to recommend in particular those who have continued in the service to the present moment as worthy of the favourable notice and patronage of Congress.

"I consider it an indispensable duty to close this last act of my official life by commending the interests of our dearest country to the protection of Almighty God, and those who have the superintendence of them to his holy keeping.

"Having now finished the work assigned me, I retire from the great theatre of action, and bidding an affectionate farewell to this august body, under whose orders I have so long acted, I here offer my commission, and take my leave of all the employments of public life."

Retires to Mount Vernon.

Immediately on resigning his commission, General Washington returned to his home at Mount Vernon, which, during the eight years of the war, he had visited but twice,

Washington.

and then hastily, on his way to and from Yorktown in the year 1781, with the Count de Rochambeau. Greatly attached to his agricultural and horticultural pursuits, he devoted his time to the care of his plantations, garden, and grounds, to the management of what was considered in America at that time a large landed property; to the extensive correspondence which devolved upon him, particularly in connection with the events of the war; and to the reception and entertainment of visitors, who came in great numbers from every part of the United States and from Europe. This last mentioned call upon his time and attention, necessarily very serious, was rendered less oppressive than it would otherwise have been by the excellent housewifery of Mrs Washington, who administered with method and skill the liberal but unostentatious hospitality of Mount Vernon. For two years after the war, he carried on his heavy correspondence without clerical aid, writing and copying his letters with his own hand. To the close of his life he kept his account books with great care, and with his own hand, according to the system of double-entry.

Agricultural pursuits.

In the autumn of 1784, General Washington crossed the Alleghanies, partly for the purpose of examining the lands which he had formerly taken up in that region; and partly to explore the head waters of the Potomac and James rivers, with reference to their connection with the streams which flow into the Ohio. This was a subject which had, from an early period, been familiar to his thoughts, as one of vast importance to the growth and prosperity of the United States. The result of his inquiries was highly favourable to a system of inland navigation, connecting the Atlantic seaboard with the great rivers of the west, and the region drained by them. On his return he addressed an elaborate, well-reasoned, and persuasive letter on the subject to the governor of Virginia. This communication had a powerful effect on the public mind, and led to the organization of the James River and Potomac Canal Companies. In acknowledgment of his agency in bringing about this result, and still more in gratitude for his revolutionary services, the State of Virginia presented him with 50 shares in the Potomac Canal Company, valued at 10,000 dollars, and 100 shares in the James River Canal Company, valued at 50,000 dollars. In obedience to the principle which governed him through life, this grant was accepted by Washington only on condition that he should be allowed to hold the property in trust for some public object. The shares in the James River Canal were finally appropriated for the endowment of a college at Lexington, in Rockbridge county, Virginia, which in consequence assumed the name of Washington College. The shares in the Potomac Canal Company were appropriated for the endowment of a university at the seat of the Federal government—an appropriation which remains without effect.

Agriculture was at this period of his life, as indeed at almost every period, his main occupation. He looked upon his official duties, civil and military, as an interruption to its pursuit. A resident in the lower part of Virginia, and the owner of extensive landed estates, he was, as a matter of course, a slaveholder. His correspondence shows him to have been a strict and vigilant, but at the same time a just, thoughtful, and humane master, studying his own interest in the cultivation of his farms not more than the comfort and welfare of his dependants. In common with most, if not all, the leading statesmen of Virginia of that day, he was opposed to slavery; but he happily lived at a time when the subject, which now so violently agitates the American Union, had not yet been drawn into the party divisions of the country, and was discussed exclusively in its bearings on the public welfare. As early as 1786, he had formed a resolution never, unless compelled by particular circumstances, "to possess another slave by purchase;" and, in a letter to Mr Morris, written in that year, he says, "there is not a man living who wishes more sincerely than I do to see a plan adopted for the abolition of slavery. But there is only one proper and effectual mode by which it can be accomplished, and that is by legislative authority; and this, as far as my suffrage will go, will never be wanting." This sentiment is repeated in several parts of his correspondence; but his habitual respect for the law led him to deprecate all interference with legal rights; and it is the object of the letter to Mr Morris, from which the above extract is taken, to remonstrate, with reference to a particular case, against such interference on the part of "individuals and private societies."

His views of slavery.

Washington.

The period succeeding the peace of 1783, up to the adoption of the Constitution of the United States in 1788, was more critical, with reference to the permanent prosperity of the country, than that of the war itself, however oppressive and exhausting. A reduction of the States which had declared themselves independent to the former colonial condition, could not have been brought about by continuing the war; but the peace found the United States without a government, unable to command respect abroad, or to start upon a career of prosperous growth and development at home. The country was exhausted by the war; there were no manufactures, very little commerce, and no means, except recommendations of the Congress of the Confederation, which were treated with utter neglect, of raising a revenue for the purpose either of paying the interest of the foreign debt, or to meet any public expenditure for domestic purposes. The manifold evils of this state of things were felt by every intelligent person, but the remedy was all but hopeless. The most obvious resort was to clothe the Federal Congress with the power to raise a revenue by imposts and direct taxation. But there was, on the part of some of the states, a great reluctance to confer larger powers on that body; and few, even of the most far-sighted individuals, had conceived the idea of converting the old confederation, which was simply a league of independent states, assembled in Congress, each with equal powers, and acting only by recommendations addressed to their separate state governments, into a federal government possessing authority that should bind the individual citizen. This change, however, was at length effected, and, by a series of agencies, at first in striking disproportion to the importance of the result, and in no small degree under the influence of Washington. Although wholly retired to private life, his name and authority were, at this time, almost the only vital power in the country; the common respect and reverence for him almost the only bond of union.

It will be borne in mind that before the adoption of the present constitution of the United States, the several states were, in all their commercial affairs, in the relation to each other of independent nations; and it happened, in some instances, that conterminous states pursued a policy of mutual hostility. In the month of March 1785, Commissioners on the part of Maryland and Virginia met at Alexandria in the latter state, for the purpose of "keeping up harmony in the commercial regulations of the two states, with reference to the navigation of the Rivers Potomac and Pocomoke, and of the Chesapeake Bay," the waters of which were to some extent common to the two states. General Washington was one of the commissioners on the part of Virginia, and his associates being on a visit to him at Mount Vernon, it was there agreed by them to recommend to their respective states the appointment of a new commission with enlarged powers, to devise a plan for the establishment, under the sanction of Congress, of a naval force on the Chesapeake Bay, and a uniform tariff of duties on imports, to which the laws of the two states should conform. The proposal thus concerted at Mount Vernon was adopted by the legislature of Virginia, and being brought before that body at a time when it had under consideration

Washington.

a project for granting enlarged commercial powers to Congress, a resolution was passed, directing that so much of the report of the commissioners as referred to a uniform tariff of duties should be communicated to the other states, with an invitation to attend the proposed meeting. On the 21st of January 1786, a resolution passed by the legislature of Virginia, appointing commissioners to meet with those which might be appointed by the other states, "to take into consideration the trade of the United States; to examine the relative situation and trade of the said states; to consider how far a uniform system in their commercial regulations may be necessary to their common interest and their permanent harmony." Washington, at his own instance, for personal reasons, was not a member of this commission, though the object was one which he had greatly at heart. The meeting was appointed to be held in Annapolis in September 1786; but delegates from five states only attended, and some of them with powers too limited for any valuable purpose. Nothing, accordingly, was attempted beyond the preparation of a report, setting forth the existing evils, and recommending to the several states to appoint delegates to meet at Philadelphia the next May. A copy of this report was sent to the Congress, which still retained a nominal existence; and that body, by recommending the proposed measure, gave it, in the opinion of some persons, that necessary constitutional sanction in which the meeting at Annapolis was deficient. This report was adopted by Virginia, and seven delegates appointed, with Washington at their head, to represent that state in the proposed convention.

President of the Federal Convention.

This body, now usually called the "Federal Convention," assembled in Philadelphia on the 2d of May 1787. Washington was unanimously elected its president. In anticipation of the meeting, and the duties which might devolve upon its members, "he read," says Mr Sparks, "the history and examined the principles of the ancient and modern confederacies. There is a paper in his handwriting which contains an abstract of each, and in which are noted, in a methodical order, their chief characteristics, the kinds of authority they possessed, their modes of operation, and their defects. The confederacies analysed in this paper are the Lycian, Amphictyonic, Achæan, Helvetic, Belgic, and Germanic. The debates in the Convention were principally had in committee of the whole, in which, by the appointment of Washington as the presiding officer of the body, the chair was occupied by Hon. Nathaniel Gorham of Massachusetts. Without his taking an active part in the debates, the influence of Washington was steadily exerted, and in the direction of an efficient central government. The Convention remained in session about four months, and on the 17th of September 1787, the result of their labours, as embodied in the present constitution of the United States, was communicated to the Federal Congress, with a letter signed by General Washington as president of the Convention. This instrument of government, under which the United States have so signally prospered for nearly three-fourths of a century, though not deemed perfect in every point by Washington, or probably by any of its most ardent friends, was regarded by him, and declared to be in his correspondence, the best that could be hoped for in the condition of the country, and as presenting the only alternative for anarchy and civil war. "There is a tradition," says Mr George T. Curtis in his valuable history of the Constitution (vol. ii., p. 487), "that when Washington was about to sign the instrument, he rose from his seat, and holding the pen in his hand, after a short pause, pronounced these words—'Should the States reject this excellent constitution, the probability is, that an opportunity will never again be offered to cancel another in peace, the next will be drawn in blood.'"

The Convention by which the Constitution was framed was not clothed with legislative power, nor was the Congress of the Confederation competent to accept or reject the new form of government. It was referred by them to the several states represented by conventions of the people, and it was provided in the instrument itself, that it should become the supreme law of the land when adopted by nine states. The residue of the year 1787 and the first half of 1788 were taken up with the holding of these conventions, and it was not till the summer of 1788 that the ratification of nine states was obtained. The action of these conventions was watched with great solicitude by Washington, and his influence was efficiently employed through the medium of his correspondence to procure the adoption of the new form of government.

Washington.

The 4th March 1789 had been appointed by the Congress as the time when the new constitution should go into operation. Previous to that time the choice of the electoral colleges, and of the senators and representatives who were to compose the first Congress, was to be had in the several states. By the constitution, as originally framed, two persons were to be voted for by the presidential electors as president and vice-president, without designating for which of the two offices the candidates were respectively supported. The candidate receiving the majority of votes was to be the president; and in case of equality of two or more candidates, the house of representatives, voting not *per capita* but by states, the members from each state, whether great or small, casting one vote, was to designate a president and vice-president from the three highest candidates having an equal number of votes. The whole number of electoral votes given in the first election was but sixty-nine, and they were all for General Washington. Thirty-four votes were given for John Adams, and a much smaller number of votes being scattered among several other candidates, George Washington and John Adams were elected the first president and vice-president of the United States. The private and confidential correspondence of Washington shows the sincerity of his uniform public declarations, that he shrunk from the office with a candid reluctance, both as a candidate and after his election. He is probably the only person who has ever been called to the chair of state without having desired, and to some extent perhaps exerted himself to obtain, the nomination.

Elected the first President of the United States.

Such was the apathy of the country with reference to the new form of government, and such the tardiness of the new Congress in coming together, that although the 4th of March 1789 was appointed as the day of meeting, a quorum of the two houses was not assembled till the 6th of April. The first business was to count the electoral votes for president and vice-president, and to communicate the result to the persons chosen. Washington received the official notification of his election at Mount Vernon, on the 14th of April, and started immediately for the seat of government, which was for the first two years established at New York. His journey through the states of Maryland, Pennsylvania, and New Jersey was a triumphal procession. Debates on the proper official style by which he was to be addressed, and a disagreement between the two houses on that subject, which ended in nothing being done, caused some delay; and it was not till the 30th of April 1789 that he took the oath prescribed by the Constitution as the first President of the United States. There were other statesmen in the country who stood high in the respect and in the affections of the people, but the preference for Washington was absolute and unqualified. No other individual was thought of for a moment as a rival candidate. In advance of all the constitutional forms of election, which in his case were but forms, he was chosen unanimously in the hearts of the people. He was fifty-seven years old when he entered upon the office. His frame was naturally vigorous and athletic, but its strength

Washington.

was perhaps somewhat impaired by the labours and exposures of two wars, and by repeated severe attacks of disease. Such an attack threatened his life immediately after entering upon the presidency; and in a letter to Lafayette he speaks of himself at the age of fifty-one as having inherited the constitution of a short-lived family. His father died young, but his venerable mother lived to witness his elevation to the presidency, and died at the age of eighty-two. Washington had made a farewell visit to her before repairing to the seat of government. His great elevation and distinguished honours produced no change in her simple mode of life. She occupied to the last the humble dwelling of one upright story at Fredericksburg, in which he had passed his boyhood, and which, somewhat modernised, is still standing. Her habitual commendation of him was, that "George had always been a good son."

Unanimously re-elected.

Administration.

At the close of his first presidential term of four years, though extremely desirous of retiring from public life, Washington yielded to the urgency of friends of all parties, and consenting to accept the office for a second period, was again unanimously elected. His administration, therefore, may be spoken of as covering a space of eight years from the date of the new government. As that government was in its leading features a new political system, and all its departments were to be organized and put in action for the first time, unusual difficulties attended his administration, for the want of precedents to which he could look for guidance. Other difficulties grew out of the state of public affairs abroad and at home. The interest felt in the American Revolution by the friends of liberty in Europe had to a considerable degree passed away, and the United States had not acquired a strength which enabled them to command the respect of foreign powers. Worse than this, it was some time before a fiscal system could be organised and a revenue raised for paying the interest of the foreign debt, a debt paltry in amount; but no debt is small which a man is unable to pay. Difficulties arose with England relative to the execution of the treaty of 1783, by which the independence of the United States was acknowledged. She complained that the States threw obstacles in the way of the recovery of debts due to British subjects; and the United States in turn complained that the military posts on the north-western frontier were retained by England, and the Indians encouraged in their hostility against the Union. Soon the French Revolution broke out, and each of the belligerents gave great cause of complaint to the American government. Meantime important questions and interests divided opinion, and gradually led to the formation of parties in the Union; the assumption by Congress of the revolutionary debts of the States, the funding system, the location of the seat of the federal government, the taxes to which resort had been had to create a revenue, the establishment of a national bank, and as the French Revolution advanced, the relations of the Union to the two great belligerents.

Peculiar difficulties at home and abroad.

At the commencement of his administration, and before the organization of the parties which afterwards took place, General Washington surrounded himself in the executive offices with the most distinguished men in the country. Mr Jefferson in the department of State, and Mr Hamilton in the Treasury, the prospective leaders of the two great parties into which the country was before long divided, received equal marks of his confidence; and when his retirement from office at the end of the first term was proposed by him, they with equal urgency entreated him to accept a renomination. Had it been possible for any person to administer the presidential office without the aid of party support, or rather to conciliate unanimous support by merits and services which win the respect and gratitude of all parties, Washington was certainly marked out by the entire course of his life and the history of the country as such a person. It was his earnest desire to give this character to his administration. He had composed it of the individuals who, in different parts of the Union, possessed most of the public confidence, and whom he had called to his assistance on the sole ground of being best qualified to conduct the public business to the satisfaction of the people. But the administration of a government, and especially one coming into existence, where much of the detail of organization is to be struck out anew, necessarily assumes a certain leading character founded on general principles and ideas, with respect to which the judgments of men naturally differ. It is only in times of extreme peril, and hardly then, that they can be brought to think alike, and act in one united mass, without party divisions. General Washington's administration commenced with a state of public opinion predisposed to the formation of parties. The Constitution had been adopted in the most important States by slender majorities, and in the face of a strong opposition. Those who opposed the adoption of the Constitution were, generally speaking, persons who regarded a strong central government with apprehension, as dangerous to the prerogatives of the State governments and the liberties of the people. It was a matter of course that, after the adoption of the Constitution, the measures of the new government, which tended to give it strength and efficiency, should be feared and opposed by the same class of statesmen and citizens. Among these measures were some which, by their friends, were deemed of vital importance to the government of the country, such as the funding system, the assumption of the revolutionary debts of the several States, and the establishment of a national bank. On these measures the members of the first cabinet were divided. Mr Hamilton, the secretary of the treasury, by whom they were proposed, and Knox, the secretary of war, were on one side; Mr Jefferson, the secretary of state, and Mr Randolph, the attorney-general, on the other. The political influences throughout the country were about equally divided, Mr Hamilton and Mr Jefferson being respectively the acknowledged representatives of the systems which favoured and opposed a strong central government. General Washington, with untiring assiduity and patience, sought to conciliate the opposite opinions, holding himself in suspense as long as the public service admitted as to the adoption of particular measures, and seeking advice with equal anxiety on both sides. Eventually, however, a decision must be made. The measure is a distinct political issue, and must be adopted or rejected. In reference to the subjects above referred to, the President sustained the general views of the secretary of the treasury; and in this way, though standing aloof from all electioneering plans and arrangements of party, became at length identified in public opinion with the principles and measures of the party of which Mr Hamilton was the acknowledged leader. His great name and spotless character shielded him for a considerable time from the assaults of party warfare. The persons that opposed his administration were content with condemning its measures, and inveighing against those members of the Cabinet and of Congress by whom they were projected and sustained. Some check was imposed on all general censures upon his administration so long as Mr Jefferson remained at the head of it, and responsible even for some of the measures most obnoxious to its opponents, such as the proclamation of neutrality in the war between France and England. All restraint of this kind ceased with his retirement from the Cabinet soon after the commencement of his second term. That of Mr Hamilton took place not long afterward; but the withdrawal of these great rivals, instead of relieving Washington from the embarrassments arising from their hostile relations to each other, was in fact the signal for a stricter organization, in Congress and through-

Washington.

Washington.

out the country, of the parties of which they were severally the leaders. Mr Hamilton was understood to carry with him more of the confidence and sympathy of the president, who was from that time more and more identified in public opinion with the federal, which was still the dominant party. Party defamation, however, reached him only by slow degrees, and if one may use that phrase, with moderation. He possessed a hold on the affections of the country too strong to be seriously loosened by newspaper diatribes. It was notorious to the whole people that office, so far from being an object of his ambition, was regarded by him as a burden. His revolutionary services were still everywhere freshly and enthusiastically appreciated. Men of high character, though opposed to his political system, desired to treat him personally with respect; vulgar detraction could not reach him. Accordingly, though parties might be considered as distinctly organized by the close of the first term of his administration, he was, as we have stated, unanimously re-elected, having received 132 votes in the electoral colleges, that being the entire number of the presidential electors.

In the first year of his administration, the President made a hasty tour through the Eastern States of the Union; and in the following spring he visited the Southern States, on each occasion (it is mentioned as a trait of manners) travelling with his own carriage and horses. The United States at that time numbered a population of about four millions; the largest cities, Philadelphia, Boston, and New York, were then small towns; the great branches of industry were almost unknown; a small military force guarded the Indian frontier; there was not a single public vessel, nor a state government west of the Alleghanies. This state of things but ill sustains a comparison with that which we now behold in the American Union: thirty-three States, some of the largest in the basin of the Mississippi and two on the Pacific Ocean; a population of thirty millions; a commercial tonnage inferior to that of England alone, if inferior even to that; a highly advanced condition of the great industrial pursuits; a respectable military and naval establishment; and creditable progress in science and literature. Yet the United States, as Washington saw them on his tours in 1789 and 1790, presented such a contrast with the colonies, as he traversed them on his way to Boston in 1756, as was probably never brought within the experience of one man, and within so narrow a compass as thirty-three years.

Washington entered upon his second term of the presidential office, to which, as we have seen, he had been unanimously re-elected, on the 3d of March 1793. He still stood before the country with unshaken personal popularity, in a relation unshared, indeed unapproached by any other individual, but at length driven by the force of circumstances, and strongly against his private impulses, into the position of the head of an administration, which, if warmly supported, was also warmly opposed. Shortly after the commencement of his second term of office, the war between France and England broke out. The French Revolution, as was natural from the all-important services rendered by France to the United States in their own revolutionary struggle, enlisted the warm sympathy of the American people. Washington fully shared this sentiment, and his great personal regard for Lafayette, with whom he kept up a regular correspondence, and from whom he naturally derived his general impressions of the march of events, led him to look with a favourable eye upon the movements of which Lafayette was for a considerable time an influential leader. But that judicial moderation, which was the most striking trait of Washington's character, soon took alarm at the excesses of the French Revolution, and the conclusions of his own mind were confirmed by the tenor of the despatches of Mr Gouverneur Morris, who, as the American minister at Paris, enjoyed much of the confidence of Louis the Sixteenth and his family, and of the still faithful friends of the tottering monarchy.

War between France and England.

Washington.

As the United States were first introduced to the family of nations by the alliance with France of 1778, the very important question arose, on the breaking out of the war between France and England, how far they were bound to take part in the contest. The second article of the treaty of alliance seemed to limit its operation to the then existing war between the United States and Great Britain; but by the eleventh article the two contracting powers agreed to "guarantee mutually from the present time and *for ever* against all other powers," the territories of which the allies might be in possession respectively at the moment the war between France and Great Britain should break out, which was anticipated as the necessary consequence of the alliance.

Not only were the general sympathies of America strongly with France, but the course pursued by Great Britain toward the United States since the peace of 1783 was productive of extreme irritation, especially her refusal to give up the western posts, which, as has been intimated, had the effect of involving the north-western frontier in a prolonged and disastrous Indian war. These causes, together with the recent recollections of the revolutionary struggle disposed the popular mind to make common cause with France, in what was regarded as the war of a people struggling for freedom against the combined despots of Europe. Washington, however, from the first, determined to maintain the neutrality of the country. The news of the war reached him at Mount Vernon, and he immediately addressed letters to the heads of departments, to prepare them to express their opinions, on his return to the seat of Government, as to the measures necessary to prevent the country from being drawn into the vortex. They agreed unanimously on the expediency of issuing a proclamation of neutrality, and of receiving a minister from the French Republic; while on some other points submitted to them, especially the extent of the above-mentioned "guarantee," the members of the Cabinet were equally divided.

Neutrality of the United States.

This proclamation, though drafted by Mr Jefferson and unanimously adopted by the Cabinet, was violently assailed by the organs of the party which followed his lead. A series of questions which General Washington had confidentially submitted to the Cabinet, embracing all the phases of the relations between the two countries, had found its way to the public, and the President was assumed to have answered in his own mind adversely to France every question proposed by him for the opinion of his constitutional advisers. The growing excitement of the popular mind was fanned to a flame by the arrival at Charleston, South Carolina, of "Citizen" Genet, who was sent as the minister of the French Republic to the United States. Without repairing to the seat of government, or being accredited in any way in his official capacity, he began to fit out privateers in Charleston, to cruise against the commerce of England. Although the utmost gentleness and patience were observed by the executive of the United States in checking this violation of their neutrality, Genet assumed from the first a tone of defiance, and threatened before long to appeal from government to the people. These insolent demonstrations were of course lost upon Washington's firmness and moral courage. They distressed but did not in the slightest degree intimidate him; and their effect on the popular mind was to some extent neutralized by the facts, that the chief measures to maintain the neutrality of the country had been unanimously advised by the Cabinet, and that the duty of rebuking his intemperate course had devolved upon the Secretary of State, the recognised head of the party to which Genet looked for sympathy.

If the conduct of France and of the French minister gave great offence to the American government, that of England

Washington.

was scarcely less exceptionable. Besides the causes of irritation already mentioned, she had added materially to the existing animosity by orders in council, by which the lawful carrying trade of the United States was vexatiously interfered with, and still more by the impressment of seamen from the American vessels. At the close of the first year of President Washington's second administration, a very able and elaborate report was drawn up by Mr Jefferson, then about to retire from office, on the commercial relations of the country. At the Session of Congress of 1794, a discrimination against the commerce of England was proposed in a series of resolutions introduced by Mr Madison, the leader of the opposition in the House of Representatives, and a statesman whose general moderation was not less conspicuous than his ability and patriotism. Proportionate weight attached to a measure brought forward under his advocacy. The subject was debated in various forms in the course of the session, and an act passed the House of Representatives embracing the principle of discrimination, which was, however, lost in the Senate by the casting vote of the vice-president.

In this critical state of affairs, General Washington determined to take a decisive step to extricate the country from the embarrassment of being at variance, at the same time, with both of the belligerents. This step was the appointment of a special minister to England; and the selection for this important trust of the Chief-Justice of the United States, John Jay, one of the wisest and most circumspect, as well as one of the most experienced, of the public men of the day. His nomination was violently assailed by the opposing party, and barely passed the Senate. He succeeded in negotiating a treaty, by which the principal points in controversy between the two governments were settled; the western posts were given up, indemnification promised by the United States for the losses accruing by the non-payment of debts due to British creditors, and by Great Britain for illegal captures; and the commercial intercourse of the two nations was in most respects satisfactorily regulated. The twelfth article failed to obtain the confirmation of the Senate, inasmuch as it stipulated that molasses, sugar, coffee, cocoa, and *cotton* should not be carried in American vessels, either from the British Islands or from the United States, to any foreign port; the great agricultural staple of the country, of which more than four millions of bales will be exported the present year (1860), not being known sixty-five years ago to the negotiators on either side, as an article of American production!

Mission of Jay to England.

Jay's treaty unpopular.

On the arrival and before the official promulgation of the treaty, it was violently assailed. It was barely adopted by the constitutional majority (two-thirds) of the Senate, and on its official publication became the subject of unmeasured denunciation. Boston led the way in a town meeting, where resolutions strongly condemning the treaty were adopted and ordered to be transmitted to the President. He had made up his mind that the public interest required the confirmation of the treaty, and returned to the Boston remonstrants a dispassionate answer to that effect. With this example from a portion of the country, where the strength of his administration was concentrated, it was not likely that the tone of opposition would be gentler in other parts of the Union. On the contrary, the vehemence with which the treaty was assailed daily gathered strength, and at length the barriers of deference toward the personal character of the President were wholly broken down.

"The mission of Jay," says Chief-Justice Marshall in his *Life of Washington*, "visibly affected the decorum which had been usually observed toward him, and the ratification of the treaty brought into open view feelings which had long been ill concealed. With equal virulence, the military and political character of the President was attacked, and he was averred to be totally destitute of merit either as a soldier or a statesman. The calumnies with which he was assailed were not confined to his public conduct; even his qualities as a man were the subject of detraction. That he had violated the constitution in negotiating a treaty without the previous advice of the Senate, and in embracing within that treaty subjects belonging exclusively to the legislature, was openly maintained, for which an impeachment was publicly suggested; and that he had drawn from the treasury for his private use more than the salary annexed to his office, was unblushingly asserted!"

Washington.

Such was the frenzy of party; it afflicted Washington, but did not cause him to swerve a hair's breadth from his course.

An attempt was made in the House of Representatives to withhold the appropriations necessary to carry the treaty into effect. The party metaphysics of the day revelled in the plausible argument which has since reappeared on similar occasions, that, as no money can be constitutionally drawn from the treasury without a specific appropriation, it was not competent for the President and Senate, as the treaty-making power, to pledge the faith of the country to the expenditure of money. It was forgotten, however, that a treaty is by the same constitutional authority the supreme law of the land, and as such binding on the conscience of the legislature. The extreme views of the opponents of the administration did not prevail, and the appropriations necessary to carry the treaty into effect passed the two houses. It was on this subject that Mr Fisher Ames, of Massachusetts, made the celebrated speech which is still freshly remembered.

Among the other measures of the opposition was the demand made by the House of Representatives for the communication of the instructions under which the treaty was negotiated. In the modern usage of Congress, a call of this kind from either house is complied with as a matter of course, containing, as it always does in important cases, a reservation that the communication can, in the President's opinion, be made without detriment to the public service. The practice of the government had not yet been established by usage in reference to subjects of this kind. The demand for the communication of the instructions, under which Mr Jay had acted, was regarded, and justly, as a hostile movement against the administration, and the President refused to communicate the paper. He planted himself resolutely on the ground, that the treaty-making power was confided by the Constitution to the President and Senate, and that it was not competent for the House of Representatives to require the communication of the instructions which might have been given to the negotiators. The resolution, as originally moved, made an unqualified demand for the instructions and other papers connected with the treaty. Further reflection led the mover (Mr Livingston) so far to modify the call as to except from it papers the communication of which might affect existing negotiations. A further amendment was moved by Mr Madison to except such papers "as it might be inconsistent with the interests of the United States at this time to disclose." But this wise and temperate suggestion, from the ablest and most sagacious member of the opposition, was rejected by a decisive vote of the house. Had it passed, it is probable that the President would have communicated the instructions, which, in the absence of that qualification, he resolutely withheld.

No transaction in the civil life of the President throws stronger light on the firmness of his character and his resolute adherence to principle. This has been shown by subsequent events more clearly than it was understood at the time. It was believed by the opponents of the administration, and that impression was no doubt shared to some extent by the public, that the instructions given to Mr Jay might contain matters which it would not be entirely convenient to the administration, or the President as its head, to disclose. It was probably supposed by many persons that Washington would have yielded to the request of the House of Representatives, had not some motive stronger

Washington.

than mere abstract principle prevented his doing so. It is the only instance probably in the history of the government where a paper, which could be laid before the public without inconvenience to the country or the administration has, when asked for by either House of Congress, been withheld. Such, however, was indubitably the fact in this instance. The instructions in question remained for thirty years buried in the public archives and undivulged. At length, in compliance with a call of the Senate of the United States in 1825, and in reference to the illegal captures of American vessels made by the French cruisers prior to 1800, a mass of papers filling a large octavo volume was communicated to the Senate, and among them these once celebrated instructions. It was then found by the few who took the trouble to examine them as a matter of historical curiosity, that nothing could be more innocent; that they contained nothing which the most prejudiced opponent could have tortured to the discredit of the administration; and that Washington had no motive whatever for withholding them but that of constitutional principle.

The limits of this article do not admit of a detailed narrative of events; but we ought not to omit all mention of the firmness and resolution of Washington in calling into action the military force of the Union, to suppress almost the only very formidable attempt to resist the laws, which has taken place since the adoption of the federal constitution. The tax levied on distilled spirits in 1792 had been from the first unpopular in some portions of the country, and especially in Western Pennsylvania. The newspapers teemed with inflammatory appeals to the people, the payment of the duty was in many cases refused, the tax-gatherers and other officers of the United States were insulted, meetings to oppose the law were held, and at length preparations made for organized forcible resistance. These proceedings extended over a period of nearly two years. Trusting to the return of reason on the part of the disaffected, no coercive measures beyond the ordinary application of the law were for a long time resorted to by the federal government. This lenity was, however, ascribed to fear, and led to daily increasing boldness on the part of the malcontents in western Pennsylvannia, till in 1794 it became manifest that more decisive measures must be adopted. The militia of the neighbouring states of New Jersey, Maryland, and Virginia were called out in aid of the militia of Pennsylvania, to the amount in the whole of 15,000 troops. The President avowed the intention of taking the field in person, and repaired to the rendezvous of the troops at Cumberland and Bedford. These demonstrations produced the desired result, the disaffected perceived the madness of their course, and the insurrection subsided without a conflict.

President Washington's sympathies were warmly enlisted in favour of Lafayette, after it became necessary for him to abandon his army, and give himself up to the Prussians. On his first arrival in America, he had the good fortune, as we have seen, to gain the confidence of the Commander-in-chief, which he retained by the uniform propriety of his conduct to the close of the war. There is no stronger testimony to the solid merit of the young French nobleman, than his having played his difficult part, military and political, to the entire satisfaction of his illustrious American chief. The ties of personal attachment between them were added to those of official confidence and respect. A friendly correspondence was kept up between Washington and Lafayette and his wife, after the close of the Revolutionary War. The hopeful interest taken by Washington in the French Revolution in its early stages was, as has been stated, in some degree inspired by his regard for Lafayette, and by confidence in his principles, of which he had given such satisfactory proof in America. After his denunciation by the Jacobins at Paris, and his escape from his army, Washington having heard that Madame Lafayette was in want endeavoured, through his ministers, to contribute to her relief, delicately seeking to make his donation assume the form of the repayment of a debt. After Lafayette, by a refinement of barbarous stupidity, of which it would not be easy to find a parallel, had, though a fugitive from the guillotine in Paris, been thrown into a fortress in Austria, Washington addressed a letter in his favour to the Emperor of Germany. It received no answer; and Lafayette remained in the fortress of Olmütz, till, by a just retribution, his enlargement, which was refused to the respectful request of Washington, was extorted by the command of Napoleon. Sir Walter Scott, by a strange inadvertence, states that Lafayette was given up on the 19th of December 1795, in exchange for the Duchess d'Angoulême. His release was peremptorily demanded by Napoleon in the conferences at Leoben, which preceded the treaty of Campo Formio, and he was finally set at liberty on the 23d of September 1797.

Washington.

During his confinement, and while Madame Lafayette was imprisoned in Paris, awaiting that fate which in one day had smitten her grandmother, the Duchess de Noailles, her mother, the Duchess d'Ayen, and her sister, the Countess de Noailles, but which she happily escaped by the downfall of Robespierre, her son George Washington Lafayette, just of age for the conscription, succeeded, through the friendly aid of the late Messrs Thomas H. Perkins and Joseph Russell of Boston, in making his escape to America. He found a paternal welcome at Mount Vernon, where he lived, as a member of the family, for about three years, and returned to France on the liberation of his father. During the residence of young Lafayette at Mount Vernon, the Duke of Orleans (afterwards King Louis Philippe) was also a visitor there with his brother; and tradition points to the border of the paper-hangings in one of the parlours as having been cut out and prepared for pasting on the walls by these young French exiles (in conjunction with the youthful members of the Washington family); happier perhaps, certainly freer from care, while so employed, than at any earlier or later period of their chequered and eventful lives.

At length the last year of President Washington's second quadrennial term of office arrived. Suggestions began to be made to him by his friends, looking to another re-election, but nothing could now shake his purpose to retire; and he determined to put all doubt on that subject at rest by a very formal announcement of his purpose. Having this immediate object in view, with parental interest in the present welfare of his countrymen, and provident forethought for the future, he determined to connect with it another object of still greater ulterior importance,—a *Farewell Address* to his fellow-citizens, embodying his last counsels for their instruction and guidance. The steps taken by Washington for the preparation of this address were marked with more than his usual circumspection and care. They have been the subject of some difference of opinion and discussion on various occasions, in which it would exceed the limits of this article to engage. All the known facts of the case are brought together and set forth, with great acuteness and precision, by Honourable Horace Binney, one of the most distinguished jurists of America, in an essay just published at Philadelphia (October 1859), entitled, *An Inquiry into the Formation of Washington's Farewell Address.*

Farewell address.

It had been the intention of Washington, from an early period of his administration, to decline a re-election at the close of the term of office for which he was chosen in 1789. Early in 1792 he considered the expediency of a farewell address, in connection with the announcement of his purpose to retire. Among other confidential friends consulted

Washington. by him at this time was Mr Madison, with whom he communicated both orally at Philadelphia and by letter after the recess of Congress. Mr Madison, in reply to his letter, after earnestly dissuading the President from his purpose to retire, transmitted to him the draft of an address, which has been preserved. It is of no great length, and was evidently intended not to go far beyond the hints contained in the President's letter, either in the choice or treatment of the topics. Washington having been induced by the earnest and unanimous solicitation of his friends to consent to a re-election, this address was of course laid aside.

In the spring of 1796, and in the last year of his second administration, having, as we have seen, made up his mind irrevocably to decline a renomination, Washington again took counsel on the subject of a farewell address. In the progress of the political divisions of the day, Mr Madison had ceased to be of the number of his confidential advisers, and the President called upon Hamilton to aid him on this occasion. Washington's first step was to prepare himself a rough sketch of a farewell address. It consisted of a few preliminary sentences introducing the draft furnished by Mr Madison in 1792 (to which, for particular reasons, Washington adhered with some tenacity), and this was followed by the thoughts and sentiments which he deemed most appropriate for such an address. As this paper was intended only to furnish materials, that portion of it which follows Madison's draft, and was composed by Washington himself, is a series of remarks and suggestions, not studiously arranged nor elaborated for promulgation. This paper was shown by Washington to Hamilton at Philadelphia in the spring of 1796, and the wish expressed that he would "redress" it. It was also suggested that, besides doing this, Hamilton, if he thought best, "should throw the whole into a new form," "predicated upon the sentiments contained" in Washington's draft.

This was accordingly done. Hamilton first prepared the address thrown wholly into a "new form," and then digested, in another paper, in connection with Mr Madison's short address, the thoughts and suggestions appended to it, as we have seen in Washington's original draft. The President gave a decided preference to the new form, and, after very careful revision by him, it was published on the 19th of September 1796.

Of the documents and papers connected with this interesting production, there have been preserved, in addition to most if not all the correspondence between Washington and Hamilton, Washington's original rough draft of a farewell address and Hamilton's revision of it (these two papers exist only in the copies taken by Mr Sparks, the originals having disappeared), and Hamilton's original draft of an address in the "new form." There is also preserved among Hamilton's papers "an abstract of points to form an address," which appears to have been drawn up by him as a guide in preparing his original draft. Hamilton's original draft, as revised and corrected, and adopted by Washington, has disappeared. The original manuscript of the *Farewell Address*, from which it was printed, is in existence, and it is wholly in the handwriting of Washington. It contains very many corrections, erasures, and interlineations, which are also all in Washington's handwriting. It was presented to the editor of the paper in which it was published, Claypole, at his request, by Washington himself; and at Claypole's decease it was purchased for twenty-five hundred dollars by James Lennox, Esq. of New York, who has caused a very carefully prepared edition of it to be privately printed, with all the variations accurately noted in the margin.

The above statement is believed to contain the material facts of the case, as far as they appear from the papers now in existence. The limits of this article will not admit a more detailed investigation of the question of authorship, nor could it be made to advantage without a careful examination and comparison of the original papers in the case. From such an examination it will, we think, appear that the *Farewell Address*, as drawn up by Hamilton, and published by Washington to the people of the United States, commencing with the material portions of Mr Madison's draft of 1792, presents in a more developed form the various ideas contained in Washington's original draft, and treats in argumentative connection the topics therein more aphoristically propounded, the whole combined with original suggestions of a kindred type from Hamilton's own pen. Great skill is evinced by him in interweaving, in its proper place, every suggestion contained in Washington's draft (with a single exception); nor is there believed to be anything superadded by Hamilton of which the germ at least cannot be found in Washington's draft, in his multifarious correspondence or in other productions unquestionably from his pen. Washington.

A single topic contained in Washington's draft was excluded, with his full consent and approbation, from the published address. The passage in question consisted of suggestions of a personal character, an indignant allusion to the efforts made by "some of the gazettes of the United States," by misrepresentations and falsehoods, "to wound his reputation and feelings," and "to weaken, if not entirely destroy, the confidence" reposed in him by the country; a proud assertion of the uprightness of his intentions; a touching demand of respect for "the gray hairs of a man "who had passed the prime of his life in the service of the country," that he may "be suffered to pass quietly to his grave;" with a concluding observation, that his fortune had not been improved by the emoluments of office. These ideas, rather more carefully digested than any other portion of Washington's original draft, are, in the published address, omitted almost wholly, and this with the distinct approbation of Washington. It appears to have been thought that, in a paper calculated to descend to posterity, allusions to temporary causes of irritation had better be suppressed. From this opinion we are compelled, with great diffidence, to dissent. We are under the impression, that though this part of Washington's draft, like the rest of it (but less than the other portions), was "in a rough state," the substance of it, with some softening of the language, which was never intended for publication, might have been retained. The opponents of Washington were not conciliated by its absence, and posterity has lost a lesson on the license and ferocity of party defamation nearly as important as any contained in the *Address*. It reflects new lustre on the modesty of Washington, that, in a matter personal to himself, he deferred to the judgment of a trusted friend; but this judgment, in the present case, we conceive to have been erroneous.

It may finally be observed, that Washington, with reference to this address, as to every act in life, aimed, with the entire sacrifice of self, to accomplish the desired good. He was accustomed, as a military chieftain, to employ daily the pens of active and intelligent secretaries in communicating his plans, transmitting his commands, and generally carrying on his correspondence, without the thought that they were any the less the dictates of his own mind and judgment, because conveyed in the words of another. This habit he carried with him to the Presidency, freely putting in requisition the aid of such official advisers and personal friends as, in his opinion, would best enable him to perform the duty of the day. In doing this, he retained and exercised an independent judgment, and he adopted nothing furnished to him by others, which did not, after rigid scrutiny, stand the test of his own marvellous discernment and unerring wisdom.

The vice-president, Mr John Adams, was chosen his

Washington. successor by a majority so slender as to show that the country was now divided into two parties nearly equal. The tone of the public journals and the debates in Congress displayed an intensity of party feeling usually found under similar circumstances. Twelve members of the House of Representatives voted against the response of the house to the President's address to Congress at the opening of the last session, and a member from Virginia allowed himself to say, "that he did not regret the President's retirement." On the 3d of March, the last day of his administration, he gave a farewell dinner to the foreign ministers, the president and vice-president elect, and other distinguished persons of both sexes. Much hilarity prevailed; till toward the close of the entertainment, filling his glass, he said to the company with a gracious smile, "Ladies and gentlemen, this is the last time I shall drink your health as a public man. I do it with sincerity, wishing you all possible happiness." Bishop White, in relating this anecdote, adds that there was an end of all gaiety; and that, having directed his eye accidentally to Lady Liston, the wife of the British minister, he perceived the tears running down her cheeks. The next day General Washington attended the inauguration of President Adams, and received on that occasion the most striking tokens of the public respect and veneration. The crowd followed him with acclamations from the chamber of the House of Representatives, where the inaugural ceremonies of his successor were performed, to his own door. "There turning round, his countenance assumed a grave and almost melancholy expression, his eyes were bathed in tears, his emotions were too great for utterance, and only by his gestures could he indicate his thanks and convey his farewell blessing."[1] Similar demonstrations of respect were repeated at a splendid entertainment given to him in the evening by the citizens of Philadelphia.

The last official letter of General Washington as President of the United States was addressed to the secretary of state, for the purpose of placing on record a formal denunciation of the forgeries to which allusion has been already made. This letter, after denying the truth of the facts which were alleged for the sake of giving a show of probability to this wretched fabrication, adds, with touching pathos, "As I cannot know how soon a more serious event may succeed to that which will this day take place, I have thought it a duty which I owed to myself, to my country, and to truth, now to detail the circumstances above recited, and to add my solemn declaration that the letters herein described are a base forgery, and that I never saw or heard of them till they appeared in print." Washington left Philadelphia about the 11th or 12th of March 1797, accompanied by Mrs Washington, Miss Custis, and George Washington Lafayette and his tutor, and returned to Mount Vernon by the way of Baltimore, accompanied by the blessings of the people.

Return to Mount Vernon.

Here it was his fondly cherished wish and hope to pass the remainder of his days in tranquil retirement. He was sixty-five years of age a few days before he retired from the presidency, and, as has been already mentioned, he did not consider himself as of a long-lived family. He had taken a definitive leave of political life; he was fond of agricultural pursuits; and his private affairs, much neglected during the eight years of his presidency, as they had also been while he was in the military service of his country, imperatively demanded his attention. In addition to this, the state of parties was such as to dispose him more than ever to stand aloof. Extreme opinions tending in opposite directions more than ever divided the country, and the voice of moderation, ever scorned by zealots, was, even if uttered by Washington, less likely than ever to be heard.

But his hopes of unmolested retirement, however ardently cherished, were doomed to be disappointed. The course pursued by the French Directory was such as to exhaust the patience alike of the government and people of the United States. From the first arrival of M. Genet in 1793, although his successor did not come quite up to the standard of his indecorum, the diplomatic relations with France had been of the most unsatisfactory kind. The neutrality observed by the United States in the war raging in Europe was, or was pretended to be, taken in ill part, and the negotiation of Jay's treaty gave new cause of offence. While the French ministers in America scarcely kept within the bounds of civility towards the federal government, her ministers to France were either not received, or received to be insulted, and her commerce was surrendered a hopeless prey to the public cruisers and the privateers of the Republic.

Washington.

It was necessary that outrages like these, of which the injury was great and the shame worse than the injury, should at length have an end. The despatches of the envoys to France, detailing the affronts which had been put upon them and their country, were laid before Congress, and a just resentment was kindled in that body and throughout the Union. A suitable addition was voted to the naval and military force of the United States, and active preparations commenced for the impending conflict. With the first serious alarm of an approaching struggle, all eyes were turned towards Washington, as the necessary leader of the armies of the country. No other person was thought of for the chief command. Washington was early prepared for the call, which could not fail to be made upon him, by the letters of his confidential friends; and though sagaciously predicting that the French Directory would not have the madness to push matters to a war, he avowed his purpose to obey the call of the country. After alluding to his occupations at Mount Vernon, he adds in writing to Hamilton, "If a crisis should arrive, when a sense of duty or a call from my country should become so imperious as to leave me no choice, I should prepare for relinquishment, and go with as much reluctance from my present peaceful abode as I should go to the tomb of my ancestors."

Appointed lieutenant-general.

The unwelcome necessity presented itself. Toward the close of June 1798, letters were addressed to General Washington, both by the President and the Secretary-at-war, tendering to him informally the command of the army about to be organized. His replies were in unison with the sentiment just quoted, though filled with expressions of distress at the thoughts of leaving his retirement. Some delay took place in the transmission of the letters of the President and the Secretary to Mount Vernon, and before the answers to them could be received at the seat of government, Washington had been nominated to the senate by President Adams as commander-in-chief of the armies of the United States, with the rank of lieutenant-general, a title never conferred in any other instance in the United States before or since, except in that of General Scott, on whom it was justly bestowed a few years since by Congress.

General Washington accepted the commission, stipulating only that he should not take the field till the army was in a situation to need his presence, or the country was actually invaded. The President, however, in the letter communicating his appointment, had declared that he stood in urgent need of his advice and assistance, and indeed "of his conduct and direction of the war;" and Washington engaged in the organization of the army, with the spirit and energy of earlier days. Difficulties and embarrassments of no ordinary kind presented themselves; but the experience of two wars, and two civil administrations had sufficiently taught him, that these are unhappily at all times the conditions of the public service. It may be stated, in general terms, that the main difficulties which attend the adminis-

[1] President W. A. Duer's Recollections in Irving's *Washington*, vol. v. p. 271.

Washington.

tration of a government in peace or in war, spring not so much from the necessary and intrinsic conditions of the public service, as from the selfishness and the passions of individuals and the madness of parties.

There is a suggestion in a long and very interesting letter to the secretary at war, of the 4th of July 1799, written in reply to the overtures above alluded to, which shows that the newly appointed commander-in-chief was fully aware of the tremendous risks to which his military reputation might be exposed. He had evidently reflected on the possibility that he might be brought into actual conflict with the youthful French chieftain, who had already filled the world with the rumour of his military genius in those campaigns of 1796 and 1797, to which Europe had seen no parallel since the days of Julius Cæsar. After some modest allusions to his advancing years, Washington, in the letter referred to, says, "I express these ideas not from affectation, for I despise everything that carries that appearance, but from the belief that, as it is the fashion of the present day, set or adopted by the French (with whom we are to contend), and with great and astonishing success too, to appoint *generals of juvenile years* to lead their armies, it might not be impossible that similar ideas and wishes might pervade the minds of our citizens." It was his often repeated sentiment, that if the French attempted to gain a foot-hold in America, they must not be permitted to land; and his reference to their youthful commanders shows that he must have contemplated the probability that, in the event of a war, he should be brought in direct collison with the youngest and most successful of them, the hero of Arcole and Lodi. But the "man of Destiny" had been led by his star in another direction, and the man of Providence was not called to meet him in the field. Four days before the letter of Washington just cited was written, Napoleon had landed at Alexandria. The directory saw, before it was too late, the madness of their proceedings, and showed a willingness to retrace their steps by an intimation that another mission from the United States should be honourably received. They might with propriety have been required to take the initiative in the work of peace, and to send their own envoys to America. But the United States were then a feeble power; and the administration was harassed by dissensions among its political friends, and by a formidable opposition. President Adams probably adopted the more prudent course, in closing with the overture of the directory. In the meantime the wheel of fortune was revolving; the bloody game of Egypt had been played out; Napoleon had returned to France; the directory had sunk before him; and his brother Joseph, on the 30th of September 1800, concluded with Messrs Ellsworth, Davie, and Murray, a treaty of peace.

Accommodation of the United States with France.

The conclusion of a treaty of peace with France was a fulfilment of his anticipations which Washington did not live to witness. His illustrious life was drawing unexpectedly to a close. December 1799 found him apparently in unusual health. His favourite nephew Lewis, writing of him as he appeared to himself and a friend at that time, says, "the clear and healthy flush on his cheek and his sprightly manner brought the remark from both of us, that we had never seen the general look so well. I have sometimes thought him decidedly the handsomest man I ever saw."

Illness in December 1799.

On the 10th of December 1799, he completed the draft of an elaborate plan for the management of his plantations, laying down the rotation of the crops for a succession of years in advance. The morning of that day was clear and calm, but the afternoon was lowering. The next, the 11th of December, was a blustering, rainy day, and at night says the *Diary*, "there was a large circle round the moon." The morning of the 12th was overcast. Washington's last letter was written that morning. It was to Hamilton, and principally on the subject of a military academy. At ten o'clock he rode out as usual over his farms. "About one o'clock," he remarks in his *Diary*, "it began to snow, soon after to hail, and then turned to a settled cold rain." He was, however, protected by an outside coat, and remained in the saddle five hours.

Washington.

On franking the letters brought to him for that purpose by his secretary, he said the weather was too bad to send a servant to the post-office, which was at Alexandria, 9 miles off. His secretary, Mr Lear, from whose narration these minute details are derived, perceiving the snow was clinging to his hair behind, expressed his fears that his neck must be wet. He said it was not; that his greatcoat had kept him dry. He went to dinner, which had been kept waiting for him, without changing his dress, and in the evening appeared as well as usual.

There were 3 inches of snow on the ground on the morning of Friday the 13th, and it continued to fall. In consequence of this state of the weather, and of a sore throat of which he complained, evidently the result of his exposure the day before, Washington omitted his usual morning ride around his plantations. It cleared up, however, in the afternoon, and he went out to mark some trees, which were to be cut down for the improvement of the grounds between the river and the house. He had a hoarseness upon him at this time, which increased in the evening, but he made light of it. This was the last time that he left his house.

The newspapers were brought from the post-office in the evening, and he passed it in the parlour reading them. At nine o'clock Mrs Washington went up to the room of her granddaughter, Mrs Lewis (who was confined), leaving the general and Mr Lear together. He was very cheerful, and when he found anything of interest, read it aloud as well as his hoarseness would permit. He requested Mr Lear to read aloud the debates in the Virginia Assembly on the election of senator and governor; and discovered some feeling at the remarks of Mr Madison respecting Mr Monroe. When he retired for the night, Mr Lear advised him to take something for his cold. He answered, "No, you know I never take anything for a cold; let it go as it came." These were the last words, hopeful of health, which passed his lips.

Fatal termination of the disease.

Saturday, the 14th, was the last day of his life. It was long and full of suffering. Between two and three o'clock in the morning he awoke Mrs Washington, telling her he had had an ague fit, and was very unwell. He could then scarcely speak, and breathed with difficulty. Thoughtful of others even in this emergency, he would not allow her to get up to call a servant, for fear of her taking cold. At daybreak, Caroline the servant came to make a fire, and was sent by her mistress to call Mr Lear. Hastening to the general's chamber, Mr Lear found him breathing with difficulty, and hardly able to articulate. He desired that his friend and physician, Dr Craik, who lived in Alexandria, should be sent for, and that in the meantime Mr Rawlins, one of the overseers, should bleed him.

A soothing mixture was prepared for his throat, but he was unable to swallow the smallest quantity. The effort to do so caused distress, almost suffocation. Rawlins came soon after sunrise, and prepared to bleed him. When the arm was ready, Washington, perceiving that he was agitated, said as plainly as he could, "Don't be afraid;" and when the vein was opened, observed, "The orifice is not large enough." The blood flowed pretty freely, but Mrs Washington, fearful that blood-letting might not be proper, begged that much should not be taken. When Mr Lear, however, was about to untie the ligature, the general raised his hand to prevent it, saying, "More, more." Mrs Washington being still anxious lest he should suffer by the loss of blood, about half a pint only was taken. His throat was now bathed with *sal volatile*, and his feet placed in warm

Washington. water, but without affording any relief. When the hand of the attendant was gently applied to his throat, he said, "It is very sore." About eight o'clock he rose and was dressed; but he found no relief from the change of position, and at ten returned to his bed.

The alarm rapidly increasing, a physician was sent for from Port Tobacco, on the other side of the river, but between eight and nine o'clock Dr Craik arrived. He immediately applied a blister to the throat, took more blood, and had a gargle prepared, which, however, the patient was wholly unable to use. Other remedial applications were attempted, but without effect. At eleven o'clock a third physician was sent for, and in the meantime the general was again bled. No benefit resulted from this treatment, and he remained unable to swallow.

About three o'clock Drs Dick and Brown arrived, and, after consultation, the sufferer was for the fourth time bled. The blood came thick and slow, but its loss produced no faintness. He was now able to swallow a little, and active medicines were administered, but without beneficial effect.

About half-past four o'clock Mrs Washington was called to his bedside, and he requested her to go to his room and bring from his desk two wills, which she did. He looked at them, handed her one to burn as useless, and gave the other into her possession.

After this Mr Lear returned to his bedside, and took his hand. "I find," said the general, "I am going. My breath cannot last long. I believed from the first that the disorder would prove fatal. Do you arrange and record all my late military letters and papers. Arrange my accounts and settle my books; and let Mr Rawlins finish recording my other letters, which he has begun." He then asked Mr Lear if he recollected anything which it was essential for him to do, as he had but a very short time to continue with them. Mr Lear expressed the hope that he was not so near his end. He observed with a smile that he certainly was, and that, as it was the debt which we must all pay, he looked to it with perfect resignation.

In the course of the afternoon he was helped up, and, after sitting about half an hour, desired to be undressed again and put to bed. Perceiving his servant Christopher, who had been in attendance most of the day, to be standing, he thoughtfully told him to be seated. In the course of the afternoon, he suffered great pain from the difficulty of breathing, and desired frequently to change his position in bed. On these occasions his secretary lay by his side, in order to turn him with as much ease as possible. He was touched with these attentions, and said, "I am afraid I shall fatigue you too much; it is a debt we must pay to each other, and I hope, when you want aid of this kind, you will find it."

About five o'clock in the afternoon, Dr Craik came again into the room, and, upon his going to the bed-side, the general said to him, "Doctor, I die hard, but I am not afraid to go. I believed from my first attack that I should not survive it. My breath cannot last long." Dr Craik, his companion on the field of battle and his friend through life, perceiving that the last hour was near, pressed the hand of Washington, but could not speak, and left the bedside in speechless grief.

Between five and six, the three physicians approached his bedside. Dr Craik asking if he could sit up in bed, he held out his hand and was raised up. He then said to the physicians, "I feel myself going; I thank you for your attentions; but I pray you to take no more trouble about me. Let me go off quietly; I cannot last long." He lay down again; restless and suffering, but without complaining, frequently asking what hour it was.

About eight o'clock the physicians again came into the room, and applied blisters and cataplasms to the legs. At ten o'clock he made several attempts to speak to Mr Lear, but for some time without success. At length he said, "I am fast going; have me decently buried; and do not let my body be put into the vault till three days after I am dead." Mr Lear, unable to speak, bowed assent. He then spoke again and said, "Do you understand me?" Mr Lear replied that he did; and Washington said, "It is well." Washington.

These were the last words which he uttered. Between ten and eleven o'clock, and about ten minutes before he died his breathing became easier. He lay quietly, withdrew his hand from Mr Lear's, and felt his own pulse. At this moment his countenance changed, his hand fell from his wrist, and he expired without a struggle. Mrs Washington, who was seated at the foot of the bed, said in a collected voice, "Is he gone?" A signal from Mr Lear gave the answer. "It is well," she said; "all is now over; I shall soon follow him; I have no more trials to pass through."

The disease of which General Washington died was what is now technically called "acute laryngitis," a disease of very rare occurrence, and at that time not discriminated from other inflammatory diseases of the throat. "During his whole illness," says Mr Lear, in the memorandum from which the foregoing account is taken almost *verbatim*, "he spoke but seldom, and with great difficulty and distress, and in so low and broken a voice as at times hardly to be understood. His patience, fortitude, and resignation never forsook him for a moment. In all his distress he uttered not a sigh nor a complaint, always endeavouring from a sense of duty, as it appeared, to take what was offered to him, and to do as he was desired by his physician."

On the 18th of December, followed by the sorrowing members of his family, by his friends and neighbours, his mortal remains were deposited in the family vault at Mount Vernon, where they still rest. In consequence of the suddenness of the event, the news of his illness and of his death went out at once to the country, and fell like the tidings of a domestic sorrow upon the hearts of the people. Appropriate resolutions, drawn by General Lee, one of the members from Virginia, were in his absence moved by his colleague, Mr John Marshall, afterwards chief-justice of the United States, expressive of the public sorrow at the loss of him "who was first in war, first in peace, and first in the hearts of his fellow-citizens." The tributes of respect paid to his memory by Congress were repeated by the state legislatures, the courts, the municipal bodies, the seats of learning, and the associations of every description throughout the Union; and all the people mourned. Public mourning.

We have already seen that, a few hours before his death, Washington sent to his study for two wills, which, when brought, were handed by him to Mrs Washington, one to be destroyed and the other preserved by her. As he had kept them both to the close of his life, it may be supposed that, in conformity with his strictly methodical business habits, the two wills had been prepared by him to meet respectively the contingencies of surviving his wife or dying before her. Although, as he frequently observes in his correspondence, his affairs had greatly suffered by his long absences from home, he left a large estate. He inherited a small property from his father; his elder brother bequeathed to him the estate of Mount Vernon; he received a large accession of wealth with his wife; and he made extensive purchases of unimproved lands, not only in Virginia, but in several other states, some of which probably rose in value. A schedule appended to his will of that part of his property, which was to be sold for distribution among his general heirs, amounts, as estimated by him, to something more than half a million of dollars. The larger part of his estate was specifically bequeathed, and must have more than equalled this amount. President Adams the elder, writing to a friend in Massachusetts, at the time of Washington's election as commander-in-chief in 1775, speaks of him as "a gentleman of one of the finest fortunes upon the continent." It is prob-

Washington.

able that many of the unimproved lands, though possessing a speculative value, were unproductive, and of stocks and other property yielding a fixed income, the amount appears to have been small.

Emancipation of his slaves by will.

By the third *item* of the will, which was made about six months before his death, General Washington provided that, upon the decease of his wife, all the slaves held by him *in his own right* should receive their freedom. "To emancipate them during her life," the will proceeds, "would, though earnestly desired by me, be attended with such insuperable difficulties, on account of their intermixture by marriage with the dower negroes, as to excite the most painful sensations, if not disagreeable consequences to the latter, while both descriptions are in the occupancy of the same proprietor, it not being in my power under the tenure by which the dower negroes are held to manumit them." For those emancipated, who from old age or bodily infirmity should be unable to support themselves, the will directs that a comfortable provision of food and clothing while they lived should be made by his heirs. Those who were too young to support themselves, and who had no parents able or willing to support them, were to be bound by the court till they were twenty-five years of age, were to be taught to read and write by the masters to whom they were bound, and brought up to some useful occupation. The will expressly forbids the sale or transportation out of Virginia of any slave of whom he might die possessed, under any pretence whatsoever, and it enforces the general intentions of the testator in the following stringent terms:—

"And I do moreover most pointedly and solemnly enjoin upon my executors . . . to see that this clause respecting slaves and every part thereof be religiously fulfilled at the epoch at which it is directed to take place, without evasion, neglect, or delay, after the crops which may then be in the ground are harvested, particularly as it respects the aged and infirm; seeing that a regular and permanent fund be established for their support as long as there are subjects requiring it; not trusting to the uncertain provision to be made by individuals."

For his favourite servant Billy, who attended him throughout the Revolutionary War, a special provision was made in the following terms, and with characteristic precision:—

"To my mulatto-man William, calling himself William Lee, I give immediate freedom, or if he should prefer it (on account of the accidents which have befallen him, and which have rendered him incapable of walking or of any active employment), to remain in the situation he now is, it shall be optional in him to do so; in either case, however, I allow him an annuity of thirty dollars, during his natural life, which shall be independent of the victuals and clothes he has been accustomed to receive, if he chooses the last alternative; but in full with his freedom if he prefers the first; and this I give him as a testimony of my sense of his attachment to me and for his faithful services during the Revolutionary War."

The estate of Mount Vernon was bequeathed to his nephew, Bushrod Washington (the son of the General's younger and favourite brother, John A. Washington), afterwards one of the associate justices of the Supreme Court of the United States. This bequest was made, in the words of the testator, "partly in consideration of an intimation to his deceased father, while we were bachelors, and he had kindly undertaken to superintend my estate during my military services in the former war between Great Britain and France, that, if I should fall therein, Mount Vernon, then less extensive in domain than at present, should become his property." On the decease of Mr Justice Washington without children, it came into the possession of a nephew, who bequeathed it to his widow. Her son, John A. Washington, is the present incumbent. Three years since a contract was entered into between Mr John A. Washington and "the Ladies' Mount Vernon Association of the Union," for the purchase of 200 acres of the estate, including the mansion-house and the tomb, for 200,000 dollars. The greater part of the stipulated purchase-money has been already paid.

Washington.

We have in the foregoing article aimed to present the reader with a comprehensive, though necessarily greatly condensed sketch of the principal events of the life of Washington, as the best means of conveying an adequate impression of his character. As his active life covers very nearly half a century of the most important period in the history of the Anglo-American colonies and of the United States, and as he was himself intimately associated with the events of greatest consequence while he was on the stage, it was manifestly necessary to pass rapidly over the ground. Much has of necessity been omitted, and much superficially narrated. Mr Sparks' admirable Life and edition of the writings of Washington, the standard work of Chief-Justice Marshall, and Mr Washington Irving's classical volumes, have furnished most of the materials of the foregoing narrative, and their own words have been sometimes borrowed. The reader will probably wish that this had been done oftener.

Personal appearance and habits.

General Washington's personal appearance was in harmony with his character; it was a model of manly strength and beauty. He was about six feet two inches in height, and his person well proportioned; in the earlier part of life rather spare, and never too stout for active and graceful movement. The complexion inclined to the florid; the eyes were blue, and remarkably far apart; a profusion of brown hair was drawn back from the forehead, highly powdered, according to the fashion of the day, and gathered in a bag behind. He was scrupulously neat in his dress, and while in camp, though he habitually left his tent at sunrise, he was usually dressed for the day. His strength of arm, and his skill and grace as a horseman, have been already mentioned. His power of endurance was great, and there were occasions, as at the retreat from Long Island and the battle of Princeton, when he was scarcely out of his saddle for two days. Punctilious in his observance of the courtesies of society as practised in his day, he was accustomed, down to the period of his inauguration as President, at the balls given in his honour, to take part in a minuet or country dance. His diary uniformly records, sometimes with amusing exactness, the precise number of ladies present at the assemblies at which he was received on his tours through the Union. His general manner in large societies, though eminently courteous, was marked by a certain military reserve. In smaller companies he was easy and affable, but not talkative. He was frequently cheered into gaiety at his fireside by the contagious merriment of the young and happy, but often relapsed into a thoughtful mood, moving his lips, but uttering no audible sound.

Religious opinions.

Washington's religious impressions were in harmony with the rest of his character, deep, rational, and practical. On this topic our remaining space admits of little more than a reference to the interesting article on this subject, in the fourth section of the Appendix to Mr Sparks' twelfth volume. Washington was brought up in the Episcopal communion, and was a member of the vestry of two churches. He was at all times a regular attendant on public worship, and an occasional partaker of the communion; and is believed habitually to have begun the day with the reading of the Scriptures and prayer in his closet. His private correspondence, his general orders, and his public acts of all kinds, contain devout recognitions of a Divine providence in the government of the world; and his whole life bears witness to the influence of a prevailing sense of religious responsibility. In his last moments he breathed a truly pious spirit of resignation. In his own affecting words, "he died hard," but he was "not afraid to go." Though prevented by the rapid progress of his disease, and the almost total obstruction of the vocal organs, from expressing his feelings,

Washington.

he manifested to the last the submission of a sincere Christian to the will of the Great Disposer.

Posterity will not be left without a faithful representation of his person. The statue by Howden in the Capitol at Richmond, modelled at the age of fifty-three, is the accepted embodiment of his countenance and form, and has been followed substantially by all his successors in several monumental works of distinguished merit. A series of portraits by able artists, from the age of thirty-eight onwards, delineate him under all the modifications of feature and person gradually induced by the advance of years.

General and particular views of his character.

In the final contemplation of his character, we shall not hesitate to pronounce Washington, of all men that have ever lived, the greatest of good men, and the best of great men. Nor let this judgment be attributed to national partiality. In the year 1797, Mr Rufus King, then the Amerian minister in London, wrote to General Hamilton —"No one who has not been in England can have a just idea of the admiration expressed among all parties for General Washington. It is a common observation, that he is not only the most illustrious but the most meritorious character that has yet appeared." Lord Erskine, in writing to Washington about the same time, says—"You are the only human being for whom I ever felt an awful reverence." Mr Charles James Fox remarks of him, that "a character of virtues, so happily tempered by one another, and so wholly unalloyed by any vices, as that of Washington, is hardly to be found on the pages of history." Lord Brougham, in his brilliant comparative sketch of Napoleon and Washington, after a glowing picture of the virtues and vices of the great modern conqueror, exclaims—"How grateful the relief which the friend of mankind, the lover of virtue, experiences when, turning from the contemplation of such a character, his eye rests upon the greatest man of our own or of any age—the only one upon whom an epithet, so thoughtlessly lavished by men, may be innocently and justly bestowed!" Nor are these testimonies confined to Englishmen, in whom they might be supposed to be inspired in some degree by Anglo-Saxon sympathy. When the news of his death reached France, Fontanes, by direction of Napoleon, delivered an eloquent eulogium, in which he declared him to be "a character worthy the best days of antiquity." M. Guizot, a far higher authority, in his admirable essay on the character of Washington, pronounces, that "of all great men he was the most virtuous and the most fortunate." "All proclaimed him," says the historian Botta, "equal to the most renowned commanders of antiquity;" and Alfieri, in the dedication of the *First Brutus*, declares "that the name of the Liberator of America is alone worthy to stand at the head of a tragedy on the Liberator of Rome."

The comparison of Napoleon and Washington suggests a remark on the military character of the latter, who is frequently disparaged in contrast with the great chieftains of ancient and modern time. But no comparison can be instituted to any valuable purpose between individuals which does not extend to the countries and periods in which they lived, and to the means at their command. When these circumstances are taken into the account, Washington, as a chieftain, will sustain the comparison with any other of ancient or modern time. A recent judicious French writer (M. Edouard Laboulaye), though greatly admiring the character of Washington, denies him the brilliant military genius of Julius Cæsar. It is, to say the least, as certain that Julius Cæsar, remaining in other respects what he was, could not have conducted the American Revolution to a successful issue, as that Washington could not have subdued Gaul, thrown an army into Great Britain, or gained the battle of Pharsalia. No one has ever denied to Washington the possession of the highest degree of physical and moral courage; no one has ever accused him of missing an opportunity to strike a bold blow; no one has pointed out a want of vigour in the moment of action, or of forethought in the plans of his campaigns; in short, no one has alleged a fact from which it can be made even probable that Napoleon or Cæsar, working with his means and on his field of action, could have wrought out greater or better results than he did; or that, if he had been placed on a field of action, and with a command of means like theirs, he would have shown himself unequal to the position.

Washington.

Natural temperament.

There is in this respect a great mistake on the subject of Washington's temperament, which was naturally sanguine. Traditionary accounts, which must, however, be received with great caution as far as particular anecdotes are concerned, authorize the belief that, in early life at least, he habitually waged a strenuous warfare with his own ardent temper. At all events, while he was placed in circumstances in both his wars which forced upon him the Fabian policy, there were occasions, as we have seen in the narration, when he seized the opportunity of making what, if it had failed, would have been called a rash movement. This showed him the possessor of an extensive capacity, conforming patiently to straits, and keeping good heart in adversity, but ready at a moment of change to move with vigour and power. When we add to this an unquestioned fondness for the military profession, who can doubt that, if he had been trained in the great wars of Europe, he would have proved himself equal to their severest test? It is a remarkable fact, that from his youth upward he evinced military capacity beyond that of all the trained and experienced officers with whom he was associated or brought in conflict. The neglect of his advice in 1755 cost the veteran Braddock his army and his life, and threw the valley of the Ohio into the power of the French; and all the skill and energy visible in the operations of General Forbes, by which it was recovered in 1758, were infused into them by Washington.

Genius for the conduct of affairs.

Akin to the argument against his military capacity, is the question whether, generally speaking, Washington was a man of genius—a question not to be answered till that word is explained. Dr Johnson calls it "that power which constitutes a poet;" and in that acceptation Washington certainly was not endowed with it. As little did he possess the genius of the orator, the man of letters, the sculptor, the painter, the musician. The term is so habitually, not to say exclusively, appropriated to that native power which enables men to excel in science, literature, and the fine arts, that those who are destitute of it in these departments are often denied it altogether. But there is a genius of political and military skill, of social influence, of personal ascendency, of government; a genius for practical utility; a moral genius of true heroism, of unselfish patriotism, and of a stern public integrity, which is as strongly marked an endowment as those gifts of intellect, imagination, and taste, which constitute the poet and the artist. Without adopting Virgil's magnificent but scornful contrast between scientific and literary skill on the one hand, and those masterful arts on the other, by which victories are gained and nations are governed, we must still admit that the chieftain who, in spite of obstacles the most formidable, and vicissitudes the most distressing, conducts great wars to successful issues;—that the statesman who harmonizes angry parties in peace; skilfully moderates the counsels of constituent assemblies, and without the resources of rhetoric, but by influence mightier than authority, secures the formation and organization of governments, and in their administration establishes the model of official conduct for all following time,—is endowed with a divine principle of thought and action as distinct in its kind as that of Demosthenes or Milton. It is the genius of a consummate manhood. Analysis may describe its manifestations in either case, but cannot define the ulterior

Washington. principle. It is a final element of character. We may speak of prudence, punctuality, and self-control, of bravery and disinterestedness, as we speak of an eye for colour and a perception of the graceful in the painter; a sensibility to the sublime, the pathetic, and the beautiful in discourse; but behind and above all these there must be a creative and animating principle, at least as much in character as in intellect or art. The qualities which pertain to genius are not the whole of genius, in the one case any more than the other. The arteries, the lungs, and the nerves, are essential to life, but they are not life itself—that higher something which puts all the organic functions of the frame in motion. In the possession of that mysterious quality of character manifested in a long life of unambitious service, which, call it by whatever name, inspires the confidence, commands the respect, and wins the affection of contemporaries, and grows upon the admiration of successive generations, forming a standard to which the merit of other men is referred, and a living proof that pure patriotism is not a delusion, nor virtue an empty name, no one of the sons of men has equalled George Washington. (E. E-T.) Washington.

WASHINGTON, a newly constituted territory of the United States of North America, having been detached from Oregon territory by Act of Congress in 1853. It forms the extreme N.W. portion of the territory of the United States, and is bounded on the N. by the British North American possessions, the line of boundary being 49. N. Lat., E. by the Rocky Mountains, which separate it from the Nebraska territory; S. by Oregon, from which it is separated by the Columbia River, and parallel 46. of N. Lat.; W. by the Pacific Ocean; and N.W. by the Strait of Juan de Fuca, &c., separating it from Vancouver Island. It lies between 45. 32. and 49. N. Lat., and 111. 54. and 124. 40. W. Long.; and is about 600 miles in length from E. to W., by about 230 in width from N. to S., the estimated area being 123,022 square miles.

Comparatively little is yet known of this extensive country, except that in its general features it very much resembles the adjoining territory of Oregon. The coast line, however, is more broken, and the mountain ranges in general more scattered and irregular. Proceeding northward along the coast from the mouth of the Columbia River, which forms a large bay, bounded on the N. by Cape Disappointment, we come to Shoalwater Bay, a considerable sheet of water communicating with the Atlantic by a narrow mouth. North of this, in about parallel 47. of latitude, is Gray's Harbour, extending inland about 12 miles, and about 2½ miles across at its mouth, but afterwards attaining a width of 5 or 6 miles. From this point N. to Cape Flattery, which bounds the Strait of Juan de Fuca on the S., the coast is high and rocky, and but little indented. The Strait of Juan de Fuca is a vast arm of the sea, about 10 miles wide at its mouth, and about 100 miles deep. Extending southward from the head of this Strait into the territory of Washington for about 70 or 80 miles, are Admiralty Inlet, Puget's Sound, and Hood's Canal. These are of great extent, and form numerous islands, presenting a coast line of great length, with precipitous banks, so that vessels of the largest size can come close to the shore.

The surface of the country is naturally divided into three regions—the western, or coast region, lying between the Cascade Mountains and the sea; the central region; and the eastern or Rocky Mountain region. The western region has a breadth of about 150 miles, and is much broken in the surface by offshoots of the Cascade Mountains. A coast chain extends parallel to the coast, west of Puget's Sound, and has its principal point Mount Olympus, upwards of 8000 feet high. Except where traversed by the coast chain, this region slopes generally to the west. It discharges numerous streams into Puget's Sound and the Columbia River, but only a few directly into the sea, and of these the principal is the Sawamish; the Chehalis falls into Gray's Harbour, and several small ones empty themselves into Shoalwater Bay. This is the only part of the territory with settled habitations, and the greater part of it is covered with magnificent forests of pine, fir, oak, ash, cedar, and other trees. Some portions of the soil are of great fertility, and the climate is mild and salubrious. The Cascade Range is much less elevated than the Rocky Mountains, but it has several lofty summits, as Adam's, St Helen's, Rainier, and Baker, one or more of which rise to the height of upwards of 13,000 feet. The central region, lying east of the Cascade Range, belongs to the basin of the Columbia, and comprises principally the great plain of the Columbia, a vast rolling prairie, nearly 200 miles in length by about 100 in extreme width. This region is for the most part dry and arid except near the rivers and streams, and but little fitted for cultivation. It is bounded eastward by the Cœur d'Alene Range, between which and the Rocky Mountains the surface consists of a succession of high mountains and elevated valleys, abounding in scenery of the wildest and most picturesque character. It is of course little suited for agriculture, but it contains spots of great fertility, and its lower parts are generally well wooded.

The principal river of Washington is the Columbia. which receives all those lying E. of the Cascade Range, It is about 7 miles wide at its mouth, but has a sand-bar, which impedes the navigation, and renders it inaccessible to vessels of more than 10 or 12 feet draught. At the Cascade Mountains it forms a series of falls and rapids, which entirely obstruct the navigation. Its principal affluents in this territory are the Snake River or Lewis Fork, which belongs chiefly to Oregon territory, the Yakema, Okanagan, Spokane, and Clarke's Fork. There are a number of lakes in the interior and eastern regions, and some of them of considerable size. As yet little is known of the mineral resources of the territory. Coal has been found on the Chehalis and in the neighbourhood of Puget's Sound; and it is generally believed that the country is well supplied with the useful if not also with the precious metals. Agriculture is rapidly extending, though the rearing of horses and cattle is as yet the chief object of pursuit by the settlers. Wood being plentiful, the lumbering trade receives some degree of attention, especially in the neighbourhood of Puget's Sound; and the fisheries are actively carried on, salmon and other fish being remarkably plentiful here. The country abounds in game and wild animals, as deer, elk, otter, beaver, fox, bear, &c. which are hunted by the Indians for the Hudson's Bay Company. Washington, as a part of Oregon territory, comprised the two counties of Lewis and Clarke, and in 1850 contained 1201 inhabitants. In 1854, a local census ascertained the population to be 3965, and in 1857 it was estimated at 10,000.

WASHINGTON, the capital of the United States of North America, is pleasantly situated on the left bank of the Potomac river, at its junction with a tributary called the Eastern Branch, 38, 136, and 226 miles S.W. from Baltimore, Philadelphia, and New York respectively. The observatory from which American geographers generally reckon their meridians is in lat. 38. 53. 39. N., and long. 77. 2. 48. W. from Greenwich.

The district of Columbia, in which Washington is situated, was formed by Act of Congress in 1790, the States of Virginia and Maryland having each ceded a portion of their territory for that purpose. The two portions formed a square of 10 miles, or an area of 100 square miles. In 1846, however, the portion ceded by Virginia was restored to that state, so that the present district comprises only the

Washington.

portion lying on the Maryland side of the Potomac, and has an area of about 60 square miles. This district is independent of any of the states, and is solely under the government of Congress.

The city of Washington was founded in 1793; and in 1800 the government, which had hitherto had its seat in Philadelphia, was transferred thither. Its site, which has a general elevation of about 40 feet above the river, is diversified by irregular elevations, which give a pleasant variety to the city, and furnish commanding positions for its principal buildings. It has on the south the Eastern Branch, and on the north it is separated from Georgetown by a stream called the Rock Creek, while a small stream, the Tiber Creek, flows through the town. At a little distance, it is surrounded by an amphitheatre of wooded hills of moderate elevation, commanding extensive and picturesque views, and affording eligible sites for suburban villas. The city is regularly laid out, and traversed by streets from 70 to 100 feet wide, running east and west, and north and south. Besides these, there are fifteen avenues, from 130 to 160 feet wide, named after the fifteen states which at the time of its formation constituted the Union, and extending from several centres in the direction of these states. It is about 4½ miles in length from N.W. to S.E., and about 2½ in breadth from N.E. to S.W.; but only a small portion of this area has yet been built upon, and hence Washington has not incorrectly been termed a "city of magnificent distances." The two great centres of the city, standing about a mile apart, are the Capitol and the President's House, from which most of the avenues diverge.

The Capitol, in which the National Congress hold their sittings occupies a commanding position 72 feet above the water-level of the Potomac. It was commenced in 1793, but operations were subsequently suspended in consequence of the war, and much that had been done was destroyed by the British in 1814; so that the whole edifice was recommenced in 1815, and was not entirely finished till 1828. In 1851 the foundation stone of two additional wings was laid; and including these and the space between the wings, the whole building will occupy an area of about 4½ acres. The original building, consisting of a centre and two wings, has a length of 352 feet, a depth at the wings of 121, and is crowned by a magnificent central dome, 145 feet in height from the ground, each of the wings being also surmounted by a flat dome. The exterior presents a rusticated basement of the height of the first story; the two others are comprised in a Corinthian elevation of columns and pilasters; and the whole building is surrounded by a balustrade of stone. The eastern and principal front, including the steps, projects 65 feet, and is embellished with a magnificent portico of eighteen columns 30 feet high, forming a colonnade 160 feet in length, the centre of which is crowned by a pediment of 80 feet span. The western front has a receding portico 100 feet in length, with ten columns. The two additional wings, not yet completed, are to be each 238 feet in length by 140 in width, surrounded on three sides by colonnades, and to communicate with the main building on the fourth by corridors 44 feet long and 50 wide. Within the Capitol are the Senate Chamber, Hall of Representatives, Rotunda, Congressional Library, the Chamber of the Supreme Courts, and numerous offices. The grounds, extending to about thirty acres, are enclosed by an iron railing, and are very tastefully laid out and planted, forming one of the pleasantest promenades in the city. Near the western entrance of the Capitol stands a monument erected by the officers of the navy, in memory of their brother officers, who fell in the war of Tripoli. It consists of a column of marble springing from a large square base, to the height of 40 feet, and surmounted by an eagle. On the abutments of the eastern front are two interesting groups representing "Columbus" and "Civilisation." In front of the Capitol is also a much admired colossal statue of Washington in a sitting posture, by Greenough, bearing the simple and appropriate inscription of "First in war, First in peace, First in the hearts of his countrymen." Washington.

The President's House, the White House, or Executive Mansion, stands in the centre of a beautiful plot of ground of twenty acres, 44 feet above the Potomac, tastefully laid out and adorned with trees and shrubbery. The edifice, which is of white freestone, is two stories in height, crowned by a balustrade; and extends 170 feet in front and 86 feet in depth. The north front has a lofty portico ornamented with four Ionic columns. The interior arrangements are elegant and well adapted to the various purposes for which the building is designed. In the centre of a small square in front is a bronze statue of Jefferson, and across Pennsylvania Avenue in the centre of Lafayette Square, is a bronze equestrian statue of General Jackson.

In the same square with the President's House are buildings for the state, treasury, war, and navy departments. The state department occupies a plain brick edifice to the N.E. of the President's House. It is 160 feet long by 55 wide, and is two stories in height. In this building all the diplomatic business of the country is transacted, and it also contains a large library of books, maps, &c. Immediately south of this is the treasury department, occupying an imposing stone building of three stories, 340 feet long by 170 wide, exclusive of the north and south wings. The eastern front has a magnificent colonnade of forty-two Ionic columns. The building of the War Department occupies the north-west corner of the square, and is precisely similar in design to the State Department buildings. The buildings occupied by the Navy Department lie directly west of the President's Mansion, and behind the War Office buildings.

One of the finest structures in Washington is the General Post-Office. It is of white marble, in the Corinthian order, three stories in height, 204 feet long, and 102 deep, containing in all eighty-one rooms. Near the post-office is the Patent-Office, a magnificent building, partly of freestone and partly of marble, three stories in height, having an elegant central portico, with eight Doric columns in front. It has several magnificent halls, one of which, designated the National Gallery, contains cabinets of natural history, relics of Washington and Franklin, &c. The City Hall is an elegant stuccoed building, 200 feet in length. One of the noblest institutions and finest structures in Washington is the Smithsonian Institution, situated on a gently rising ground, west of the Capitol, and surrounded by extensive grounds, laid out in gardens, &c. It originated in a bequest of more than half a million of dollars left by an Englishman, named Smithson, "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." The building, which is of a reddish freestone, is Romanesque in style, and is 450 feet in length by 140 in width, and has nine towers, varying in height from 75 to 150 feet. It consists of a central compartment, 205 feet by 55, two connecting ranges of 60 feet, and two wings. It has a lecture-room capable of containing nearly 2000 persons, a museum for objects of natural history, 200 feet in length, a library capable of containing 100,000 volumes, a gallery for painting and statuary, 120 feet long, and one of the best-furnished laboratories in the United States.

The Washington monument on the Mall, between the president's house and the river, will, when completed, be a magnificent structure. It comprises a grand circular colonnaded building, 250 feet in diameter and 100 feet high, from the centre of which springs an obelisk shaft 70 feet square at the base, and 500 feet high, making a total elevation of 600 feet. The vast rotunda, forming the base of the monument, is surrounded by thirty massive columns, each 12 feet in diameter and 45 feet high, elevated

Watch ‖ Waterford.

upon a base 20 feet in height and 300 feet in diameter, and surmounted by an entablature 20 feet high, and crowned by a balustrade 15 feet in height. The terrace outside the colonnade is 25 feet wide, and the walk within the colonnade 25 feet wide. Over the columns severally is sculptured the escutcheon of each of the United States, while over the central portico is emblazoned the coat of arms of the Union. Around the rotunda are stationed statues of the signers of the declaration of the independence, and in niches statues of the fathers of the revolution; and directly opposite to the entrance is a statue of Washington himself. The interior of the shaft is embellished with a great variety of inscriptions and bas-reliefs, and in the centre of the monument will be placed the tomb of the father of his country.

The National Observatory is situated on the banks of the Potomac towards Georgetown, and is a very efficient establishment, chiefly conducted by naval officers. The arsenal occupies a fine position on Greenleaf's Point, at the junction of the Eastern Branch with the Potomac, and thus affords great facilities for the receiving and shipping of ordnance and other military stores. It contains an extensive model armoury, and the machinery employed here is very complete. About a mile and a quarter N.E. of the arsenal, on the Eastern Branch, is the Navy Yard, covering an area of 20 acres, and enclosed by a wall. This is one of the largest naval yards in the Union, and employs a great number of hands in the manufacture of anchors, chain-cables, steam-engines, &c. On the western side of the yard is a pyrotechnic laboratory. The Columbian College, incorporated in 1821, occupies a fine brick edifice, pleasantly situated on an eminence just beyond the limits of the city, and directly north of the President's House; and had in 1859 eight professors and teachers, and sixty-six students. The National Medical College, established in 1823, is a flourishing institution with eight professors and seventeen students. The National Institute, founded in 1840, and having for its object the promotion of general science, holds its meetings and has its head-quarters at the patent-office. The metropolis is well supplied with churches, there being in 1850 no fewer than thirty-seven. The finest building of this class is the Episcopalian Church of Trinity; but many of the others are handsome structures. Among the other buildings of Washington may be mentioned the barracks, coast survey office, penitentiary, hospital, jail, poor-house, and orphan asylum. There are several bridges over Rock Creek and the Eastern Branch, and one upwards of a mile in length over the Potomac. A spacious canal uniting the Potomac with the Eastern Branch passes through the city. Vessels drawing 14 feet of water can come up to the Potomac Bridge, and frigates can ascend the Eastern Branch to the navy yard without being lightened. In 1800 the population of Washington was only 3210, (1810) 8208, (1820) 13,247, (1830) 18,827. (1840) 23,364, (1850) 40,001.

WATCH. See Clock and Watch Making.

WATERFORD, a maritime county of the province of Munster, in Ireland, bounded on the N. by the river Suir, which separates it from the counties of Tipperary and Kilkenny; on the E. by the harbour of Waterford, which divides it from the county of Wexford; on the S. by the Atlantic; and on the W. by the counties of Cork and Tipperary. It lies between 51. 55. and 52. 15. N. latitude, and 7. 10. and 8. 24. W. longitude; extending 28 miles in its greatest length from N. to S., and 52 in breadth from E. to W., and comprehending an area of 721 square miles, or 461,553 acres, of which 325,345 are arable, 105,496 uncultivated, 23,408 in plantations, 1525 in towns, and 5779 under water. Of the 105,000 acres of unimproved pasture-land, situated chiefly on the summits of the Monavullagh and Knockmeledown Mountains, it is probable that 20,000 acres may be advantageously reclaimed for cultivation, 30,000 acres may be drained for pasture, and 55,000 acres, situated mostly near the summits of the mountains, may be considered as not worthy of improvement. A remarkable example of success in the cultivation and reclaiming of mountain-land may be observed around the abbey of monks of the order of St Bernard la Trappe, situate at Mount Melleray, three miles north of Cappoquin.

Waterford.

In the time of Ptolemy, all this district was inhabited by the tribe of the Brigantes, whose territory extended from Carnsore Point in Wexford, westward along the coast to the Blackwater. It was afterwards peopled by the Desii, who are supposed to have migrated from a tribe of the same name in Meath; and having spread themselves also over the plain country of Tipperary, those settled in Waterford were distinguished by the name of South Desii, and the others by that of North Desii. Here the Danes established a permanent settlement in the ninth century, making the city of Waterford their chief seat of government; and though frequently involved in wars with the surrounding natives, they retained possession of the city and district until their subjugation by the English, who, in 1170, under Strongbow, stormed Waterford, took their chieftain or prince prisoner, and brought the whole of the Deciis into the possession of the English. Shortly after, Henry II. granted the greater part of the county to Robert le Poer, and the remainder, with that of Cork, then a petty kingdom, to Milo de Cogan, two of his followers. In 1206, King John erected the territory into a county, from which the city was excepted, being under a separate jurisdiction. King John landed at Waterford in 1211, and personally visited many parts of the country. The next king of England who visited Ireland, Richard II., landed at Waterford in 1394, with an army of 4000 men-at-arms, and 30,000 archers. This king again landed at Waterford in 1399. In 1444, the county, together with the greater part of the rest of Munster, was granted to James, earl of Desmond. A few years after, both county and city were granted to John Talbot, earl of Shrewsbury, who was then created earl of Waterford; but both lands and title were resumed by the king under the statute 28th Henry VIII., which vested the lands of absentee proprietors in the crown. The county suffered severely in the reign of Elizabeth, through the rebellion of the Earl of Desmond, and the Spanish invasion; and also in the wars of 1641, during the first years of which, its possession was the subject of continued sanguinary contention between the English and Irish forces, until it was ultimately reduced under the authority of the English Parliament by Cromwell. During the war of the Revolution, it took part with King James, and was reduced by King William's forces, under General Kirk, after the decisive battle of the Boyne.

The general character of the county is mountainous. The Knockmeledown ridge, the highest point of which is 2609 feet above the sea-level, ranges along its north-western boundary, forming the line of demarcation on the side of Tipperary. The Commeragh and Monavulagh Mountains lie in a direction nearly north and south from the east of Clonmel to Dungarvan; their loftiest summit, Knockanafrian, is 2478 feet high. On several of the summits of these mountains are large piles of stones, apparently of artificial construction, but of unknown origin. To the south of Dungarvan are the Drum Mountains, much lower than the preceding, but rugged and difficult of passage. They form the division between two of the baronies. The south-eastern district is low, of alluvial formation, and forms a kind of peninsula, cut off from the remainder of the county by a line of marshy land, which has the appearance of having been once under water. There are no large rivers in the interior. The Suir forms its northern boundary from beyond Clonmel to the estuary formed by its junction with the combined waters of the Barrow and Nore. Vessels of

Waterford. 800 tons come up to the city of Waterford, where they can discharge their cargoes at the quay; barks and large lighters can proceed upwards to Carrick-on-Suir, and boats of fifty tons to Clonmel. The Blackwater, called also the Owenduff and Owenmore, "the black and the great river," after flowing through the western part of the county, forms part of the boundary on the side of Cork county, and discharges itself into Youghal harbour. It is navigable for vessels under 100 tons to its confluence with the Bride, a smaller stream which joins it from the west. The Brickey empties itself into Dungarvan harbour. The Neir, in the west of the county, is a small tributary of the Suir. There are no lakes, except a few of very small size in the Commeragh Mountains, the largest, called Cummeloughs, are but six or eight acres in extent, the others, called Stilloughs, smaller. A tract at Ballyscanlan, in Middlethird barony, covered with water during winter, subsides into a small lake in the dry season. The county enjoys the benefit of an extensive line of seacoast. Two miles east of the city is the Little Island, of triangular shape; after which the coast takes a southern direction, forming the western side of Waterford harbour, at the entrance of which is the pier harbour of Dunmore, with a lighthouse exhibiting a fixed light, red towards the sea, and bright inland. The harbour, in which vessels of fifteen feet draught may lie afloat, covers a cove of six acres. West of Dunmore are the small islands of Fileskirt. Farther westward, between Brownstown and Newtownheads, is Tramore Bay, notorious for shipwrecks. A vessel caught in it finds it almost impossible to work out by plying to windward. The ground is so foul and rocky that cables are frequently cut and ships lost. The north-west is the only part which affords a possibility of escape, the east being so shoal and rocky that vessels driven on that side are involved in terrible breakers at a considerable distance from shore. Proceeding westward are the small grassy rocks called the Islands of Jeane, and the inlets called Bonmahon, Clonea, and Rineshark. Dungarvan harbour affords shelter to vessels drawing ten feet of water. Ardmore Bay and Whiting Bay are still farther west. Youghal harbour forms the western boundary of the county. Off the coast, and extending along that of the southern part of the adjoining county of Wexford, is the Nymph Bank, long looked upon as an inexhaustible source of supply of round fish, but much less productive than had been represented; the fish not being abundant, and of a poorer description than those taken on other banks.

The eastern part of the county consists of clay-slate, interrupted by small patches of primitive limestone, susceptible of a high polish, and by conglomerate and basalt, which latter appears in a columnar form on the cliffs over the sea. A copper mine at Knockmahon, except the mines of Berehaven in Cork, the most productive in Ireland, has been worked for many years by the Mining Company of Ireland. The ore is sent in a crude state to Swansea to be smelted. The average annual produce is stated at 4500 tons, valued at L.40,000. Lead was formerly raised in large quantities in the same district. The veins in the hill of Cruach and on the shore at Kilmurrin have given out a large quantity of silver. The western part of the county is old conglomerate, with red, purple, green, and gray clay-slate. It is bordered in many parts by a band of millstone grit and white sandstone, which also constitutes the fringe of a broad bed of carboniferous limestone, that passes through a great part of the interior from east to west. Slates from the quarries south of Lismore are raised at an average of 2800 tons annually, value L.4200. Mineral veins are also found in this district. At Ardmore, an iron mine was formerly wrought, from which steel of superior quality was said to have been fabricated. The sandstone in many places is wrought into millstones. Ochres, boles, and clays, fit for the manufacture of earthenware, are found in various places.

The population of the county, according to calculations made at different periods, was as follows:— Waterford.

Date.	Authority.	Inhabitants.	Date.	Authority.	Inhabitants
1760	De Burgo	60,096	1831	Parl. census	177,054
1792	Beaufort	75,000	1841	Ditto	196,137
1812	Parl. census	119,457	1851	Ditto	164,051
1821	Ditto	127,842			

The latest of these returns show a reduction of 45 inhabitants per square mile in ten years, the number in 1841 being 272, and in 1851, 227. The population according to the return of the Commissioners of Public Instruction in 1834, gives a total population of 182,018; of which number the members of the Established Church were 8391, the Protestant dissenters 861, and the Roman Catholics 172,766. The proportion of Roman Catholics to Protestants, including Protestant dissenters, was as 1 to 0·05352, or as 1 to $\frac{1}{20}$th nearly; or the Protestants were to the Roman Catholics as 1 to 18·67. The number of children receiving instruction in public schools was as follows, according to the returns under the population act in 1821, those of the Commissioners of Education in 1824–26, of the Commissioners of Public Instruction in 1834, and of the Board of National Education in 1839.

Date.	Males.	Females.	Sex not ascertained.	Total.
1821	6088	2119	—	8,207
1824–26	9476	5524	182	15,121
1834	7200	4100	300	11,600
1838–39	3510	2644	—	6,154

According to the return of 1824–26, in which only the religious persuasion of the people is noticed, the numbers are, of the established church, 1373; dissenters, 100; Roman Catholics, 13,662; religious persuasion not ascertained, 46. The number of schools of each denomination, and of pupils attending them, in 1851, was ascertained by the Census Commissioners to be:—

	No. of Schools.	Number of Children.		
		Males.	Females.	Total.
CITY OF WATERFORD.				
Church Education	1	31	24	55
Endowed	2	59	30	89
Boarding	1	33	18	51
Private	30	434	293	727
Parochial	2	32	20	52
Free	8	1,057	302	1,359
Industrial	1	...	42	42
Workhouse	1	...	354	354
Gaol	1	25	...	25
Total	47	1,671	1,083	2,754
COUNTY OF WATERFORD.				
National	63	2,805	2,558	5,363
Church Education	7	116	113	229
Endowed	1	37	...	37
Boarding	4	108	71	179
Private	44	638	449	1,087
Parochial	18	605	261	866
Free	11	215	870	1,085
Mission	1	3	1	4
Charitable Boarding	1	8	14	22
Workhouse	5	753	613	1,366
Gaol	1	31	6	37
Total	156	5,319	4.956	10,275
Total County and City	203	6,990	6,039	13,029

The county is divided into eight baronies, and the county of the city of Waterford, the valuation and acreable contents of which are as follows:—

Waterford.

Divisions.	Acreable contents.	Annual Valuation.
	Acres.	L.
Coshmore and Coshbride	89,402	45,459
Decies, Within Drum	58,907	30,864
Decies, Without Drum	137,814	82,521
Gaultiere	30,723	29,161
Glenahoiry	19,568	9,007
Kilculliheen	2,271	3,205
Middlethird	45,120	37,671
Upperthird	77,089	40,061
Waterford (City of)	669	39,630
Total	461,563	317,579

These are subdivided into seventy-four parishes, thirty-three in the diocese of Waterford, and forty-one in that of Lismore; the cathedrals of each of these being in the cities of the same name with the respective dioceses. Waterford sent eight members to the Irish Parliament, two for the county, and two each for the city of Waterford and the boroughs of Dungarvan, Lismore and Tallow. By the arrangements at the time of the Union, the number was reduced to four, two for the county, and one each for Waterford city and Dungarvan. The Reform Act for Ireland added one member to the city.

The county is included in the Leinster circuit. The assizes are held in the city of Waterford, and general sessions of the peace are held four times in the year in that city; twice a year at Dungarvan, and twice at Lismore. The county gaol, the infirmary, and the lunatic asylum for the county and city are in Waterford city. The county contains the poor-law unions of Dungarvan, Kilmacthomas, Lismore, and Waterford; portions of the two latter being in neighbouring counties. The unions of Clogheen and Carrick-on-Suir, which are seated in Tipperary, also include parts of this county.

Though the land is in general coarse, there is a considerable tract of rich soil, particularly in the south-eastern quarter; and the mountainous districts affords good pasturage for cattle. The estates are in general very large: that of the Duke of Devonshire is the most extensive. Tillage has increased rapidly since 1779, when not one thirtieth part was under the plough. The settlement of the religious fraternity of St Bernard la Trappe, near Cappoquin, the members of which have devoted much attention to the reclamation and improvement of a large mountainous tract granted to them for their residence, has stimulated the spirit of industrious exertion. Wheat and oats are largely raised, clover very generally grown, but other kinds of green crops are not yet so general as in England. Lime for manure is abundant in the western parts, and large quantities of coralline sea-sand are carried into the interior for the same purpose. The fences are mostly banks of earth topped with furze in the flat country, and dry stone walls in the mountainous parts. The extent of land under each description of crop in 1849 and 1859 was:—

Crops.	1849.	1859.
	Acres.	Acres.
Wheat	36,081	23,671
Oats	26,633	32,526
Barley, bere, rye, beans, and pease	8,444	3,651
Potatoes	23,934	23,385
Turnips	9,984	10,886
Other green crops	2,659	4,042
Flax	11	38
Meadow and clover	15,686	18,749
Total	123,432	116,948

The best breeds of cattle are to be seen on the pastures. Sheep are not a common stock; swine, raised chiefly for export, are very numerous, as are goats in the higher lands. Waterford is one of the principal dairy counties in the island, and exports much butter. Very little cheese is made. The number of live stock in the county was as follows in 1858 and 1859:— Waterford.

Live Stock.	1858.	1859.
	No.	No.
Horses	14,150	14,184
Cattle	81,486	84,440
Sheep	44,171	42,408
Pigs	65,560	55,701

The want of timber, both for ornamental and useful purposes, is much felt; but the deficiency is yearly diminished by the increased attention to plantations. There is but little bog. The extensive range of seacoast, indented by numerous creeks and inlets, holds out great inducements for profitable employment in the fisheries. During the ten years' continuance of the system of bounties, and of grants and loans for the building and repairs of boats and the purchase of fishing-gear, adopted by the Board of Fisheries instituted in 1819, the sea-fishery was carried on with much spirit, particularly in Dungarvan, the centre of the system. Some working fishermen accumulated capital; some became boat-owners, and some boat-owners masters of trading-vessels. But on the termination of the bounties and grants, the business declined rapidly; the boats fell into decay, and were laid up. The Nymph bank stretches along the whole of the southern coast, and was once supposed to afford an inexhaustible supply of cod, ling, &c., but its capabilities are not now so highly estimated. The coasts abound with shell-fish. Salmon and other species of river-fish, are taken in large numbers in the Blackwater and Suir, and in the numerous smaller streams.

Carrick-on-Suir was once the centre of a very extensive woollen manufacture, which branched out into most parts of this county. It has been for many years almost extinct, the supply at present serving only for the domestic consumption of the peasantry. The largest cotton-factory in Ireland for spinning and weaving has been established at Portlaw, to the west of Waterford city, giving employment to upwards of 1000 people. There are distilleries, breweries, and paper-mills. Flour is also extensively manufactured, and largely exported. Some glass was formerly made at Waterford, and coarse earthenware in several places; but Waterford is not a manufacturing county. The inland trade chiefly centres in Waterford city, which is also a good emporium for the export of grain and salted provisions. Some business in both departments is also done at Dungarvan and Youghal.

Among the mansions of the nobility and gentry of large estates, the most remarkable are Lismore Castle, the seat of the Duke of Devonshire, formerly an episcopal residence until granted by Miler Magrath, archbishop of Cashel, to Sir Walter Raleigh, from whom this and other property was purchased by Sir Richard Boyle, afterwards Earl of Cork. It is seen to great advantage, being built on the verge of a hill, with the river Blackwater running beneath. Curraghmore, the magnificent mansion of the Marquis of Waterford, is situated about 10 miles from Waterford.

The habitations, dress, and manners of the peasantry, in the rural districts, resemble those similarly circumstanced in other parts of the province, being distinguished chiefly by the difference of their modes of life, as residing on the seacoast, the rich pasture-lands, the mountain-districts, or in the vicinity of a populous town. The county contains numerous remains of ancient structures. A pillar-tower at Ardmore, about 90 feet high, is in a state of high preservation.

Waterford. Near the same place is a large rath, and several others in various parts. The remains of small circular intrenchments, mostly at short distances from each other, can also be traced. Cromlechs are also numerous, some very large. The names of upwards of twenty monastic establishments have been preserved, but the sites of few of them are now discernible. The same may be said of the numerous castles erected in many parts of this county, long the theatre of petty wars. Natural caves are to be seen, both on the coast and in the interior, as well as others which have every appearance of owing their origin to human ingenuity. There are several mineral springs, chiefly chalybeate.

WATERFORD City is situate on the northern verge of the county, and on the southern bank of the Suir, about 20 miles from the mouth of the harbour. It was founded by the Danes, according to some authorities, as early as the middle of the second century, but as stated by others with more probability, in the ninth century. It continued in the possession of these settlers, wholly independent of the surrounding native princes, and generally at variance with them, till the arrival of the English under Strongbow, who took it by storm, and was in the act of consummating his victory by an indiscriminate massacre of the inhabitants, when he was prevented by the interference of his ally and protector Dermot M'Murrough, king of Leinster, whose daughter Eva he subsequently married in the city. Henry II. afterwards landed here, and from that period it long continued to be one of the principal places of communication with England, and a considerable mart for foreign trade. King John, when Earl of Morton, landed here in 1183. On his accession to the throne, he granted its first charter, and again visited the city the year after. In the next century it suffered twice by conflagrations, the latter time so severely, that it remained several years in a decayed state. In 1368, the citizens, under the command of the mayor, suffered a severe defeat from the Poers and O'Driscolls. At the close of the same century, Richard II. landed here on both the occasions on which he visited this part of his dominions. Money was coined here by the Danes, and a mint established by John; a privilege confirmed by Edward IV. when he abolished all the mints in Ireland except those of this city, Dublin, and Drogheda. Waterford signalized itself by its steady attachment to the royal interests during the attempts of Simnel and Warbeck, in the reign of Henry VII. The latter of these pretenders laid siege to it, but was forced to withdraw his forces, in commemoration of which the city obtained its motto, "Urbs intacta manet." At the close of the long-continued warfare which had devastated Ireland during the latter part of Elizabeth's reign, the citizens objected to having James proclaimed, and refused admission to Lord Mountjoy, then lord-deputy, and his forces, until compelled to submit by his threat to level the city and strew it with salt. In the wars of 1641, they sided with the confederate Catholics, and after several vicissitudes of fortune, ultimately capitulated to the parliamentary army under Ireton. In the subsequent war in 1688, they took part with King James, who here embarked for France after his defeat at the Boyne; and the city shortly afterwards surrendered, upon terms, to King William's forces under General Kirk.

The walls of the Danish city enclosed a triangular area of about 15 acres. The only remaining vestige of them is a round tower, built by one of the Danish sovereigns, and from him named Reginald's Tower, which has been rebuilt from its ruins, and is now occupied as a barrack. The county of the city extends along the river from Carrick-on-Suir to Passage, and on the north side beyond the river into Kilkenny county. This portion is connected with the main body by a wooden bridge. It comprehends an area of 9683 acres, including 822 on which the city stands, and contains twelve parishes, three of which are rural. The corporation consists of a mayor, ten aldermen, and thirty councillors. The city returns two members to the imperial Parliament, by a constituency numbering about 1150. Waterland || Water-spout.

The municipal courts are a court of conscience, for debts under forty shillings; the mayor's court, for disputes as to servants' wages. The city business is transacted in the town-hall, an elegant modern building. Besides the county court-house and prison already noticed, there are a city gaol, and a penitentiary or house of correction. The ecclesiastical buildings are a cathedral, founded in 1076, but since taken down and rebuilt from the ruins and materials of the old building, but without any resemblance to the former structure; several parochial churches, a Roman Catholic cathedral, Roman Catholic chapels, and dissenting meeting-houses. There are several endowed schools, the principal of which are the Blue-coat schools for boys and girls. Among the charitable institutions are, the Widows' Houses; the Leper Hospital; the Hospital of the Holy Ghost; the Fever Hospital, the first founded in Ireland; and the District Lunatic Asylum, confined to the county and city.

The quays, the finest range in the kingdom, which extend along the bank of the river from one end of the town to the other, and from which most of the other streets branch out, form the most ornamented part of the city. Waterford derives its wealth and importance from its commerce, which is now chiefly with Great Britain. So early as the commencement of last century, it adopted the liberal policy of admitting foreign traders to the freedom of the city, which induced several intelligent merchants from the continent to settle here. The exports are mostly cattle, sheep, pigs, grain, flour, butter, and salted and dried provisions. Mercantile affairs are superintended by the Chamber of Commerce, incorporated in 1815, and by the Board of twenty-four Harbour Commissioners, appointed by the Corporation and the Chamber of Commerce. Under their management a dock-yard has been constructed, capable of receiving vessels of very large dimensions, and the main passages of the river have been cleansed and deepened. The consequence has been a rapid and extensive increase of trade.

The population of the county of the city amounted in 1834 to 29,352, of which number 4427 were members of the Established Church, 429 Protestant dissenters, and 24,433 Roman Catholics. The population of the city alone, in 1851, was 23,339. The population of the other towns containing more than 2000 souls each was, in 1851, Dungarvan, 6965; Lismore, 2340; Carrickbeg (a suburb of Carrick-on-Suir), 2108; Cappoquin, 2145; and Portlaw, 4351. (H. S—R.)

WATERLAND, DANIEL, D.D., a learned English divine, who greatly distinguished himself in theological controversies, was born in 1683, at Wasely in Lincolnshire, of which place his father was rector. He had his academical learning at Magdalen College, Cambridge, where he drew up a useful tract, which went through several editions, entitled *Advice to a Young Student, with a Method of Study for the first four years.* In 1713 he became master of the college, was soon after appointed chaplain to George I., and at the time of his death, in 1740, was canon of Windsor, archdeacon of Middlesex, and vicar of Twickenham. He left behind him, among other works, *A Critical History of the Athanasian Creed*, 1724; *Scripture Vindicated*, 1734; *A Defence of Christ's Divinity*, 1719–1724; and a *Review of the Doctrine of the Eucharist*, 1737; &c. A collective edition of his works, with a review of his life and writings, was published by Bishop Van Mildert, Oxford, 1823, 10 vols. 8vo. A general index, forming the eleventh volume, was added in 1828.

WATERSPOUT. See PHYSICAL GEOGRAPHY.

Water-works || Watson.

WATERWORKS. See AQUEDUCT and HYDRODYNAMICS.

WATFORD, a market-town of England, Hertfordshire, on the right bank of the Colne, here crossed by a bridge, 15 miles N.W. of London. It is almost surrounded by the river, and consists of one main street, upwards of a mile in length, lined with well built houses, mostly of brick. The church, an ancient building, has a fine embattled tower surmounted by a spire, and contains some ancient monuments. There is another Established church in the parish, and places of worship for Wesleyans, Independents, and Baptists. The town has an old free school, national, British, and infant schools, a literary institution, almshouses, and a poorhouse. The market-house is an antique edifice, supported on wooden pillars, and a new post-office has been erected here. Many of the inhabitants are employed in brewing, malting, and tanning, and in straw-platting. There are also here silk, paper, and flour mills. A considerable trade in corn and cattle is carried on at the weekly markets and annual fairs. Pop. (1851) of the town, 3800; of the parish, 5989.

WATSON, RICHARD, Bishop of Landaff, celebrated as an able theologian, and as a professor of chemistry, was born in August 1737, at Heversham near Kendal, in Westmoreland. His ancestors had been farmers of their own estates for several generations; and his father had for forty years been master of the free school at Heversham, but was become infirm, and had resigned it a little before his birth. He was however educated at this school, and continued there till 1754, when he was sent as a sizar to Trinity College, Cambridge. He applied without intermission to his studies, and in 1757 he obtained a scholarship, with particular expressions of approbation from Dr Smith, who was then master. He had made it a constant practice in his mathematical pursuits to think over the demonstration of every proposition that he studied, in his solitary walks; a habit which must certainly have been very conducive to the improvement of geometrical talent, though it could scarcely be adopted without great labour by those who follow the algebraical mode of analysis in all their investigations. After this period he passed many hours daily, for a considerable portion of his life, in the occupation of instructing others, without much enlarging the scale of his own information, though certainly not without adding to the solidity and precision of his knowledge of the most important elementary truths of science; and when he graduated in 1759, he was classed as the second wrangler, which he seems to have considered, not without reason, as the place of honour for the year, the senior wrangler, who was a Johnian, having, as it was generally believed, been unfairly preferred to him. In October 1760 he became a fellow of Trinity, and in November, assistant tutor of the college. Having taken his degree of M.A. in 1762, he was soon afterwards made moderator of the scholastic exercises of the university, an arduous and honourable office, which he also filled in several subsequent years.

In 1764 he undertook a journey to Paris, though without being able to speak the language, in order to take charge of his young friend and pupil Mr Luther, who returned to England with him soon after. He was elected in the same year professor of chemistry, though he had never devoted any portion of his attention to that science; but he soon rendered himself sufficiently master of all that was then known of the science, to give a very popular course of lectures on the subject about a year after his election, with the assistance of an operator whom he had brought from Paris, and to become the author of a series of essays, which served for many years as the most agreeable introduction to the elementary doctrines and the ordinary processes of chemistry. He obtained from the government, by proper representations, a salary of L.100 a year for himself, and for all future professors. He also paid some attention to theoretical and practical anatomy, as having some relation to the science of chemistry. In 1767, he became one of the principal tutors of Trinity College; in 1769, he was elected a fellow of the Royal Society, and in October 1771, he unexpectedly obtained the important and lucrative appointment of regius professor of divinity, upon the premature death of Dr Rutherforth, and in that capacity he held the rectory of Somersham in Huntingdonshire. He had been little accustomed to the study of the divinity of the schools, or even of the fathers; but his eloquence and ingenuity supplied the want of theological learning, though he gave some offence to his more orthodox colleagues, by confining his arguments more strictly to the text of the scripture than they thought perfectly consistent with the duty of a champion of the Church of England, which they considered to be the description of a professor of divinity in an English university. He attracted, however, as long as he officiated in person, audiences as numerous, to the exercises in the schools at which he presided, as had attended his chemical lectures. He married, in December 1773, Miss Wilson of Dallam Tower, in Westmoreland. Their union continued uninterrupted for more than forty years. In 1774, he obtained a prebend of Ely, in exchange for a rectory in Wales, which the Duke of Grafton had procured for him; and he became archdeacon of Ely in January 1780: in the same year Bishop Keene presented him with the rectory of Northwold, in Norfolk; and in 1782, his pupil, the Duke of Rutland, gave him the rectory of Knaptoft in Leicestershire: the same interest obtained him also from Lord Shelburne the bishopric of Landaff. Here his episcopal preferment rested. He generally joined the politics of the opposition, and especially on the question of the unlimited regency; but he was too independent in his sentiments to become a very useful member of any administration; and he retired, before the end of the year 1789, without books, and with somewhat more of disgust than he ought in justice to have felt, to an estate which he had bought at Calgarth, on the banks of Winandermere, and occupied himself entirely, besides the education of his family, in agricultural improvements, especially in planting, for which he received a medal from the Society of Arts in 1789. His pupil, Mr Luther of Ongar, in Essex, had died in 1786, and left him an estate, which he afterwards sold for something more than L.20,000. He considered as one of the best practical results of his chemical studies, the suggestion which he made to the Duke of Richmond, then master of the ordnance, respecting the preparation of charcoal for gunpowder, by burning the wood in close vessels, which, it seems, very materially improved the quality of the powder.

Watson.

He had the liberality to confer, in 1804, a small living, as a reward for literary merit only, on Mr Davies, the author of the *Celtic Researches*. The next year he applied with success to the Duke of York for the promotion of his son, who had then the rank of a major; and his royal highness speedily complied with his solicitation, as a personal favour only, without waiting for any ministerial influence. His health had been seriously impaired by an illness which attacked him in 1781, and which his friends attributed, though perhaps without sufficient reason, to excessive study. In October 1809, he had a slight paralytic affection, and another in 1811; but it was in 1813 that his last illness might be said to begin, and he sank gradually till the 4th of July 1816. The elder of his two sons was in the army, the younger in the church: he left also several daughters. His writings are as miscellaneous as they are numerous, but none of them are bulky.

Institutionum Chemicarum pars Metallurgica, Cambr. 1768, 8vo.

Watson.

Repr. Ess., vol. v. "Experiments and Observations on the Solution of Salts," *Phil. Trans.*, 1770, p. 325, Ess. v. Especially on the specific gravities of salts and their solutions. "Remarks on the Effects of Cold in February 1771," *Phil. Trans.*, 1771, p. 213, Ess. v. With some experiments on congelation. "Experiment with a Thermometer having its bulb blackened," *Phil. Trans.* 1773, p. 40, Ess. v. Raised 10°. "Chemical Experiments and Observations on Lead Ore," *Phil. Trans.* 1678, p. 863, Ess. v. "Observations on the Sulphur Wells at Harrowgate," *Phil. Trans.* 1786, p. 171, Ess. v. *An Essay on the Subjects of Chemistry, and their General Division. Assize Sermon preached at Cambridge*, 1769, 4to. *Letters to the Members of the House of Commons, by a Christian Whig*, 1772. *Two Sermons*, Cambr. 1776, 4to. On the Revolution, and on the King's Accession. *A brief State of the Principles of Church Authority*, 1773. Reprinted in 1813 as a charge. *A Fast Sermon*, Feb. 1780. *A Sermon addressed to the Clergy of Ely*, 1780. Recommending oriental literature. *An Apology for Christianity, in a series of Letters addressed to Edward Gibbon, Esq.*, Lond. 1776, 12mo. Often reprinted, and considered as very satisfactory, though the author confesses, with more of the courtier than of the orthodox divine, in a letter to Mr Gibbon, that the essay, "derives its chief merit from the elegance and importance of the work it attempts to oppose." *Chemical Essays*, Lond. 1781–7, 5 vols. 12mo. Addressed to his pupil the Duke of Rutland. The work was intended for general information, and became extremely popular as a first introduction. The first volume relates to salts, sulphurs, vitriols, and gunpowder; the second to common salt, distillation, lime, clay, and pit-coal; the third to bitumens, charcoal, evaporation, lead, and lead ores; and the fourth to zinc, gum, metal, tin, copper, iron, and stones; the fifth is a republication of the author's earlier chemical tracts. After the completion of these volumes, he had the resolution to burn all his chemical papers. *A Letter to Archbishop Cornwallis on the Church Revenues*, 1782. A plan for equalizing the bishoprics. *A Sermon preached the 30th Jan. before the Lords*, 1784, 4to. *Visitation Articles for the Diocese of Landaff. Theological Tracts*, Lond. 1785, 6 vols. 8vo. Collected from various authors, not excluding many works of dissenters from the Church. *A Sermon on the Wisdom and Goodness of God, in having made Rich and Poor*, 1785, 1793. Adapted to allay the discontents which were then prevalent among the lower classes. *Sermons and Tracts*, Lond. 1788, 8vo. Chiefly republications. *An Address to Young Persons after Confirmation*, 1789, 12mo. *Considerations on the Expediency of Revising the Liturgy*, 1790, 8vo. Anonymous. *A Sermon preached for the Westminster Dispensary in* 1785, with an Appendix, 1792. *A Charge to the Clergy of his Diocese*, 1792, 4to. *Two Sermons and a Charge*, 1795, 4to. The first Sermon is entitled Atheism refuted; the second, The Christian Religion no Imposture. *An Apology for the Bible, in a series of Letters addressed to Thomas Paine*, Lond. 1796, 12mo. An able and judicious answer to the contemptible work of a mischievous incendiary: It seems to have been singularly successful in producing clear and rapid conviction. Thanks were returned to the author from Ireland and from America, and he gained L.1000 by the sale of the book, besides allowing it to be often reprinted gratuitously. *An Address to the People of Great Britain*, 1798, 8vo. Enforcing the necessity of submission to the exigencies of the times. It went through fourteen editions, besides several piracies; and it was reprinted in Ireland by order of Lord Camden, then Lord-Lieutenant. Mr Wakefield answered it somewhat intemperately, and the bishop attempted ineffectually, out of respect for his classical acquirements, to lighten the punishment which was allotted to him. *Charge to the Clergy of Landaff. Second Charge*, 1802. On similar subjects. *A Charge relating to Ecclesiastical Reform*, 1802. *A Sermon preached at the London Hospital*, 1802. Against the principles of Paine. *Thoughts on the Intended Invasion*, 8vo. *Substance of a Speech intended to have been delivered*, 1804. In favour of Catholic Emancipation. *Sermon preached before the Society for the Suppression of Vice*, 1804. *A Charge to the Clergy*, 1805. *Another Charge, on the Catholic Question*, 1808. *Two Apologies, Two Sermons, and a Charge*, 1806, 8vo. Reprinted. *A Second Defence of Revealed Religion*, 1807. In two sermons preached in the Chapel Royal. *A Paper on Planting and on Waste Land. Communications to the Board of Agriculture*, vol. vii., 1808, 4to. He had also written some Preliminary Observations in the Agricultural Report of Westmoreland. *Miscellaneous Tracts*, Lond. 1815, 2 vols. 8vo. Religious, political, and agricultural. "His discourse on the first and second Adam, and the nature of death as affected by each, is almost unequalled in originality of thought and vigour of expression." *Quarterly Review*. It has been said that he published some papers in the *Manchester Memoirs*; but they do not appear in the indices. *Anecdotes of the Life of Richard Watson, Bishop of Landaff; written by himself at different times, and revised in* 1814. *Published by his son Richard Watson, LL. B., Prebendary of Landaff and Wells*, Lond. 1817, 4to; Lond. 1818, 2 vols. 8vo, *Quarterly Review*, xviii., p. 229. Treated with great ability, but with too much severity. His chief mistake indeed seems to have been, that he expected his literary merits alone to secure him political advancement; further than this, there is nothing disgusting, to a candid reader, in the sincerity with which he displays the consciousness of his own merits. (T. Y.)

Watt.

WATT, JAMES,[1] a philosopher, mechanician, and civil engineer, whose inventive talents, extensive knowledge of the sciences and arts, and practical application of them to the purposes of life, place him in the foremost rank of those illustrious men whose discoveries have influenced the state of society, and conferred distinction upon their country and age. His great-grandfather farmed his own small estate in the county of Aberdeen, but engaging in the civil wars, was killed in one of Montrose's battles, and his property lost to his family. His son, Thomas Watt, left an infant, was brought up by relations, and having a turn for the mathematical sciences, made such proficiency by his own exertions, under very untoward circumstances, occasioned by the persecutions of the times, as to enable him at a later and quieter period to establish himself at Greenock as a teacher of these sciences, and of the dependent arts of surveying and navigation. There he acquired reputation, and dying in 1734, at the advanced age of ninety-one, left a brief record of his partiality to his profession in the inscription upon his tomb in the West Churchyard. He is there styled professor of the mathematics. He had two sons, John and James; the former, brought up as a mathematician, settled first at Ayr and afterwards at Glasgow, where he was much employed in surveying and directing the improvement of estates, was an able man, and drew neatly and accurately, which was not very common in those days. He died in 1737, at an early age, leaving "A Survey of the River Clyde, from Glasgow to the Point of Toward," which was published by his brother several years afterwards. James, his younger brother, of an active, ingenious, and enterprising mind, became a merchant in Greenock, and was for upwards of twenty years a member of the town council, a magistrate, and a zealous promoter of the improvements of the town. By his wife, Agnes Muirhead, he had two sons, James, the subject of the present article, and John, a youth of promising abilities, who was lost at sea soon after he became of age. Misfortunes in trade, and the decay of the faculties of his mind, occasioned his retirement from business some years before his death, which happened in 1782, in his eighty-fourth year.

James Watt, his eldest son and only surviving child, was born at Greenock the 19th January 1736. He received the rudiments of his education in the public schools of his native town; but, from the extreme delicacy of his constitution, was with difficulty enabled to attend the classes, and owed much of his acquirements to his studious habits at home. Little more is known of his early years, than that, from the first, he manifested a partiality for mechanical contrivances and operations, and frequently employed himself in that way. The desire of improvement in an art then little practised in Scotland, induced him to go to London in his eighteenth year, and there to place himself under the tuition of a mathematical instrument maker;

[1] It may be interesting to the readers of the *Encyclopædia Britannica* to know that the following article on JAMES WATT was contributed in 1823 by the son of the great mechanician, the late James Watt of Birmingham. A few necessary emendations have been made on it, chiefly drawn from the *Origin and Progress of the Mechanical Inventions of James Watt*, by his kinsman, James P. Muirhead, M.A., 3 vols. 1854; and from the *Life of James Watt* by the same author, 1858. The character of Watt appended to the biography is from the brilliant pen of the late Lord Jeffrey, who knew the engineer well, and enjoyed much of his esteem. Further information regarding Watt and his discoveries will be found in the SIXTH PRELIMINARY DISSERTATION, by Principal Forbes, prefixed to this work.

Watt. but he remained little more than a twelvemonth, the infirm state of his health compelling his return to his paternal roof.

In that short period he appears to have made great proficiency, and he continued, after his return to Scotland, to perfect himself in this art, both at home and on his visits to his mother's relations at Glasgow, where it was his wish to establish himself. But some opposition being made by the corporations, who considered him as an intruder upon their privileges, the professors of the university took him under their protection, and accommodated him with an apartment and premises for carrying on his business within their precincts, with the title and office of *mathematical instrument maker to the university.* This took place in 1757, when he was twenty-one years of age, and it must be inferred that he had already given satisfactory proofs of talent to the eminent men who then adorned that seat of learning; of whom it is sufficient to mention the names of Robert Simson, Adam Smith, Dr Black, and Dr Dick, the professor of natural philosophy. There Mr Watt applied sedulously to business, and in the few intervals which its concerns and ill health allowed, cultivated those various talents which distinguished him in after-life; and there a lasting friendship was formed with the kindred minds of Dr Black, and of Mr, afterwards Dr Robison, then a student at the university, and nearly of his own age. He remained in the college until some time in the year 1763, when he removed into the town previously to his marriage with his cousin, Miss Miller, which took place in the summer of the following year.

The steam-engine had been a frequent subject of conversation between Mr Robison and himself, and the former had suggested the possibility of its application to the moving of wheel-carriages. About the year 1761 or 1762, Mr Watt had tried some experiments on the force of steam in a Papin's digester, and had constructed and worked with strong steam a small model, consisting of an inverted syringe, the bottom of the rod of which was loaded with a weight, alternately admitting the steam below the piston, and letting it off to the atmosphere. Observing the imperfections of this construction, he soon abandoned it; but the attention necessary to be bestowed upon his business prevented his reconsidering it, until the winter of 1763–4, when he was employed by the professor of natural philosophy to put in order a working model of a steam-engine upon Newcomen's construction. When he had repaired it and set it to work, he found that the boiler, though large in proportion to the cylinder, was barely able to supply it with steam for a few strokes per minute, and that a great quantity of injection-water was required, though it was but lightly loaded by the pump attached to it. It soon occurred that the cause lay in the little cylinder (2 inches diameter, 6 inches stroke), exposing a greater surface to condense the steam than the cylinders of larger engines did, in proportion to their respective contents. By shortening the column of water in the pump, less steam and less injection-water were required, and the model worked at a proper speed. Thus the purpose for which it was put into his hands was accomplished; and with this mode of accounting for the defect, and this result, most artists would have been satisfied; but the case was different with Mr Watt. He had now become aware of a great consumption of steam, and his curiosity was excited to a more accurate investigation of the causes, in which he proceeded in a truly philosophical manner. The cylinder of his small model being of brass, he conceived that less steam would be condensed by substituting cylinders of some material which would transmit heat more slowly. He made a larger model, with a cylinder (6 inches diameter and 1 foot stroke) of wood soaked in oil and baked to dryness. He ascertained, from experiments made with boilers of various constructions, that the evaporation of boiling water is neither in proportion to the evaporating surface, nor to the quantity of water, as had been supposed, but to the heat that enters it; and that the latter depended chiefly on the quantity of surface exposed to the action of the fire. He likewise determined the weight of coal required for the evaporation of any given quantity of water. Being convinced that there existed a great error in the statement which had been previously given of the bulk of water when converted into steam, he proceeded to examine that point by experiment, and discovered that water, converted into steam of the heat of boiling water, was expanded to 1800 times its bulk, or, as a rule for ready calculation, that a cubic inch of water produced a cubic foot of steam. He constructed a boiler to be applied to his model, which should show, by inspection, the quantity of water evaporated, and consequently would enable him to calculate the quantity of steam used in every stroke of the engine. This he now proved to be several times the full of the cylinder. He also observed, that all attempts to improve the vacuum, by throwing in more injection water, caused a disproportionate waste of steam; and it occurred to him that the cause of this was the boiling of water in vacuo at very low heats (recently determined, by Dr Cullen, to be under 100°); consequently, at greater heats, the injection-water was converted into steam in the cylinder, and resisted the descent of the piston. He now perceived clearly that the great waste of steam proceeded from its being chilled and condensed by the coldness of the cylinder before it was sufficiently heated to retain it in an elastic state; and that, to derive the greatest advantage, the cylinder should always be kept as hot as the steam which entered it, and that, when the steam was condensed, it should be cooled down to 100°, or lower, in order to make the vacuum complete. Early in 1765, the fortunate thought occurred to him of accomplishing this by condensing the steam in a separate vessel, exhausted of air, and kept cool by injection, between which and the cylinder a communication was to be opened every time steam was to be condensed, while the cylinder itself was to be kept constantly hot. No sooner had this occurred to him, than the means of effecting it presented themselves in rapid succession. These in a great measure have already been described in the present work. A model was constructed, and the experiments made with it placed the correctness of the theory, and the advantages of the invention, beyond the reach of doubt. Watt.

In the course of these trials he was much struck by the great heat communicated to the injection-water by a small quantity of steam; and he proceeded by a very simple experiment to satisfy himself upon that subject, when he discovered that water converted into steam will heat about six times its own weight of water at 47° or 48° to 212°. He mentioned this extraordinary fact to Dr Black, who then explained to him his doctrine of latent heat, to the support of which Mr Watt had afterwards the satisfaction of contributing his experiments. From some of these he was led to suppose the latent heat of steam to be above 1000°, but he afterwards considered 960° a more accurate determination. From others, he deduced the important conclusion, that the sum of the latent and sensible heat of steam, at different temperatures, is a constant quantity, the latent heat increasing as the sensible heat diminishes; or, in other words, that a given weight of water in the state of steam contains nearly the same quantity of heat, whatever may be the bulk or density of the steam.

He also, at this time, made experiments upon the capacities of different bodies for heat, and upon the heats at which water boils under various pressures; from which he ascertained, that where the heats proceeded in an arithmetical, the elasticities proceeded in a geometrical ratio,

Watt. the curve of which he laid down. These he repeated some years after with more accuracy.

We have been thus minute in our details of the successive steps by which Mr Watt proceeded to his great improvement upon the principle of the steam-engine, in order to convey some idea of the sagacity, ingenuity, and science, with which he conducted the investigation. Our limits will oblige us to be more brief in our narrative of his subsequent improvements.

From this period (the early part of 1765), his mind became very much engaged in contriving the machinery for executing his improvement upon a large scale; but the want of funds prevented his attempting it, until he was induced to address himself to Dr Roebuck, who had a short time before completed his establishment of the Carron Ironworks, and who, in addition to his known qualities of ingenuity and enterprise, was considered to be possessed of ample means of introducing the invention to the public. He agreed to enter into the plan, upon having the proceeds of two-thirds of the invention assigned to him; and an engine upon a large scale was then constructed by Mr Watt, at Kinneill, near Borrowstounness, where the doctor then resided, the trials made with which gave satisfaction. But the introduction of the invention to the public was retarded, on the one hand, by the pecuniary difficulties in which the doctor became involved, by the failure of several of his multifarious undertakings; and, on the other, by the employment which the rising reputation of Mr Watt for knowledge and skill in the line of a civil engineer procured him.

He was employed in 1767 to make a survey for a canal of junction between the rivers Forth and Clyde, by what was called the Lomond Passage, and attended parliament on the part of the subscribers, where the bill was lost. An offer was then made to him of undertaking the survey and estimate of an intended canal for the Monkland Collieries to Glasgow; and these proving satisfactory, the superintendence of the execution was confided to him. This was quickly followed by his being employed by the Trustees for Fisheries and Manufactures in Scotland to make a survey of a canal from Perth to Forfar, through Strathmore; and soon afterwards by the Commissioners of the Annexed Estates, to furnish a report and estimate of the relative advantages of opening a communication between the Firth of Clyde and the Western Ocean, by means of a navigable canal across the isthmus of Crinan,[1] or that of Tarbert. Business of this description crowded upon him; and surveys, plans, and estimates, were successively undertaken by him for the harbours of Ayr, Port-Glasgow, and Greenock; the deepening of the river Clyde; the rendering navigable the rivers Forth and Devon, and the water of Leven; the making of a canal from Machrihanish Bay to Campbeltown, and of another between the Grand Canal and the harbour of Borrowstounness; the building of bridges at Hamilton and at Rutherglen, &c. &c. In these surveys he made use of a new micrometer, and a machine for drawing in perspective, which he had invented to facilitate his operations. Our limits do not allow us to go into the details of his Reports, which are remarkable for their perspicuity and accuracy, although the work of a self-taught engineer. The last and greatest work upon which he was employed was the survey and estimate of the line of a canal between Fort-William and Inverness, since executed by Mr Telford upon a larger scale than was at that time proposed, under the name of the Caledonian Canal.

Whilst engaged upon this survey, in the latter part of the year 1773, Mr Watt received the account of the death of his affectionate wife, who left him a daughter and a son. He appears soon after to have made up his mind to adopt the advice of his friend Dr Small of Birmingham, and the invitation of Mr Boulton, to settle in England. He had secured his title to his Improvements for saving Steam and Fuel in Fire-engines, by patent, in the year 1769; but all hopes of carrying them into effect by the assistance of Dr Roebuck being at an end, he had induced that gentleman to agree, for certain considerations, to transfer his share of the patent to Mr Boulton of Soho, near Birmingham,—a gentleman equally distinguished by his knowledge of the arts and his enterprising spirit, who had some years before established his manufactory upon a scale as unrivalled for extent and elegance as for the variety and perfection of the processes carried on. In conjunction with him, an application was made to parliament for an extension of the term of the patent; and an act prolonging it for twenty-five years was obtained in the year 1775, when the business of making steam-engines was commenced by the firm of Boulton and Watt. Watt.

Mr Watt now married for his second wife Miss Macgrigor, the daughter of an old friend at Glasgow, and devoted himself to the improvement of the details of the engine with a degree of application and exertion not to be expected from his delicate and infirm state of health; and he found in his partner a zealous and able coadjutor. Some engines for pumping water were soon made upon a large scale, and the savings in fuel were demonstrated by repeated comparative trials to amount to three-fourths of the quantity consumed by those of the best construction previously in use. A deputation from the mining interests of Cornwall was sent to ascertain the fact, and their report led to the introduction of the improved engines into that county, to which they have proved of such vast utility.

The immediate application of the powers of steam to giving a rotatory motion to mills had formed an early object of Mr Watt's attention, and he had deeply considered the various means of effecting this. One method of producing a continued movement in one direction was by a steam-wheel, described in his patent of 1769. Various others of a similar kind suggested themselves to him, of some of which drawings and models were made; but the difficulty of rendering them steam and air tight, and the loss of power by friction, induced him to turn his thoughts to the adaptation of the reciprocating motion to the production of a continued regular rotatory one. This he accomplished by a series of improvements, the exclusive property of which he secured by successive patents in the years 1781, 1782, 1784, and 1785, including, among other inventions, the rotatory motion of the sun and planet wheels,[2] the expansive principle, the double engine, the parallel motion, and the smokeless furnace. The application of the centrifugal regulating force of *the governor* gave the finishing stroke to the machine.

The invention of the separate condenser, and the contrivances necessary to give it full effect, would alone have established the fame of Mr Watt; but when to these are added the various inventions called forth to perfect his rotative engines, we are impressed by a union of philosophical research, of physical skill, and of mechanical ingenuity, which has, we believe, no parallel in modern times. The perfection thus given to the rotative engine soon led to its general application for imparting motion to almost every species of mill-work and machinery, and gave an impulse, unexampled in the history of inventions, to the extension of our manufactures, wealth, and population.

[1] The Crinan canal was executed several years afterwards under the direction of his friend Mr Rennie, with some variations.

[2] Mr Watt had originally intended to derive the rotatory motion from the working-beam by means of a connecting-rod and crank; but the workman employed to make the model communicated it to a neighbouring manufacturer, who took out a patent for it. This stimulated Mr Watt to the invention of other means of effecting the same object, of which five are described in his patent of 1781. He afterwards used the crank, which was indeed his own, when he saw occasion, in defiance of the patentee, who never troubled him.

Watt. Nor were Mr Watt's inventive powers confined to the steam-engine. The necessity of preserving accurate copies of his various drawings and of his letters, containing long and important calculations, and the desire of avoiding that labour himself, which he did not think it right to intrust to others, led him, in the year 1780, to contrive a copying apparatus, the exclusive property in which he secured by letters patent, and commenced the manufactory of them, in partnership with Mr Boulton and his friend Mr Kier, under the firm of James Watt and Company,—a contrivance of great simplicity, and of which he reaped an ample benefit in the time, labour, and expense it saved to himself, to say nothing of its advantages to the public.

In the winter of 1784–5, he put up an apparatus for heating, by means of steam, the room in which he drew and wrote. The possibility of doing this had been suggested by Colonel Cooke in the *Philosophical Transactions* for 1745; but we know not whether this was known to Mr Watt when he made this first practical attempt, from which he deduced proportions of surface, &c., which afterwards served to guide his firm in the introduction of the process in larger buildings.

Chemical studies engaged much of his attention during his busiest time; and at the very period when he was most engaged in perfecting his rotative engines, and in managing a business become considerable, and, from its novelty, requiring close attention, he entered deeply into the investigations then in progress relative to the constitution and properties of the different gases. Early in 1783 he was led, by the experiments of his friend and neighbour, Dr Priestley, to the important conclusion, that water is a compound of dephlogisticated and inflammable airs (as they were then called) deprived of their latent or elementary heat, and he was the first to make known this theory. This was done in a letter to Dr Priestley, dated the 26th April 1783, in which he states the doctor's experiments to have come in aid of some prior notions of his own, and supports his conclusions by original experiments. That letter Dr Priestley received in London; and, after showing it to several members of the Royal Society, he delivered it to Sir Joseph Banks, with a request that it might be read at some of the public meetings of the Society; but before that could be complied with, Mr Watt, having heard of some new experiments made by Dr Priestley, begged that the reading might be delayed. Those new experiments soon afterwards proved to have been delusive; and Mr Watt sent a revised edition of his letter to M. de Luc on the 26th November of the same year, viz. 1783, which was not read to the Society until the 29th April 1784, and appears in the *Philosophical Transactions* for that year, under the title of "Thoughts on the Constituent Parts of Water and of Dephlogisticated Air, with an Account of some Experiments upon that subject." In the interim, on the 15th January 1784, a paper by Mr Cavendish had been read, containing his "Experiments on the Combustion of the Dephlogisticated and Inflammable Airs," and drawing the same Inference as Mr Watt, with this difference only, that he did not admit elementary heat into his explanation. He refers in it to his knowledge of Mr Watt's paper, and states his own experiments to have been made in 1781, and mentioned to Dr Priestley; but he does not say at what period he formed his conclusions: he only mentions that a friend of his had, in the summer of 1783, given M. Lavoisier some account of his experiments, as well as of the conclusion drawn from them. It is quite certain that Mr Watt had never heard of them; and Dr Blagden has stated, that he mentioned at Paris the opinions of both the English philosophers, which were not admitted without hesitation, nor until the French chemists had satisfied themselves by experiments of their own.[1] Watt.

Mr Watt also has the merit of being the first person to introduce into this country, and to carry into effect, on a practical scale, in any country, the bleaching of linens and cottons by oxymuriatic acid, the invention of his friend M. Berthollet. That gentleman had communicated his invention to Mr Watt at Paris, in the winter of 1786–7, whither he had proceeded with Mr Boulton, at the instance of the French government, to suggest improvements in the mode of raising water at Marly; and his mind was instantly alive to the extensive application of which it admitted. He advised M. Berthollet to secure the property by an English patent; but that he declined, and left his friend to make such use of it as he thought proper. He, in consequence, communicated it to his father-in-law, Mr Macgrigor, and gave directions for the construction of the proper vessels and machinery; and soon afterwards he himself superintended the first trials at his bleachfield near Glasgow, which proved eminently successful.

Some years after this, Mr Watt was led, by the illness of the daughter, and some apprehensions entertained for the son, who were the issue of his second marriage, to consider the subject of the medical application of the factitious airs, and to contrive various apparatus for that purpose, which were described by himself, in his friend Dr Beddoe's publications on pneumatic medicine.

We have not space to particularize other improvements introduced by Mr Watt, or at his suggestion, into various arts; for there were few arts with the details of which he was not intimately acquainted, and to the practical professors of which he was not able and willing to impart information. We shall only mention, that before he left Glasgow to settle in England, he had assisted some of his friends in the establishment of a pottery there, to the success of which his experiments and advice had greatly contributed, and in which he afterwards continued a partner. At a later period, he occupied himself much upon a composition having the transparency, and nearly the hardness, of marble, from which he had many casts. This promoted, if it did not create, a taste for sculpture and statuary, and led to his employing himself, during the last years of his life, in the contrivance of a machine for multiplying busts and other carved work, which he left in a very forward state.

Mr Watt did not escape the common lot of eminent men, that of meeting with pirates of his inventions, and detractors from his merit. The latter, indeed, were but few, and their efforts transitory; but the former were numerous, and in proportion to the benefits expected to arise from an evasion of the patent-dues claimed by Boulton and Watt, though these were established upon the liberal footing of receiving only one third of the savings of fuel compared with the best steam-engines previously in use. In consequence, the attention both of Mr Watt and Mr Boulton was greatly occupied, from the year 1792 to the year 1799, in defending their patent rights against numerous invaders, the principal of whom were supported by a portion of the mining interest of Cornwall, although the respectable part of it refused to concur in their measures. The admission of their respective sons into the partnership in 1794 infused vigour into their proceedings; and, after repeated verdicts, establishing the novelty and utility of Mr Watt's inventions, the validity of his claim was finally confirmed in the

[1] There is a confusion of dates in the accounts of this affair. Mr Watt's letter to M. de Luc in the *Philosophical Transactions* appears dated 26th November 1784, which is evidently an error of the press. Mr Cavendish, in his letter, read 15th January 1784, speaks of Mr Watt's paper "as lately read before the society," whereas the paper itself purports to have been read on the 29th April 1784. [This confusion has since been cleared up by the discovery that the 26th November 1784 of the *Philosophical Transactions* should be 26th November 1783. See p. 343 of the *Life of James Watt*, by J. P. Muirhead, London, 1858.]

Watt. year 1799, by the unanimous decision of all the judges of the Court of King's Bench.

In 1800, upon the expiration of the act of parliament passed in his favour, he withdrew from business, resigning his shares to his two sons, of whom the youngest, Mr Gregory Watt, died soon after, having given splendid proofs of literary and philosophical talents, and left a durable record of the latter in his paper on "Basalt," in the *Philosophical Transactions*. Mr Watt continued to the close of his life to interest himself in the pursuits of his former associates, and to maintain an uninterrupted friendship with Mr Boulton, whom he survived several years.

On two occasions afterwards, in 1811 and 1812, he gave proofs of the undiminished powers of his mind in his former profession. In the one instance he was induced, by his grateful recollections of his residence in Glasgow, to assist the proprietors of the water-works there with a plan for supplying the town with better water, by means of a suction pipe with flexible joints, laid across the bottom of the Clyde, accompanied with instructions for insuring the supply of water on the opposite side,—a plan which answered completely, and for which the proprietors presented him with a handsome memorial of their gratitude. In the other instance he was prevailed upon, by the earnest solicitation of the Lords Commissioners of the Admiralty, to attend a deputation of the Navy Board, and to give, with his friend Captain Huddart, and Mr J. Jessop, an opinion upon the works then carrying on at Sheerness dockyard, and the further ones projected by Messrs Rennie and Whidby. On this occasion, he no less gratified the gentlemen associated with him by the clearness of his general views, than by his knowledge of the details, and received the thanks of the Admiralty. In 1814, he yielded to the wishes of his friends in undertaking a revision of Professor Robison's articles on STEAM and STEAM-ENGINES, for an early edition of the *Encyclopædia Britannica*, and enriched them with valuable notes, containing his own experiments upon steam, and a short history of his principal improvements upon the engine itself.

His originally infirm health had been subjected to severe trials by the great exertions of his mind during the period of carrying into execution his improvements on the steam-engine, and had with difficulty resisted the cares and anxieties attending upon business, and those created by the subtilties of the law, during the protracted proceedings of seven long years. There appears to have been an organic defect in his digestion, and its effects were intensely severe sick headaches; but by continual temperance, and good management of his constitution, which he treated with much medical skill, it improved as he advanced in years; and with faculties little impaired he reached his eighty-fourth year, when, after a short illness, rather of debility than of pain, he expired in the bosom of his family at his house at Heathfield, in the county of Stafford, on the 25th August 1819.

His remains are deposited in the chancel of the adjoining parochial church of Handsworth, near those of Mr Boulton. An excellent bust had been made of him some years before his death by Mr Chantrey; and a statue was afterwards finished by the same great artist, intended by filial piety to be placed upon his tomb, and to convey to distant ages a faithful representation of those features in which the lines of intense thought were blended with the mild expression of benevolence.

Mr Watt was elected a member of the Royal Society of Edinburgh in 1784, of the Royal Society of London in 1785, and a corresponding member of the Batavian Society in 1787. In 1806, the honorary degree of LL.D. was conferred upon him by the spontaneous and unanimous vote of the senate of the University of Glasgow; and, in 1808, he was elected, first a corresponding, and afterwards a foreign member of the Institute of France.

In this brief narrative of his long, busy, and useful life, we have endeavoured to confine ourselves to a statement of the principal facts, and shall now add the character drawn up soon after his death by a distinguished writer:— Watt.

"It is with pain that we find ourselves called upon, so soon after the loss of Mr Playfair, to record the decease of another of our illustrious countrymen, and one to whom mankind has been still more largely indebted,—Mr James Watt, the great improver of the steam-engine.

"This name fortunately needs no commemoration of ours; for he that bore it survived to see it crowned with undisputed and unenvied honours; and many generations will probably pass away before it shall have 'gathered all its fame.' We have said that Mr Watt was the great *improver* of the steam-engine; but, in truth, as to all that is admirable in its structure, or vast in its utility, he should rather be described as its *inventor*. It was by his inventions that its action was so regulated as to make it capable of being applied to the finest and most delicate manufactures, and its power so increased as to set weight and solidity at defiance. By his admirable contrivances, it has become a thing stupendous alike for its force and its flexibility,—for the prodigious power which it can exert, and the ease, and precision, and ductility with which it can be varied, distributed, and applied. The trunk of an elephant that can pick up a pin or rend an oak is as nothing to it. It can engrave a seal, and crush masses of obdurate metal like wax before it,—draw out, without breaking, a thread as fine as gossamer, and lift a ship of war like a bauble in the air. It can embroider muslin and forge anchors,—cut steel into ribands, and impel loaded vessels against the fury of the winds and waves.

"It would be difficult to estimate the value of the benefits which these inventions have conferred upon the country. There is no branch of industry that has not been indebted to them; and in all the most material, they have not only widened most magnificently the field of its exertions, but multiplied a thousand-fold the amount of its productions. It is our improved steam-engine that has fought the battles of Europe, and exalted and sustained, through the late tremendous contest, the political greatness of our land. It is the same great power which now enables us to pay the interest of our debt, and to maintain the arduous struggle in which we are still engaged, with the skill and capital of countries less oppressed with taxation. But these are poor and narrow views of its importance. It has increased indefinitely the mass of human comforts and enjoyments, and rendered cheap and accessible all over the world the materials of wealth and prosperity. It has armed the feeble hand of man, in short, with a power to which no limits can be assigned, completed the dominion of mind over the most refractory qualities of matter, and laid a sure foundation for all those future miracles of mechanic power which are to aid and reward the labours of after-generations. It is to the genius of one man, too, that all this is mainly owing; and certainly no man ever before bestowed such a gift on his kind. The blessing is not only universal, but unbounded; and the fabled inventors of the plough and the loom, who were deified by the erring gratitude of their rude contemporaries, conferred less important benefits on mankind than the inventor of our present steam-engine.

"This will be the fame of Watt with future generations; and it is sufficient for his race and his country. But to those to whom he more immediately belonged, who lived in his society, and enjoyed his conversation, it is not perhaps the character in which he will be most frequently recalled—most deeply lamented—or even most highly admired. Independently of his great attainments in mechanics, Mr Watt was an extraordinary, and in many respects a wonderful man. Perhaps no individual in his age possessed so much and such varied and exact information,—had read so much, or remembered what he had read so accurately and well. He had infinite quickness of apprehension, a prodigious memory, and a certain rectifying and methodizing power of understanding, which extracted something precious out of all that was presented to it. His stores of miscellaneous knowledge were immense, and yet less astonishing than the command he had at all times over them. It seemed as if every subject that was casually started in conversation with him had been that which he had been last occupied in studying and exhausting; such was the copiousness, the precision, and the admirable clearness of the information which he poured out upon it without effort or hesitation. Nor was this promptitude and compass of knowledge confined in any degree to the studies connected with his ordinary pursuits. That he should have been minutely and extensively skilled in chemistry and the arts, and in most of the branches of physical science, might perhaps have been conjectured; but it could not have been inferred from his usual occupations, and probably is not generally known, that he was

Watt.

curiously learned in many branches of antiquity, metaphysics, medicine, and etymology, and perfectly at home in all the details of architecture, music, and law. He was well acquainted, too, with most of the modern languages, and familiar with their most recent literature. Nor was it at all extraordinary to hear the great mechanician and engineer detailing and expounding, for hours together, the metaphysical theories of the German logicians, or criticizing the measures or the matter of the German poetry.

"His astonishing memory was aided, no doubt, in a great measure, by a still higher and rarer faculty,—by his power of digesting and arranging in its proper place all the information he received, and of casting aside and rejecting, as it were instinctively, whatever was worthless or immaterial. Every conception that was suggested to his mind seemed instantly to take its place among its other rich furniture, and to be condensed into the smallest and most convenient form. He never appeared, therefore, to be at all encumbered or perplexed with the *verbiage* of the dull books he perused, or the idle talk to which he listened; but to have at once extracted, by a kind of intellectual alchymy, all that was worthy of attention, and to have reduced it, for his own use, to its true value and to its simplest form. And thus it often happened that a great deal more was learned from his brief and vigorous account of the theories and arguments of tedious writers, than an ordinary student could ever have derived from the most faithful study of the originals: and that errors and absurdities became manifest from the mere clearness and plainness of his statement of them, which might have deluded and perplexed most of his hearers without that invaluable assistance.

"It is needless to say, that, with those vast resources, his conversation was at all times rich and instructive in no ordinary degree; but it was, if possible, still more pleasing than wise, and had all the charms of familiarity, with all the substantial treasures of knowledge. No man could be more social in his spirit, less assuming or fastidious in his manners, or more kind and indulgent towards all who approached him. He rather liked to talk, at least in his later years; but though he took a considerable share of the conversation, he rarely suggested the topics on which it was to turn, but readily and quietly took up whatever was presented by those around him, and astonished the idle and barren propounders of an ordinary theme by the treasures which he drew from the mine they had unconsciously opened. He generally seemed, indeed, to have no choice or predilection for one subject of discourse rather than another; but allowed his mind, like a great cyclopædia, to be opened at any letter his associates might choose to turn up, and only endeavoured to select from his inexhaustible stores what might be best adapted to the taste of his present hearers. As to their capacity he gave himself no trouble; and, indeed, such was his singular talent for making all things plain, clear, and intelligible, that scarcely anyone could be aware of such a deficiency in his presence. His talk, too, though overflowing with information, had no resemblance to lecturing or solemn discoursing, but, on the contrary, was full of colloquial spirit and pleasantry. He had a certain quiet and grave humour, which ran through most of his conversation, and a vein of temperate jocularity, which gave infinite zest and effect to the condensed and inexhaustible information which formed its main staple and characteristic. There was a little air of affected testiness, and a tone of pretended rebuke and contradiction, with which he used to address his younger friends, that was always felt by them as an endearing mark of his kindness and familiarity,—and prized, accordingly, far beyond all the solemn compliments that ever proceeded from the lips of authority. His voice was deep and powerful, though he commonly spoke in a low and somewhat monotonous tone, which harmonized admirably with the weight and brevity of his observations, and set off to the greatest advantage the pleasant anecdotes which he delivered with the same grave brow and the same calm smile playing soberly on his lips. There was nothing of effort, indeed, or impatience, any more than of pride or levity, in his demeanour; and there was a finer expression of reposing strength and mild self-possession in his manner, than we ever recollect to have met with in any other person. He had in his character the utmost abhorrence for all sorts of forwardness, parade, and pretension; and, indeed, never failed to put all such impostors out of countenance by the manly plainness and honest intrepidity of his language and deportment.

"In his temper and dispositions he was not only kind and affectionate, but generous, and considerate of the feelings of all around him, and gave the most liberal assistance and encouragement to all young persons who showed any indications of talent, or applied to him for patronage or advice. His health, which was delicate from his youth upwards, seemed to have become firmer as he advanced in years; and he preserved, up almost to the last moment of his existence, not only the full command of his extraordinary intellect, but all the alacrity of spirit and the social gaiety which had illuminated his happiest days. His friends in this part of the country never saw him more full of intellectual vigour and colloquial animation, never more delightful or more instructive, than in his last visit to Scotland in autumn 1817. Indeed it was after that time that he applied himself, with all the ardour of early life, to the invention of a machine for mechanically copying all sorts of sculpture and statuary, and distributed among his friends some of its earliest performances, as the productions of a young artist just entering on his eighty-third year.

Watt ‖ Watts.

"This happy and useful life came at last to a gentle close. He had suffered some inconvenience through the summer; but was not seriously indisposed till within a few weeks from his death. He then became perfectly aware of the event which was approaching; and, with his usual tranquillity and benevolence of nature, seemed only anxious to point out to the friends around him the many sources of consolation which were afforded by the circumstances under which it was about to take place. He expressed his sincere gratitude to Providence for the length of days with which he had been blessed, and his exemption from most of the infirmities of age, as well as for the calm and cheerful evening of life that he had been permitted to enjoy, after the honourable labours of the day had been concluded. And thus, full of years and honours, in all calmness and tranquillity, he yielded up his soul without pang or struggle, and passed from the bosom of his family to that of his God!

"He was twice married, but has left no issue but one son, long associated with him in his business and studies, and two grandchildren by a daughter who predeceased him. He was a fellow of the Royal Societies both of London and Edinburgh, and one of the few Englishmen who were elected members of the National Institute of France. All men of learning and science were his cordial friends; and such was the influence of his mild character, and perfect fairness and liberality, even upon the pretenders to these accomplishments, that he lived to disarm even envy itself, and died, we verily believe, without a single enemy."

WATT, *Robert*, author of the well known *Bibliotheca Britannica*, was born of humble parents in the parish of Stewarton, Ayrshire, in the month of May 1774. After gathering what stray scraps of knowledge came within his reach as ploughboy to a neighbouring farmer, and as an attendant on "stone-dykers" in Dumfriesshire, he subsequently at the age of eighteen entered Glasgow College in 1793. Supporting himself by teaching both publicly and privately, he got through his medical studies, which he completed at Edinburgh in 1799. He commenced practice in Paisley, where he published his *Cases of Diabetes and Consumption*, &c., 8vo, 1808. Removing to Glasgow in 1810, he there began his lectures on the theory and practice of medicine, and in 1812 published "An Address to Medical Students on the best method of prosecuting their Studies," which he appended to a *Catalogue of Medical Books*. In 1813, he published a *Treatise on the History, Nature, and Treatment of Chincough;* and in 1814, his *Rules of Life, with Reflections on the Manners and Dispositions of Mankind*. He was chosen president to the faculty of Physicians and Surgeons in Glasgow, and was, in 1817, induced partly by the annoyance to which a lingering disease subjected him, and partly also by the extent to which he had already carried out his original design of the *Bibliotheca Britannica*, to give up his professional pursuits, and devote his whole attention to the elaboration of his great work. Watt died on the 12th of March 1819, at the premature age of forty-five years. The *Bibliotheca Britannica, or General Index to British and Foreign Literature*, was published after his death in 4 vols. 4to, 1819–1824, a remarkable performance, despite all its imperfections, and one on which Watt's name will live for centuries to come.

WATTS, DR ISAAC, a learned and pious dissenting minister, was born at Southampton in 1674. In 1690 he was sent to London for his academical education under the charge of the Rev. Thomas Rowe; and in 1696 he was engaged as tutor to the son of Sir John Hartopp, Bart., at Stoke Newington. He began to preach in 1698, and met with general acceptance; and after officiating as an assistant to the Rev. Dr Isaac Chauncy, he succeeded to

Wavre || Wax.

his pastoral charge in 1702, and continued to preside over that church as long as he lived. Though his whole income did not amount to a hundred a year, he allotted one-third of it to the poor. He died in 1748. His numerous works have had an extraordinary popularity; and they have rendered his name well known among people of every denomination, and have been translated into a variety of languages. His *Lyric Poems*, his *Psalms and Hymns*, and his *Divine Songs for Children*, were once exceedingly popular. He likewise wrote on logic and philosophy, but there he was not qualified to shine. His special treatises on *Logic*, and on the *Improvement of the Mind*, while tolerable expositions of philosophy for an Englishman at the time at which Watts flourished, are nevertheless very far short of perfection; and while his *Logic* held a first place as a text-book in many colleges in England long after his death, it would be difficult now to point to a single institution where Watts' name is counted of any weight in philosophy. He also wrote works upon a variety of other subjects, and printed several volumes of his sermons. He was admired for the mildness and benevolence of his disposition. After his death, his Works were collected, and published in six volumes quarto, 1753.

WAVRE, a town of Belgium, in the province of South Brabant, on the Dyle, 15 miles S.E. of Brussels. It has a fine parish church, a college, and several schools; manufactures of cotton yarn, hats, leather, and beer; and an active trade in corn, cattle, and tobacco. A sanguinary battle was fought here on the same day as that of Waterloo, between the Prussians under Thielman, and a body of French under Grouchy, by which the latter were prevented from joining Napoleon's army. Pop. 5843.

WAX is a common vegetable product, forming the varnish which coats the leaves of certain plants, and the pollen of flowers. *Myrtle wax* is found in the berries of the *Myrica cerifera*. Wax, as usually employed, is a synonyme for bees-wax, which was, previous to Huber's time, supposed to be an elaboration of the bee from the waxy substance found in the pollen of flowers, but that ingenious writer has shown, that the substance called bees-wax is a secretion from the ventral scales of the body of the insect.

The best sort of wax is that of a lively yellow colour, and an agreeable smell, somewhat like that of honey. When new, it is toughish, yet easy to break; but by age it becomes harder and more brittle, loses its fine colour, and in a great measure its smell. It appears that wax and the pollen have for their basis a fat oil, which passes to the state of resin by its combination with oxygen. If the nitric or muriatic acid be digested upon fixed oil for several months, it passes to a state resembling wax. Wax, by repeated distillations, affords an oil which possesses all the properties of volatile oils. It is reduced into water and carbonic acid by combustion. The colouring matter of wax is insoluble in water and in alcohol. Fixed alkalies dissolve wax, and render it soluble in water. It is this saponaceous solution which forms the punic wax. It may be used as the basis of several colours, and may be made into an excellent paste for washing the hands. Ammoniac likewise dissolves it; and as this solvent is evaporable, it ought to be preferred when it is proposed to use the wax as a varnish. From the common yellow wax, by bleaching, is formed white wax, sometimes called, very improperly, *virgin-wax*. The greater the surface is in proportion to the quantity, the sooner and more perfectly this operation is performed. The usual way is to melt the wax in hot water. When melted, they press it through a strainer of tolerably fine linen, and pour it into round and very shallow moulds. When hardened by cooling, it is taken out and exposed to the sun and air, sprinkling it now and then with water, and often turning it: by this means it soon becomes white. The best sort is of a clear and almost transparent whiteness, dry, hard, brittle, and of an agreeable smell, like that of the yellow wax, but much weaker. The common yellow wax is of very great use both in medicine and in many of the arts and manufactures. It has sometimes been given internally in dysenteries and erosions of the intestines; but its great use is in the making of ointments and plasters, and the greater part of those of the shops owe their consistence to it. The white wax is also an ingredient in some of the cerates and ointments of the shops; and it is used in making candles, and in many of the nicer arts and manufactures where wax is required.

Wax.

Sealing-Wax, or *Spanish Wax*, is a composition of gum-lac, melted and prepared with resins, and coloured with some suitable pigment. There are two kinds of sealing-wax in use; the one hard, intended for sealing letters, and other such purposes; the other soft, designed for receiving the impressions of seals of office to charters, patents, and such written instruments. The best hard red sealing-wax is made by mixing two parts of shell-lac, well powdered, and resin and vermilion, powdered, of each one part, and melting this combined powder over a gentle fire; and when the ingredients seem thoroughly incorporated, working the wax into sticks. Seed-lac may be substituted for the shell-lac; and instead of resin, boiled Venice turpentine may be used. A coarser hard red sealing-wax may be made by mixing two parts of resin and of shell-lac, or vermilion and red lead, mixed in the proportion of one part of the vermilion to two of the red lead, of each one part, and proceeding as in the former preparation. For a cheaper kind, the vermilion may be omitted, and the shell-lac also for very coarse uses. Wax of other colours is made by substituting other colouring matters for vermilion, as verditer for blue, ivory black for black wax. For uncoloured soft sealing-wax, take of beeswax one pound, of turpentine three ounces, and of olive oil one ounce; place them in a proper vessel over the fire, and let them boil for some time; and the wax will then be fit to be formed into rolls or cakes for use. For red, black, green, blue, yellow, and purple soft sealing-wax, add to the preceding composition an ounce or more of any ingredients directed above for colouring the hard sealing-wax, and stir the mass till the colouring ingredients be incorporated with the wax. The earliest application of it to its present use was made in 1553. The first printed account of sealing-wax is said to have been by Berzelius in 1563.

WEAVING.

History.

WEAVING is the art of regularly interlacing threads or filaments, whatever their substance, into cloth. It is distinguished from *felting*, either—(1.) by the alternation of one series of threads first over and then under another series, as in plain weaving; or (2.) by the intermittent but regular crossing of the third, fourth, fifth, or other threads, as in twilled weaving; whereas in felting, the fibres are crossed and worked together in all directions. It is distinguished, on the other hand, from mere *platting*, by the antecedent preparation of the thread. (See SPINNING.) Those threads which run lengthwise are variously called the "warp," "twist," or "chain;" those which run crosswise, the "weft," "woof," "shoot," or "tram."

Varieties of weaving.

In *pile-weaving*, a third thread is introduced, in addition to these warp and weft threads, and is thrown into loops by being woven over wires of the breadth of the cloth. In some fabrics these wires are drawn out, and the loops are left standing. In others, as, for instance, in the manufacture of velvet and of Wilton carpets, the upper surface is cut. (See CARPET.) Thus a nap or pile is formed.

In *figure-weaving*, the warp may be divided among a number of healds or heddles, so that threads of different colours may be concealed, or be brought up to the face of the fabric, or be transposed, according to a prescribed pattern. On the order in which the warp-threads are lifted, and the threads of the weft worked in between them, the pattern, whether simple or complex, of every fabric is dependent.

In *gauze-weaving*, the warp-threads are made to cross each other between every two casts of the shuttle, thus separating the weft-threads, and producing a transparent tissue.

In *lace-weaving*, the threads of the weft are twisted round those of the warp. In knitting or *hosiery-weaving*, one continuous thread serves for warp and weft; the stitches form successive rows of loops, and the loops of each row, in turn, are drawn through those of a preceding row.

Finally, in *netting*, which may be regarded as a rudimentary sort of weaving, the threads are tied into knots at the points of intersection, so as to form meshes of equal size.

Antiquity and universality of the art.

If we look at weaving in its rudest form, no handicraft is more ancient, and none more universal. If we look at it in its most elaborate form, and in conjunction with the auxiliary operations, no handicraft can point to a more striking series of improvements, due to the happy inventiveness and the indefatigable toil of a crowd of men of all countries. Who was the first in the long line of inventors is as hopeless a question as it would be to ask who first compared human existence to a web, or our individual lives to the threads of the web or the shuttle of the loom. The allusions to this ancient craft in our Bibles make us all familiar from childhood with its rudiments. "My life is cut off as by the weaver," says Isaiah. "My days are swifter than a weaver's shuttle," says Job. To weaving, as being from remotest antiquity the domestic employment of women, the old epic and lyric poets owe many a beautiful figure, and the dramatists some of their most touching incidents. By the "gorgon in the centre web," and the resplendent "dragons with golden jaws, the virgin labour of her shuttle"—woven on the well-preserved swaddling clothes—Creusa proves to Ion that she is his mother. By a description of the ornaments she had long before woven in "the fine-threaded web," Iphigenia is led to recognise Orestes. The antiquaries who have unrolled Egyptian mummies, the travellers who have explored Central Africa, the missionaries who have familiarised us with the habits and traditions of the South Sea Islanders,—all testify to the antiquity and the universality, in some form or other, of textile industry.

History.

Leading points in the history of the industrial development of the textile arts.

The history of such an art must needs be interesting. That history links itself with the colonisation of the Greeks; with the dissemination throughout the new-born Italy of the industrial arts of Constantinople; with the rapid growth of the Italian republics, and with that, more marvellous still, of the great commercial cities of the Netherlands. When the textile industry of the Italians and of the Flemings passed over to France and to Britain, its development came to be intimately connected with three questions of State policy—the good or ill treatment of aliens; the liberty or thraldom of religious worship; and the restriction or the enfranchisement of trade. With the wise or unwise handling of these cardinal points of government, the fortunes of the humble craft of weavers have been singularly bound up.

The treatment of aliens:—Establishment of foreign weavers in Norwich by Elizabeth.

By the liberal treatment of foreigners, in spite of popular discontent and insurrection, Edward III. laid the foundations of our own textile productiveness. By a bigotry, till then unexampled in modern history, Philip II. destroyed the textile industry of the Netherlands. Elizabeth imitated the example of Edward III. on a much grander scale. The native weavers were in her day as little disposed to welcome foreign rivals as they had been in the days of the Plantagenets. Changes of fashion had depressed the once thriving trade of Norwich. Multitudes of houses in which the din of the loom had been almost incessant, were now silent and deserted, but the commonalty of Norwich would not hear of the admission to its franchises of a single alien. The mayor and aldermen had to act alone. There was much uproar and some rioting. But a few years afterwards the magistrates of Norwich wrote thus to the Privy Council:—"The foreigners brought hither a great commodity, namely the making of bays, moccados, grograynes, &c., which were not made here before. They have re-edified our houses, and caused a great trade of merchants. . . . . They live wholly of themselves, do beg of no man, and do sustain their own poor people. They obey all magistrates and all good laws. They live peaceably amongst themselves and towards all men; and we think our city happy to enjoy them."[1]

Foreign weavers exiled by Charles I.

The effects of the bigotry of Philip had been written legibly enough, one may think, on the face of the Low Countries, for those that run to read. But Archbishop Laud and his master had not learned the lesson. The descendants of some of those weavers to whom Elizabeth had secured that freedom of conscience for the enjoyment of which they had fled their country, had to become exiles in their turn, in order to insure its continuance. Some of them returned to the Netherlands to give a new impulse to the textile industry of their fatherland. Others crossed the Atlantic, and laid the foundation of the textile industry of the United States.

Revolutions of textile industry in France.

By the depopulation of the hives of the Netherlands, France had profited as well as Britain. Silk weaving had been greatly advanced at Lyons and in its surrounding district. Cloth weaving flourished at Armentières, as well as at Sedan, Abbeville, and St Omer. "They of Armentières," says a writer of the sixteenth century, in a State paper drawn up for the information of Sir William Cecil, "are the best chapmen the merchants of our Staple have had."[2] But Lewis XIV. was as little careful about the industrial prosperity of France as Laud had been about that of England; and his sphere of action was unfortunately a much wider one than Laud's. At the date of his revocation of the edict of Nantes, the looms of Lyons alone amounted, by the lowest computation, to more than 10,000. One account, of respectable authority, puts the number at 13,000. The revocation reduced them to less than 4000. At Tours, 8000 looms were reduced to 1200, and 40,000 artisans to 4000. Crowds of the best weavers were driven into England, Prussia, and Switzerland. They carried with them not only their textile skill, but their hatred of the superstition and the despotism of which, for a while, they had been the victims. The results of this emigration are very notable in the annals of all the countries to which the exiles betook themselves; but in none are they marked so saliently as in our own. The fugitives came hither at a critical moment. The dragonnades had aroused an indignation which compelled even James II. to mask his admiration for a policy so bold and a religious zeal so exemplary. So intense was that indignation, that it drove James to request that Lewis would, through his ambassador, offer some diplomatic explanations, by way of throwing a little dust into the people's eyes. London had then the edifying spectacle of excuses offered by a king who had outraged humanity, to another king who wanted only opportunity to do the like. And these excuses were presented by Bonrepans to Castlemaine, by D'Avaux to Tyrconnel. The ministers who offered

Establishment of French weavers in Britain.

[1] *Domestic Papers*, Elizabeth, xx. 49; *The benefits receyved* [*i. e.*, brought] *by the Strangers in Norwich*, MS. (State Paper Office).

[2] Ibid., xlvi. 2, *Notes of Conferences touching the Indraping of Cloth*, MS. (State Paper Office).

History.

them, and the ministers who received them, heartily approved the atrocities which were apologised for. James, it must be acknowledged, could ill conceal his real feelings. On one occasion, when the treatment of the exiles was under discussion in council, he burst out with the fierce interrogatory—"Dogs defend one another when they are attacked, why may not kings do so too?" Compelled to give ostensible encouragement to the poor fugitives, he laboured in secret to undo the effect of his public acts. The French ambassadors (there were then two of them in London) were already alive to the commercial consequences of the establishment in England of so many branches of industry, and pre-eminently of textile industry, in which France had hitherto been unrivalled. The fugitives had set on foot here the weaving of lutestrings, brocades, alamodes, mantuas, paduasoys, velvets, and of many other choice fabrics, all of which had figured largely in our yearly lists of imports. Great efforts were used to bribe some of the best workmen to return, but they had small success. After the Revolution the number of the French settlers was largely increased. From that date, the gradual progress of our woven fabrics becomes one of the most characteristic features in our commercial history.

The contests about the introduction of machinery, and the establishment of free-trade.

The main incidents of that progress thenceforward group themselves around two almost interminable domestic struggles. The one was fought with great turbulence and with all sorts of weapons. The other was usually, though not always, carried on in the comparatively peaceful arena of the press and of public discussion. The first struggle lay between inventive genius and popular dread of change. The second lay between a system of policy which looks at pre-eminence in trade as the result of certain great natural laws, with which human legislation can meddle only to its hurt, and another system which regards that pre-eminence as a thing attainable by conferring privileges and enforcing prohibitions. All the combatants aimed at the increase of employment and the security of trade. But they set about their work in a totally different way. On the one hand, the inventors were constantly improving and multiplying the tools of industry; and the economists were preaching the freedom of commerce, and the essential oneness of national interests. On the other hand, the machine breakers went about destroying, to the best of their ability, every new implement which increased the strength or the dexterity of human hands; and the protectionists moved heaven and earth to inculcate the solemn duty of being "independent of foreigners," and to prove that everybody must be a gainer by inflicting as much loss as possible upon his neighbour.

The fecundity with which mechanical inventors went on improving the appliances of textile art is equalled only by the pertinacity with which they were driven from town to town. Some of them narrowly escaped with their lives, and died in foreign exile. Others changed the course of the industry of whole districts and counties by being compelled to set up their staff in places which, but for persecution, they would never have seen. The perseverance of those who fought the battle of free trade—who made British industry the leading industry of the world, and British textile fabrics the most conspicuous branch of that industry—is equalled only by the multiplicity of the expedients by which free trade was obstructed, and every step it won was turned into a reason why it should go no further.

The weavers' petition against the treaty of 1713.

When the weavers of London petitioned against the commercial treaty of 1713, they stated, not without some pardonable exultation, that our woven fabrics in silk alone were already twenty times greater than they had been fifty years before; that we were able to make all sorts of silks, gold and silver stuffs, and ribands, "as good as the French;" that black silk, merely for scarves and hoods, which, at the epoch of the Revocation, were all imported from France, were then made in England to the annual value of more than L.300,000; and they attribute these great results to "the encouragement of the crown and of divers acts of parliament;" concluding, of course, with the prayer that parliament will continue to protect English industry.

This discussion was scarcely over when the weavers were once more in arms, not now against France, but against the East Indies. They were stricken with horror at the growing frenzy of Englishwomen for printed calicoes. "Fifteen years back," says the zealous author of *The Weavers' true Case*, "our women among the gentry were clothed with fine English *brocades* and *Venetians;* our common traders' wives with slight silk *damasks;* our good country dames with worsted *damasks*, flowered *russets*, and flowered *calimancoes;* and the meanest of them with plain worsted *stuffs:* whereas, now, those of the first class are clothed with outlawed India *chintz;* those of the second with English and Dutch printed *calicoes;* those of the third with ordinary *calicoes* and printed *linens;* and those of the last with ordinary printed linens; whereby these famous branches of the weaving trade are almost extinct."

Textile Fibres.

Attacks of the weavers on the East India trade.

The worthy weavers did not trouble themselves with thinking how it had come to pass that nearly all the wares they advocated had names as outlandish as those of the wares they denounced; or with showing why the labour of British calico-printers was less worthy of "protection" than that of British weavers; or why parliament ought to welcome Indian silk and reject Indian cotton. They clinched their argument by warning the legislature that "the wearing of printed or painted commodities puts all degrees and orders of womenkind into disorder and confusion. The lady cannot well be known from her chambermaid. But when our womenkind were clothed with silk and woollen commodities, those mistakes were avoided, and a tolerable order observed."

Facts and logic like these were powerful enough to procure an enactment (1721) which made it penal to sell or to weave calico. When that enactment was no longer tenable, it was still penal to weave calico unless the warp was wholly of linen (1736). And this continued to be British law until 1774. To trace, downwards, the course of similar legislation would be a long task.

The struggle of the hand-looms against the power-looms.

The sufferings of the hand-loom weavers, in their hopeless struggle against power-looms, make a sad chapter in British history. It is very painful to read of the execution at Lancaster, for destroying a power-loom factory, of eight persons, one of whom was a boy still so nearly within the immunities of childhood as to die whilst calling on his mother to save him. But it would be more painful still to form any adequate conception of the miseries endured by thousands of families in their long warfare with an irresistible antagonist. The severities of 1812 did not prevent the devastations of 1826, when the wooded cloughs and the wild moors of Lancashire and Yorkshire swarmed with bands of turbulent men, in whom recklessness and timidity, ignorant cunning, and bluff simple-heartedness, were strangely blended. Nor have the sufferings which attended the quiet tenacity with which multitudes of weavers who took no part in the riots clung to a doomed employment, and sent up petition after petition for parliamentary aid, taught their successors that, for the purpose of staving off industrial revolutions, a parliament is as powerless as a pauper.

How textile industry has gradually outgrown all these impediments, and has attained its present extraordinary development, cannot even be indicated within the prescribed limits of such an article as this. But the results of a long process will be seen, in brief, in our statistics of textile fibres and of textile exports. To a summary description of the ordinary methods and implements of weaving, we add some account of the laws which regulate textile labour when carried on in factories, and of their operation hitherto.

I.—TEXTILE FIBRES.

To the several articles COTTON, FLAX, HAIR, HEMP, SILK, and WOOL, we refer the reader for information with respect to each of those fibres. Here, we have but to

Textile Fibres.

notice the relative extent to which these several fibres are used for weaving purposes. Jute (not heretofore noticed) is rapidly becoming a prominent material for the weaver. In India it has long been used for coarse cloths of various kinds. In this country it is now extensively used for sacking and other like fabrics, and also for mixture with other fibres. The quantity of jute imported in 1846 was 186,000 cwt.; in 1856, 731,093 cwt.; in 1859, 1,061,288 cwt. Textile Fibres.

The following table exhibits the quantity of each of the enumerated fibres imported into the United Kingdom, in each year, from 1854 to 1859 inclusive :—

TABLE I.—*Textile Fibres Imported into the United Kingdom*, 1854 *to* 1859.

Quantities of fibre imported.

Fibres.	1854.	1855.	1856.	1857.	1858.	1859.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1. Wool (sheep, lamb, and alpaca)	106,121,955	99,300,446	116,211,392	129,749,898	126,738,723	133,284,634
2. Silk (raw and thrown)	8,557,239	7,548,759	8,236,687	12,718,867	6,638,845	10,248,353
3. Cotton (raw)	887,333,104	891,751,952	1,023,886,304	969,318,896	1,034,342,176	1,225,989,072
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
4. Flax (dressed and undressed)	1,303,235	1,293,435	1,687,041	1,866,250	1,283,905	1,432,037
5. Hemp (and other like substances undressed)	729,564	728,381	771,533	782,271	886,631	1,059,119
6. Jute (undressed)	481,733	539,297	731,093	618,833	738,085	1,061,288

The next table exhibits the computed real value of the textile fibres so imported :—

TABLE II.—*Computed Real Value of Textile Fibres Imported*, 1854 *to* 1859.

Value of fibres imported.

Fibres.	1854.	1855.	1856.	1857.	1858.	1859.
	L.	L.	L.	L.	L.	L.
1. Wool	6,499,004	6,527,325	8,664,420	9,681,541	8,972,218	9,831,007
2. Silk	6,454,357	5,493,304	8,496,145	14,238,667	6,110,576	10,596,676
3. Cotton	20,175,395	20,848,515	26,448,224	29,288,827	30,106,968	34,559,636
4. Flax	3,384,216	3,317,122	3,633,194	3,524,767	3,020,879	3,769,058
5. Hemp	1,817,905	1,471,649	1,319,907	1,216,664	1,222,393	1,469,360
6. Jute	553,993	447,167	612,290	646,356	619,668	790,383

In addition to these fibres, long employed for weaving purposes, other fibres, more or less adapted for like employment, either as substitutes or as aids, are rapidly coming into notice. Most of these are of Indian growth. They have usually been prepared for the market by very imperfect processes, and therefore their capabilities are very imperfectly known. But as the want of larger supplies of fibrous material becomes increasingly evident, these processes must needs be amended. As a field for producing such material, the capabilities of India are immense; and we are but upon the threshold of their effective development. British Guiana has also shown that it possesses similar capabilities on a considerable scale.

Abaca, or Manilla hemp.

The Abaca or Manilla hemp-tree (*Musa textilis*) yields a layer of outer fibre, called *Vandala*, which is employed for cordage, and inner layers called *Lupis*, which are used by the natives for weaving very delicate fabrics. Between these, are intermediate layers of a fibre called *Tupoz*, of which are made web-cloths and gauzes four yards long, and of various degrees of fineness. The fibres are dried, scraped, and beaten with a wooden mallet, their ends are then gummed together, and they are wound into balls. The value of this article in the London market ranges from L.30 to L.55 per ton.

China grass.

China grass fibre (*Urtica Nivea*) is chiefly imported from China and from Assam. Three several crops can be obtained in the season; the first yielding strong and coarse fibres; the second and third yielding delicate fibres suitable for fine fabrics. In 1849, a patent was obtained for an ingenious process of boiling the stems in an alkaline solution, after they have been previously steeped in water at 90°. They are then washed and dried by steam. An interesting series of specimens illustrative of this process, and some beautiful fabrics woven from the fibre—both alone and mixed with other textile materials—were shown at the Exhibition of 1851. To three several groups of such samples prize-medals were awarded.

Allied to the China-grass is the Neilgherry nettle (*Urtica Heterophylla*), samples of whose fibre, hackled by Messrs Marshall, were shown by Colonel Sykes to the British Association at its Leeds meeting in 1858. These samples, in the opinion of the manipulator, afforded proof how well this fibre "is adapted for flax-spinning machinery," and of the possibility of introducing "a warp of great strength, which so corresponds with all the essentials of real wool, that, when mixed with wool, they will both take the same dyes, mill and dress together, and will certainly manufacture a good cloth." In 1851, the Coimbatore Local Committee sent to the Great Exhibition samples of a fine flax-like fibre, the produce of another kind of nettle abundant in Mysore, and expressed their "conviction that, if well prepared and procurable in quantity, it is fitted to compete with flax in the manufacture of very fine textile fabrics." Neilgherry nettle.

The separation of the mudar or yercum fibre (*Calotropis Gigantea*, an asclepiadaceous plant) is difficult, since water injures it, so that the process becomes one of mere manipulation. Dr Royle, however, reported of it as a fibre well calculated to answer many of the purposes of flax. The pods of this plant are full of a glossy silk-like down, which the natives spin into a fine soft thread. Mixed with one-fifth of cotton, a well wearing cloth is produced, "which stands washing and takes a dye." Sanseviera or Moorva fibre has also been manufactured into a useful sort of cloth. The Sanseviera is a liliaceous plant, which may be found all over India, and is common along the Coromandel, Malabar, and Bengal coasts. This fibre is remarkable for its whiteness and its cheapness of production. Mudar and Sanseviera fibres.

The long and rigid leaves of the pine-apple tribe (*Bromeliaceæ*) abound in fine white fibres, which are capable of being woven into beautiful fabrics. Some readers will remember the admiration which was excited by a series of specimens of muslin-like tissues (*batiste d'ananas*) from the Philippine Islands, exhibited in 1851. Samples of this fibre were forwarded from Malacca, Singapore, Java, and Celebes. Instead of twisting them, the natives gum the ends together, in order to make a long thread. Pine-apple fibre.

Weaving Processes.

Plantain fibre.

The plantain or banana (*Musa paradisiaca*) belongs botanically to the same family as Manilla hemp, but its fibre is not so fine. By adequate preparation, however, it may be made into fabrics of elegant appearance, as well as into coarse and strong ones. Hitherto, it would seem, little care has been bestowed on the separation and assortment of the fibres. The extraordinary productiveness of this plant as a food-producer has been the sole reason of its cultivation, but every plant yields from three to four pounds of fibre, the utilising of which needs only labour and care.

Aloe fibre.

The aloe fibre has also great capabilities. One sort is obtained from the great aloe (*Agave Americana*), another from the *Agave vivipara*. The latter kind is also known as silk-grass fibre. Hitherto, the chief obstacle to its easy adaptation to textile purposes has been the glutinous gum in which these and other similar fibres abound. In the Report of the Jury on the second class of products exhibited at Paris in 1855, praise is accorded to a recently patented process of Messrs Perelli-Ercolini of Turin for the extraction of this gum. By that process, it is stated, the fibres are converted into a soft, bright, and flossy material, which

"Perellian silk."

the patentees call *perellian silk*, and which is capable of being spun and woven by the ordinary mechanism. But it does not appear that the product was examined by the Jury itself.

There are other fibres worth consideration in regard to their textile applicability. In addition to the works mentioned in the note, several recent volumes of the *Journal of the Society of Arts* may be consulted with advantage.[1]

II.—TEXTILE PROCESSES.

The common hand-loom.

The frame-work of the ordinary hand-loom consists of four upright posts connected by cross-beams, as well in the centre as at top and bottom. On the centre beam (called the *warp-beam*) at the back of the loom (fig. 1), the

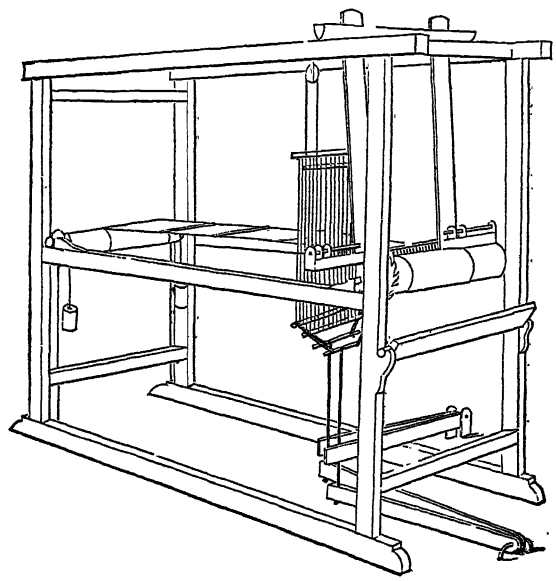


Fig. 1.

warp threads are wound. On the other centre beam (called the *cloth-beam*) in front of the loom, and immediately above the weaver's seat, the cloth is wound off as it is woven. The weight shown in the cut a shanging from the warp-beam keeps the warp-threads extended. The two healds or heddles, which hang from pulleys at the top of the loom, contain, together, as many pieces of twine as there are threads in the warp. If the warp contain 100 threads, each heald will contain 50 twines, with loops in the middle, through which the warp-threads are drawn. Each heald is connected with a treadle, which, by the pressure of the weaver's foot, raises one heald and depresses the other, and consequently raises one-half of the threads of the warp and depresses the other half, making an opening (called the *shed*) in the warp for the passage of the shuttle (fig. 2), which contains the weft-threads. The *batten* or lathe (fig. 3) is a movable frame suspended from the top of the

Weaving Processes.

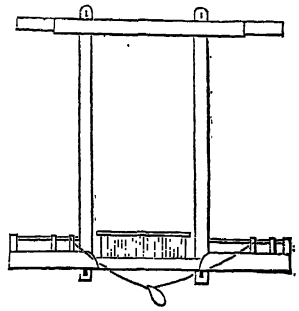


Fig. 2.



Fig. 3.

loom (between the outer frame and the healds), for the purpose of striking or beating home the weft. The sides of the batten are called the *swords*; its bottom the *shuttle-race*, both ends of which are closed so as to form two short troughs, in which move two pieces of wood called *pickers*, or fly-shuttles. To these pickers strings are attached, which meet in a handle, held by the weaver in his right hand, and which enable him, by a sharp jerk, to project the shuttle along the shuttle-race, first in one direction and then in the other. The picker was the invention of John Kay of Bury, by whom it was patented in 1733. The comb-like frame in the centre of the batten (fig. 3) is called the *reed*. Through its teeth, as well as through the healds, the warp threads pass, and thus the reed serves to keep the work perfectly even.

Preliminary processes: Warping.

This glance at the construction of the loom will facilitate comprehension of all the processes connected with weaving from first to last; but it somewhat anticipates their right order. The first of them is that of warping, which is simply stretching the number of threads necessary to form the warp equally, and laying them parallel to each other. This is commonly done by means of a *warping-mill*, as it is usually called, which consists of two parts, namely, a vertical frame or rack in which the bobbins are placed, and the reel on to which the warp is wound. The vertical frame is constructed so as to allow about fifty bobbins to be so fixed as to revolve easily, and to keep the yarn as it leaves the bobbin at equal distances. The several yarns are then brought to a focus, as it were, and made to pass through what is called a heck-box, whence it is wound round a large reel, so constructed in point of size as to gauge or measure off the warp. The reel is 6 feet in diameter and 7 or 8 in height, and is made to revolve by an endless rope passing round two wheels, one of which is turned by the warper. In order that the warp may be wound spirally on the reel, the heck-box, containing the rollers which guide the yarns, is made to rise and fall by a simple contrivance. It is made to slide up and down one of the upright supporters of the reel, by being suspended from a cord, which, passing over a wheel or pulley, winds round the axle of the reel, or

[1] *Statistical Abstract of the United Kingdom*, No. 7 (1844 to 1859), *passim*; Royle, *The Fibrous Plants of India*, 37, 41, 55, 64, 89, 247, 306–9, 345–353, 364–7; *Public Documents of the Indian Government* ("Minutes relating to Fibrous Plants"), No. 954; Sykes, "Notes on Indian Fibres" (*Journal of the Statistical Society of London*, xxi. 454–456); *Rapports du Jury mixte International . . . . de l'Exposition Universelle de* 1855, 58, 75, 76; *Minutes of Evidence before the Select Committee on Colonization (India)*, 1859.

Weaving Processes.

is unwound, according to the way in which the reel is turned. One-sixth part of the warp is usually wound off the bobbins at once. When the first portion of yarn is wound off, the clue or end of the yarns is crossed over pins projecting from the frame of the reel, and the reel is turned the reverse way, so that the yarn from the next set of bobbins descends by the descending motion of the heck-box, containing the guide-rollers. This process is repeated backwards and forwards until the whole warp is completed, when it is taken from the reel, and wound upon a stick into a bundle or large ball, the different doublings of the successive portions of the warp, as above described, forming separate crossings, in appearance not unlike a ball of lamp-cotton on a gigantic scale. The equal portions of the warp aid the weaver in counting its yarns.

Besides this division, the warp-mill makes another, which separates the yarns alternately, so as to facilitate their alternate arrangement in the geer or heddles. In the heck-box, as we have already explained, are the guide-pins, which conduct the yarns from the vertical frame to the reel. These pins are inserted in two separate pieces of wood alternately. One piece of wood is lifted by a handle, which raises the alternate yarns. This occasions a space or division between the two sets of yarns, in which a wooden peg is placed. The other set of yarns is then raised by similar means, and the result is that the alternate yarns are crossed over the ends of the intermediate yarns. This is called the lease, and is carefully tied up so as to guide the weaver when he beams the warp.

Sizing.

In the state in which the warp is wound off the reel, as just described, it is delivered to the weaver; but before he winds it on to the warping-beam it must be sized. This consists in treating the warp with some glutinous solution, size or starch, for instance; the object being to render the yarns or threads of the warp smooth and even for wefting. This is done sometimes by the hand and sometimes by a machine. Generally, it is dipped into the warm size, and squeezed by the hands and dipped again, until it is thoroughly soaked through. The machines in use merely imitate this process, the yarn being dipped and passed through rollers twice or thrice, by which the size or starch is introduced into the interstices of the yarn. It is then dried, in the case of woollen yarn, by being spread out in a field; and, in other cases, in a drying-house for the purpose. When thus sized, the yarn is ready for the loom.

Winding or beaming.

The perfect equality of tension to which the warp is subjected in the loom is of the greatest importance to the perfection of the cloth. If some of the yarns be looser than the rest, the cloth will be of unequal strength, and uneven to the eye, and its value will be less in proportion. The first operation towards extending the warp is framing or winding it on to the warp-beam; equality of tension much depends on skilful beaming. In order that the warp may be laid evenly on the beam, an instrument is used similar to the reel already described, except that it is not so fine. It is called a ravel or separator, and is composed of strips of cane fastened into a rail of wood, and secured at the upper part or extremities of the teeth by another piece of wood, called the cape. This cape is movable, and, before it is put on, the yarns of the warp are passed between the teeth of the ravel, and the cape is put down to secure the yarns in their places. This being done, the warp is gradually and carefully wound upon the beam in the order in which it is destined to be wound off in the process of weaving.

In very broad goods, whether of cotton, linen, or woollen, the co-operation of several hands is necessary to the effecting of this process. Two persons must hold the ravel, one at least must watch the proper tension of the threads, and a fourth gradually turns the beam. In this the weavers aid each other. Weaving Processes.

The warp being now upon the beam, every yarn has to be passed through a loop or eye of the heddles: this is called *drawing*. Two rods of wood are first inserted into what is called the lease—that is, the two crossings formed by the guide-pins of the warping mill, as already described. These rods are tied firmly together at the ends, the original ties are cast off, and the warp is spread out to its proper breadth. The effect of these lease-rods is to keep the alternate yarns which pass through one heddle from the intermediate yarns which pass through the other. Drawing.

The warp-beam is suspended behind the heddles, and the passing of the yarns through the loops is done by two persons, the weaver and his assistant. The former, being in front of the heddles, opens the loops; and the latter, selecting the proper thread, which, as we have explained, cannot well be mistaken, delivers it to be drawn through the open loop or eye. This being done, the yarns are drawn through the reed by a hook called the reed-hook or sley. Two threads pass through each interval of the reed, the one below and the other above the warp; and in order to preserve this division, there is another rod of wood, which divides the warps into what are called *spitfuls*, the division being just the reverse of the lease-rods. By these several contrivances, the threads of the warp are so easily distinguished, that if one break in the course of weaving, a very common occurrence in the case of a break-warp, it is easily traced and taken up.

The accuracy of the lease being thus carefully preserved, the cords which move the heddles are attached. This is so arranged that the motion communicated by the heddle is continuous—that is, while one heddle is depressed, the other must be equally raised, so that the warp is opened equally, as already described. The reed is now attached to the lay or batten, and is kept firmly in its place by the cape, and the whole is so nicely hung as not to overstrain the weaver's arm in striking the weft home. An ill-poised batten creates great fatigue; and to avoid this, and perform its work effectually, it should be hung midway between the heddle and the woven portion of the work. The whole distance between the last woven shoot of the weft, called the *fall*, and the heddle, forms the space in which the batten describes its arc; and the greater it is the harder the stroke. In light goods, accordingly, it is small, in heavy goods greater; and, as this also in part depends upon the length of the *sword*, or pendulous portion of the batten, the whole must necessarily bear a proportion to the size of the loom. The loom for narrow and light goods is small in all its parts; the loom for broad and heavy goods is of course large and strong. Properly poised, the batten returns to its position by its own weight as soon as the stroke is made. All that now remains to be done is to knot the near ends of the warp into small portions, and to tie them to a shaft attached to the cloth-beam. The warp-beam being properly adjusted, and the due degree of tension being given to the warp, lying thus evenly between the two beams, the weaver's operations may commence.

Those operations are very simple. They consist—(1.) Of the depression of the treadle with the foot; (2.) Of the throwing of the shuttle by a jerk of the picker; (3.) Of the beating close home of the weft by the batten. But the use of just the right degree of force, and no more, requires both experience and continued attention. Weaving operations.

Thus far we have been concerned only with plain weaving, in which every alternate thread of the warp is taken up, and a fabric is produced which, if examined through a magnifier, would present an appearance like this:—

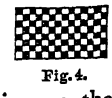


Fig. 4.

Now, suppose the two heddles, instead of taking up the

Weaving Processes.

Twilled or figure weaving.

alternate threads of the warp, were so arranged that one of them took up three threads in succession, and the other only one, it would follow that the threads of weft would not appear equally exposed on the surface of the warp, but would in some places pass over three threads, and in others only one. The result would be a figured face, as depicted in the annexed diagram. The white portion of this figure represents the threads of warp, the black the threads of the weft, covering one out of four and three out of four threads alternately. This variation of the number of threads of warp exposed is the simplest species of figure, for it can be produced by two heddles. It supposes no difference in the yarns as compared with plain weaving; it requires no difference in the operations of the weaver; it requires no increase in the number of the heddles; all it requires is a different arrangement of the warps through the loops or eyes of the heddles; and when that is done, all the processes proceed as before.



Fig. 5.

In the above description we have supposed no difference in the colour of the warp and weft, the only alteration in the appearance of the cloth being produced by the threads of weft exposed on the surface of the warp; but it must be evident that if the warp yarns consist of different colours, the cloth produced by the loom, arranged in the ordinary way, will be striped in the longitudinal direction of the web; and if the heddles be arranged as just described, the result will be a checked fabric, and this still without any change in the process of weaving.

The simplest variation in the operation of weaving is the employment of two or more shuttles containing bobbins of different coloured threads. If woven in the common loom, the weaver making an equal number of shoots of two colours alternately, the cloth produced would be striped in the transverse direction. With the heddles arranged as above described, or with two coloured warps, any variety of check may be produced.

For the convenience of using two or more shuttles containing weft different in colour, fineness, or material, movable shuttle-boxes are employed, so contrived as to slide up and down the swords and bars of the batten or lay, and by means of a loom capable of being adjusted to the shuttle-race on a level with the opposite driver.

A further means of varying the pattern consists in increasing the number of the heddles, each having a certain proportion of the warp-yarns attached to it, and each being moved by a separate treadle. The threads raised cover that shoot of weft which passes over the warp yarns not raised, and is exposed to view on their surface. The number of threads thus raised being capable of being varied as many times as there are heddles, being indeed capable of an immense number of combinations, it follows that figures may be described, or names and sentences woven in, to suit the fancy of the weaver, or the caprice of his customers. It will be observed that the employment of an additional number of heddles is only a contrivance to increase the weaver's means of varying the distribution of the warp, and consequently of the weft, for the one cannot be accomplished without the other; and when we add to this the employment of two or more coloured warp yarns, and of two or more coloured wefts, together with the adaptation of the said colours to the figure produced by the arrangement of the heddles, we at once perceive that the possible combinations are extremely numerous.

Twilled fabrics are extremely various and complicated in their character, and it is difficult to convey an idea of their structure within the space to which we are limited. The best way to gain a clear conception of the nature of a twilled cloth, is to take a small piece, say of merino or shalloon, and partially unravelling it, so as not wholly to disengage the weft from the warp, examine its structure through a single magnifier. It will then be seen that the weft yarns, instead of interlacing the warp yarns alternately and at regular intervals, as in the above figures, take up only every third thread, and that too at irregular intervals, so that the interlacing marches across the piece diagonally, and not transversely, thus (Fig. 6):

Weaving Processes.



Fig. 6.

In some of the finer fabrics, the interlacings occur only at the fourth, fifth, or sixth threads.

Under the old system of weaving, the number of combinations was limited only by the number of heddles. But if the heddles were very numerous, the loom was crowded, and the weaver overtasked. The introduction of the draw-loom made the first great improvement. The harness of the draw-loom was so arranged that no part of the warp was depressed; but such of the threads as were to be above the weft were raised, and the shuttle passed through. But of that invention enough has been said in the article CARPET.

The next great improvement consisted in the invention of the famous Jacquard engine, first exhibited at Paris in 1801. The history of this invention is too instructive to be wholly passed over.

Career of Jacquard.

Joseph Marie Jacquard had become a weaver against his will. It was probably his dislike of the paternal calling that gave the first impulse to the inventiveness which has so signally lessened its drudgery. He was amongst the many artisans who were driven from Lyons during the Reign of Terror, and who returned thither at the eve of the Consulate. The first fruits of his return was the Jacquard machine, in its original form, as shown at the National Exhibition of Industry, held at Paris in 1801. In the following year he took out a patent for his machine, but did nothing towards making it profitable. He freely imparted his plans and ideas to all comers, and seemed chiefly intent on perfecting them In proportion as the mechanism became known in Lyons, it excited discontent and opposition. Jacquard went on steadily with his experiments, and offered to transfer to the city the entire property of his inventions, and to devote his time to its service, in return for a very small pension. Napoleon, when signing at Berlin the decree which authorised the municipality to pay to Jacquard an annuity of L.60 (1500 francs), is said to have remarked, "Here, at all events, we have a man who is content with a little;" and he conferred on the inventor, in addition, the right to take a premium of L.2 for each loom that should be set to work on his principle. But the grant was of small avail to him. Almost every weaving-room into which his mechanism was introduced added to the number of his opponents. Journeymen said that it spoiled their webs, and that its object was to throw them by and by out of work. Foremen caballed against it, because it altered arrangements in which they had found both profit and self-importance. Masters said less about the invention, but abused the inventor as a plagiarist. According to them, there was nothing wonderful in the machine, and very little that was new. At length, the turbulent weavers threatened Jacquard's life; and on one occasion went near to throw him into the Rhone.

Destruction of Jacquard's mechanism and model.

In many instances the mechanism already in use was pulled down and sold by auction, piecemeal; the wood as old wood, the iron as old iron. The model itself was brought from the Palais des Arts to the Place des Terreaux, and there publicly burned. Jacquard's patent was suppressed, on the allegation that his invention was useless. Proceedings were taken against him to recover the value of materials alleged to have been spoiled in the attempt to weave fabrics with machinery unsuited to its purpose, and a *Conseil des Prud'hommes* gave its verdict against the inventor. It was with no small difficulty that he induced the council to stay execution, whilst, with his own hands, he reconstructed a dismounted machine, and wove with it a fabric which the

Weaving Processes.

Prud'hommes had just decided could not be so woven. Conclusive as was the refutation, the new machine made very slow progress until many years had elapsed. But when it did emerge, it revolutionised the trade. The inventor has now a statue on the spot where the invention was publicly burned.

Description of the Jacquard engine.

The Jacquard engine may be attached to almost any kind of loom. It is fixed to the top of the loom, in a direction perpendicular to the harness, the cords of which are attached to the lifting-hooks *a a a a*. Every one of these lifting-hooks is passed perpendicularly through an eye in a corresponding needle *b b b b*. These needles lie in rows in the frame *c c c c*. Let it be remembered that the figure is a mere skeleton of the engine itself, as the holes and needles are extremely numerous, say eight rows of fifty each, forming as many leases in the warp. The horizontal needles protrude through the frame *c c* at *b b b b*,

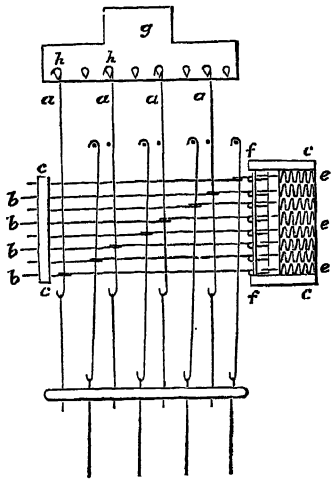


Fig. 7.

and are kept extended in their position by spiral springs *e e e*, placed in cavities at the opposite end of the frame *c c*. By this arrangement the needles have a play in the direction of the spring. They yield to pressure, and on its removal return to their former position. The needles have an elongated loop at the extremity nearest the spiral spring *f f*, with a pin passing through it so as further to limit the range of the needle. The following figure represents one of these needles, with its eyelet, loop and pin, and spring.

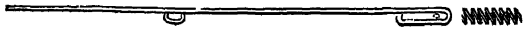


Fig. 8.

Immediately over the frame *c c* is a corresponding frame *g*, having bars arranged across, that is, at right angles with the needles. There is one bar for every row of lifting-hooks. This frame, when the engine is in operation, is alternately lowered upon the frame *c c*, and raised from it by a strong lever attached to the treadle and moved thereby. When the frame is lowered, the lifting-bars, the ends of which are seen at *h h*, make their way immediately under the curved ends of the lifting-hooks, so as to raise them, or such of them as are not prevented from being taken up, in the manner presently to be described, when the frame is raised. Supposing all the wires to be taken up, the hooks will appear as at fig. 11; but that would take up the whole warp.

It should be observed, that the lifting-bars are shaped like blunted knife-blades, having the broad part inclined out of the perpendicular, so that, in descending, their lower edges steer clear of the curved head of the lifting-hooks. As, however, they descend still farther, the flat parts of the bars press against the curved heads and force them against the springs. The lifting-bars, still continuing to descend, at length get entirely below the curved head, when the spiral springs cause the horizontal needles, and consequently the lifting-hooks, to regain their position; and when the frame *g*, with its lifting-bars, is again raised, the bars must necessarily raise the lifting-hooks.

In order to prevent the taking up of the whole warp, it will be obvious that any pressure upon any number of the horizontal needles at *b b* will force in the spiral springs, and thus remove the lifting-hooks out of the reach of the lifting-bars. In fig. 9, half of the hooks are so pressed in. To produce a figure, therefore, all that is necessary is to have the power of regulating the order in which the needles *b b b b* are pressed forward upon the spiral springs; and this is effected by means of a square revolving bar (fig. 9), pierced with holes corresponding in number and posi-

Weaving Processes.

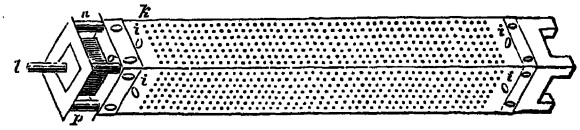


Fig. 9.

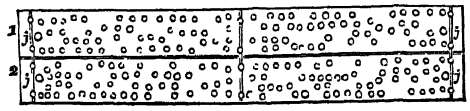


Fig. 10.

tion with the needle-points *b b*, and a number of perforated card-boards (fig. 10), which pass over it in endless succession with its revolutions.

The reader will now clearly comprehend the operation of the bar and the cards. If the bar be moved against the frame *c c*, the needle-ends *b b* will pass into the holes, and all the lifting-hooks will remain within the influence of the lifting-bars; but if the cards (fig. 10), being partly perforated and partly whole, be placed over the perforated bar, it must be obvious that such of the needles as are prevented from entering the holes of the bar, by the intervention of the unperforated portions of the cards, will be pressed against the springs, and the lifting-hooks will be removed from the operation of the lifting-bars; while those needles which pass through the perforated portions of the cards into the corresponding holes of the bar will be unaffected, and the lifting-hooks connected with them will be taken up.

As the perforation of the cards is the means by which the harness is raised,—the absence of perforation determining what part of the warp shall not be raised,—it is necessary to have one card or slip for every shoot of weft, until the whole pattern is described. The whole are loosely looped together at the corners, so as to form an endless chain, one whole revolution of which completes the pattern.

The cards are exactly fitted to the bar by means of studs *i i i i* upon the latter, corresponding with larger perforations *j j j j* in the former. The studs will be seen projecting from the section of the bar in fig. 11, the lettering of the whole of which figure corresponds with the others, so as to enable the reader to trace each part of the machine.

Setting the Jacquard.

The mode of setting the Jacquard engine in operation is as follows:—The bar (fig. 9), marked *k* in the section, the end only being there seen, is suspended in a frame *m m* by its axis *l*, which is swung so as to hang something like the lay or batten of the loom, and to move upon the side of the frame *c*, through which the needle-ends protrude, and to retire therefrom with an equable motion. It will be seen by fig. 9, that the bar has at one end four pillars *n, o, p, q; n, o*, and *p* only being seen in fig. 9. Each of these pillars is seized in succession by the hook *r*, by which means each revolution is divided into fourths. The equability and precision of this movement is secured by the T-shaped bar, which is pressed uniformly on the uppermost pillars by the action of a spring.

A careful inspection of figs. 7 and 11 will now, we hope, convey to the reader a clear conception of the manner in which the machine works. It will be seen that a roller *u* is attached to the frame *g* by a curved arm. This roller works

Weaving Processes.

in a hook-shaped bar v, and as the frame g is raised, the roller u ascends with it, and necessarily moves the frame m to which it is attached away from the frame c, through

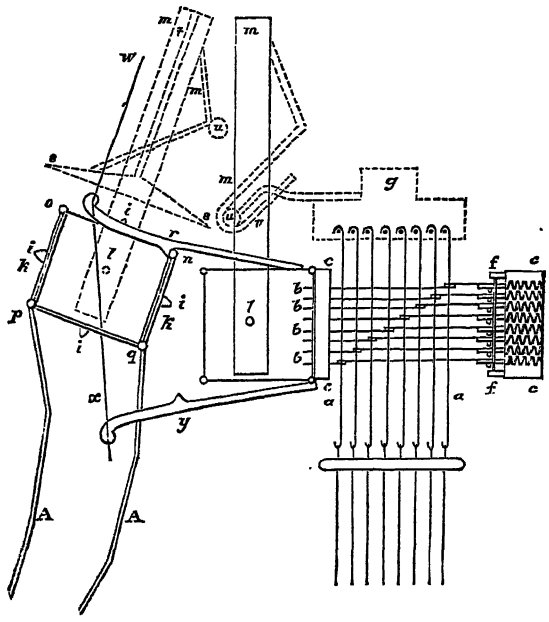


Fig. 11.

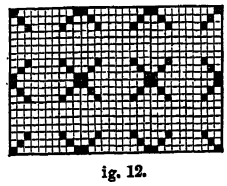
which the needle-heads project. In like manner, when the frame g is lowered, the roller u descending with it, the frame m, with the bar k, is permitted to approach the needle-heads b b. The section, fig. 11, shows the frame and bar in both positions.

The revolution of the perforated bar is provided for by the operation of the catching-hook r; for when the bar is in its place against the needle-heads, the hook slips over the furthermost pillar, and there the bar would be firmly locked against the frame c if it did not revolve on its axis; and it can only yield to the repelling operation of the roller u by making a quarter revolution. It will be readily seen, that the revolution is the only means by which the pillar of the bar is extricated from the hook.

The use of the under hook y is to reverse the operation. The hooks r and y are connected by a cord w x, by which the former is thrown out of action, and the latter brought into operation. The movement of the card-slips is of course reversed; aud the weaver is enabled to repair an accident, such as the breaking of a warp-yarn, so as to avoid any break in the pattern. The lines marked AA represent the chain of perforated cards.

In figure-weaving, everything depends on the proper arrangement of the warp-yarn. Whether the draw-loom or the Jacquard engine be employed, a single yarn misplaced must necessarily render the figure imperfect. The taking up of the proper warp-yarns, and drawing them through the appropriate *eye* or *mail*, is called drawing in or cording in. To facilitate the operation, the design or pattern is drawn upon paper, divided into squares similar to the patterns sold in the shops in all our large towns for German embroidery work. The annexed diagram will explain the nature of the design.

Cording in.



ig. 12.

In cording in, two persons usually work together, one taking up the threads, and the other counting off the pattern. Thus, in the annexed figure, the direction given to the first arrangement of the warp-yarns would be, "Take up one"—"pass eight"—"take up two"—"pass eight"—"take up two"—"pass eight"—"take up one." In this way he proceeds from shoot to shoot, until the draught is completed. It will be observed that the counting is facilitated by every ten spaces being divided by stronger lines.

Weaving Processes.

To punch the holes in the cards for the Jacquard engine an ingenious machine is employed. It is a sort of counterpart of the engine itself, being provided with lifting-cords, wires, and needles, so arranged, that by pulling the cords, the needle-heads are protruded. Answering to the revolving bar, and in front of the needle-heads, is a perforated iron plate, about two inches thick, provided with a set of movable punches, which are driven forward by the protrusion of the needle-heads, and deposited in another perforated plate temporarily placed to receive them.

Card-punching.

In order to move the proper cords, and so deposit the proper punches destined to describe the pattern on the card, the operation of drawing in is performed on a frame provided with a number of vertical threads answering to the warp of the goods to be woven. These threads are taken up with a long needle by one man, another directing as before; and, when completed, the proper threads are attached to the corresponding cords of the punching-machine, and the proper punches are deposited in the movable plate. This being done, the blank card is placed against the face of the movable plate, and against the cutting end of the punches. Both are then removed together, and placed upon another perforated plate, when the punches are driven through, and the card is cut at the requisite spot. Each card is numbered, so that there cannot be any mistake in attaching them together; and as every part of the punching-machine gauges with the corresponding part of the Jacquard engine, the precision throughout is perfect.

Power-loom weaving may be said to be almost yet in its infancy. But nearly two centuries have passed since the idea of applying mechanical power to weaving was first broached. The originator was M. de Gennes, a naval officer of considerable distinction, who communicated his plan to the French Academy of Sciences in 1678. "The advantages that may be drawn from this engine," says the author, "above the ordinary loom, are these: (1.) That one mill will set ten or twelve of these looms at work; (2.) That you may make the cloth much broader than any hitherto made; (3.) There will be fewer knots in the cloth; (4.) The work will be carried on quicker and at less charge, ... since one boy will serve to tie threads of several looms as fast as they break, and to arrange the quills about the shuttle. The account given to the Academy was translated at the time into our own *Philosophical Transactions* (June 1678), but excited little attention. A hundred and twenty years afterwards Dr Edmund Cartwright set to work on the same problem with memorable success. The circumstances under which he achieved it have been narrated in the article CARTWRIGHT. An extensive series of improvements has led to the modern power-loom in its latest form. But the principles of the machine will be as well exhibited in the ordinary power cloth-loom long used in the great woollen factories of Yorkshire, as in any other.

De Gennes' mechanical power-loom of 1678.

Power cloth-loom of Yorkshire.

The frame-work AAAA (fig. 13) is of cast-iron, and is made of great strength, so as to support the heavy work which the cloth-loom has to undergo.

B is the breast-beam, against which the weaver stands, and over which the woven cloth passes in its way to the cloth-beam C, around which it is wound as the work proceeds. The breast-beam is made smooth, the edges being rounded, so that the cloth meets with no impediment in its progress round the cloth-beam.

At the back of the loom is a corresponding arrangement for the warp; that is, there is a warp-beam parallel with

Weaving Processes.

the breast-beam, and a roller parallel with the cloth-beam, so that the plane of the warp is kept in a horizontal position. Its tension is preserved by a weight slung round the warp-roller, and acting in a direction contrary to the winding of the cloth-beam. The manner in which this operates will be seen by inspecting figure 14.

Weaving Processes.

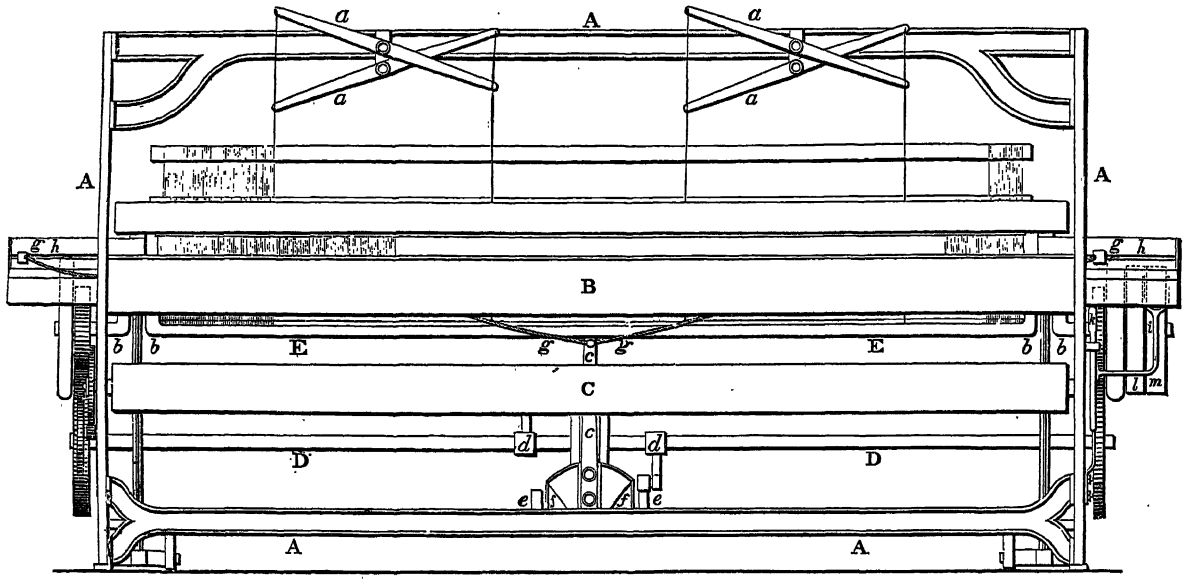


Fig. 13.

The mode of suspending the heddles is shown by the letters *a a a a*. In the smaller looms, used for cotton or worsted weaving, a single cord passing over a roller is found to be sufficient; but in weaving broad cloths, which are set in the loom twelve quarters in width, to allow for shrinking in the fulling and scouring, the length and weight of the gearing requires double support.

The cranks, by which the lay or batten is put in motion, as shown in figure 16, are marked *b b b b*. The reader will observe that it is only their lower portion that can be seen, the upper part being concealed by the breast-beam.

The shuttle in the loom here represented is thrown by a single whip-lever in the centre of the loom, moving alternately to the right and left, instead of by two levers, one placed at each end of the loom. The sudden jerk necessary for the sharp motion of this picking lever, which, be it observed, must imitate the sharp motion of the weaver's right hand, is produced by the rollers *d d* affixed to the shaft D, which, at every half-turn of the said shaft, strike down the rollers *e e* alternately, and draw the whip-lever *c* towards them by shortening the cords *f f*. The picking cord *g g* being thus alternately drawn to the right and the left, moves the shuttle along the shuttle-race *h h* in a manner with which the reader must now be familiar.

The mode of throwing the loom out of gear will be readily understood by every one who has seen machinery of any kind worked by a shaft and band. *l m* is a split drum, *l* being connected with the shaft, and *m* being unconnected therewith. It follows, that when the band is brought over the drum *l*, the shaft is necessarily set in motion, whereas the instant it is cast off upon the loose drum *m*, the machinery is stopped. The band is cast off and the loom thrown out of gear by means of the lever *k*, which, when pushed to the right, moves the forked lever which holds the band *i* in a lateral direction sufficiently to effect the purpose.

Figure 14 is an end view of the loom; X being the cloth-beam, Y the roller, and Z the batten, the motion of which is described by figure 16.

After the description already given of the processes necessary to the weaving of a piece of cloth, very little further explanation is necessary to enable the reader to understand the operations of the power-loom, and the manner in which motion is communicated, from its first source, to the heddles, the shuttle, the batten, and the warp, all of which correspond with unerring regularity; conducting the work with a degree of precision which it would be wrong to say the

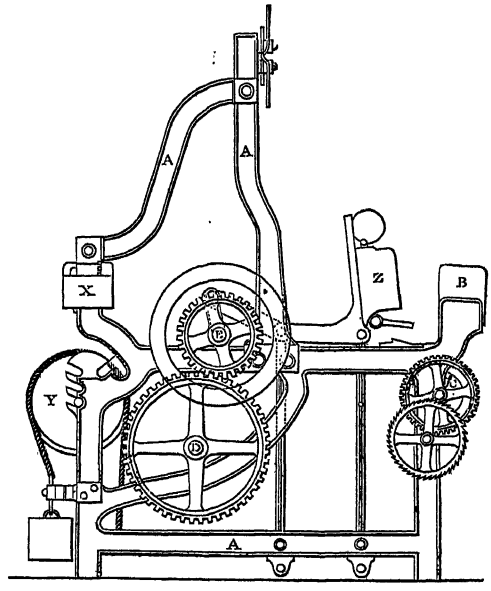


Fig. 14.

hand cannot attain, but which certainly can only be achieved by the skilful few.

The motion of the heddles is produced by two eccentric wheels or tappets, acting upon two levers or treadles, furnished with friction-rollers. While the short radius of one tappet is on one treadle, so as to permit the elevation of the corresponding heddle, the long radius of the other presses down the other treadle. Fig. 15 exhibits one of the tappet-wheels, the

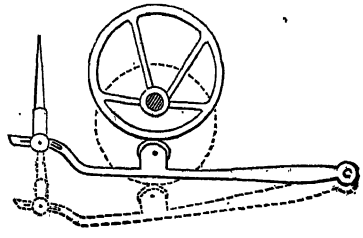


Fig. 15.

Weaving Processes.

short radius pressing upon its treadle, the dotted lines showing its position on its half-revolution, when the long radius is brought to operate on the treadle.

The shuttle, as already stated, is thrown by means of the whip-lever, shown in front of the plate. To this is attached the cord which moves the picker, similarly arranged to the fly-shuttle of the hand-loom. Some looms have two whip-levers instead of one, in which case they are placed at the ends of the loom instead of in the centre. In either case the rollers are so placed that they act upon the whip-levers at the precise moment that the heddles have sufficiently shed the warp. If an inspection of figure 13 fail to make the reader comprehend this, a consideration of the manner in which the several motions are connected, as presently described, will remove the difficulty.

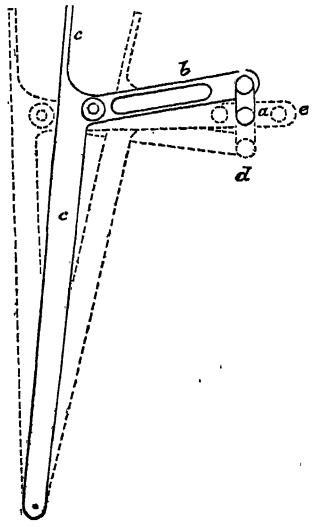


Fig. 16.

The stroke of the batten or lay is produced by a crank *a* (fig. 16) in the main or driving-shaft, which elongates the arm *b*, and moves the batten *c c* forward against the last shoot of the weft. The dotted lines show its alterations of position. At the first quarter turn of the crank, it is brought to a position horizontal with the arm *b*; at the next quarter turn, the crank is again perpendicular, and the batten is in its middle position; at the third quarter turn, the crank is again horizontal with the arm, a portion of the arm being within the crank, and the batten being then at the greatest distance from the last shoot of the weft, that is, the woven portion of the cloth. It is scarcely necessary to add, that the main, uppermost, or driving-shaft, E, is connected with the lower shaft D, to which the tappets and jerk-rollers are fixed by means of cogged wheels. The wheel of the driving-shaft being half the circumference of the wheel of the lower shaft, the former makes two revolutions to one of the latter, or, in other words, the driving-wheel communicates just half of its own velocity to the lower wheel. Thus, in one revolution of the lower shaft, the warp is shed and the shuttle thrown twice, while, to complete two strokes of the batten, two revolutions of the driving-shaft in the same time are necessary.

It needs no great culture of the eye to have noticed in exhibitions of machinery how often and how strikingly improvements in power and efficiency are at the same time improvements in form and appearance. To the Exhibition of 1851, Mr Harrison of Blackburn contributed a power-loom of 1795 and a power-loom of 1850 (of both of which the reader may see figures in the *Illustrated Official Catalogue*), very illustrative of that combination. There, also, was seen a fine example of the Jacquard loom, as applied to the manufacture of furniture damask, by Messrs Taylor of Halifax. And in the Patent Museum may now be seen an excellent example of the modern power-loom, as constructed upon the patents of Kenworthy and Bullough (1841, No. 87901); of James Bullough (1842, No. 9507); and of Ephraim Taylor (1857, No. 2296). In this loom are embodied five several improvements of practical importance:—(1.) Mechanism whereby the loom is stopped when the weft thread breaks or is absent; (2.) Mechanism whereby the loom may be instantly stopped when the driving-strap is shifted; (3.) Another arrangement, by which the loom is stopped whenever the shuttle does not get clear of the shed; (4.) An improved temple for keeping the cloth distended to one uniform width; (5.) Instead of weighting the warp-beam, the necessary resistance is obtained by the use of springs, fixed to the framing, and connected with ropes wound around the end of the beam. For weaving heavy cloth, additional resistance is obtained by means of two levers, connected by rods with the sley swords.

Power-loom of Kenworthy, Bullough, and Taylor.

Weaving Processes.

The latest curiosity in the mechanical history of weaving is the "electric loom" of the Chevalier Bonelli, of Milan. His first machine, constructed in 1854, at Turin, and afterwards improved at Berne, gave good assurance that electro-magnetic weaving was a possibility, but did not weave. Further improvements in 1859 have resulted in a machine which will actually work, and a most ingenious machine it is. The bobbins of the Jacquard loom M. Bonelli converts into electro-magnets. The design he paints on a sheet of tinfoil, the unused portions of which are covered with non-conducting varnish. The pattern, connected with one pole of a battery, passes slowly over a roller, under a vast number of brass teeth, communicating by insulated wires with the bobbins, which are connected with tne otner pole. Thus, as the tinfoil revolves, the exposed portion transmits the current through the brass teeth, and transforms the bobbins into electro-magnets, which attract and hold the bars opposite their respective points attached to the threads of the warp. As the lever descends, the bars are held up, the threads are raised below, and the shuttle passes between. The covered portion of the tinfoil of course transmits no current. There is an ingenious contrivance for keeping the teeth free from dust, so that the action of the electric fluid may be perfectly unobstructed. There is another arrangement for insulating the colours, when they are more than two, and for transmitting the current to each colour in its order.

The electro-magnetic loom of M. Bonelli.

In the accompanying woodcut (for which we are indebted to the courtesy of Mr P. Le Neve Foster, secretary of the Society of Arts), *A*, (fig. 17), represents the plate pierced with holes, which plays the part of the card. Each of the small pistons or rods, *b*, forming the armatures of the electro-magnets *c*, have a small head *d*, exactly opposite the needles *e* of the Jacquard, and are capable of passing freely through the holes of the pierced plate *A*. When the plate is slightly lowered, the heads of the pistons are prevented from passing; so that its surface then represents a plain card. The pistons are supported on a frame *f f*, which allows them to move horizontally in the direction of their length. At each stroke of the shuttle, the frame, carrying with it the plate *A*, has, by means of the treadle, a reciprocating motion backwards and forwards; and, in its backward movement, presents the end of the pistons to one of the holes of the electro-magnets; and by means of certain special contrivances contact with the magnets is secured. When the frame *f f* returns with the plate *A*, towards the needles of the Jacquard, the electro-magnets, which become temporarily magnetised by the electric current, hold back the pistons, the heads of which pass through the plate *A*, and rest behind it. On the other hand, the electric magnets, which are not magnetised—the course of the current having been interrupted—permit the other pistons to be carried back, their heads remaining outside the plate and in front of it. At this moment the plate, by means of an inclined plane beneath it, is lowered slightly, thus preventing the heads of the pistons passing through the holes by the edges of which they are stopped, so as to push against the needles of the Jacquard; on the other hand, the heads of the pistons, which have passed within and to the back of the plate, leave the corresponding holes of the plate free, and the needles of the Jacquard, which are opposite to them, are allowed to enter.

Regulation of Textile Labour in Factories.

In order to put the electro-magnets into circuit, one of the ends of the wire, forming the coil of each of the magnets, is joined to one common wire in connection with one of the poles of a galvanic battery. The other end of the coil wire of each magnet is attached to a thin metallic plate *m*, having a point at its lower extremity. All these thin metallic plates are placed side by side, with an insulating material between them, formed like the teeth of a comb *n n*. At a given time these thin plates rest with their lower extremities on the sheet *P*, which bears the design, and is wrapped round the cylinder *Q*. Obviously, as this metal plate rests on a metallised or on a non-conducting portion of the design, the corresponding electro-magnet is or is not magnetised; and its corresponding piston does or does not press against the needle of the Jacquard.

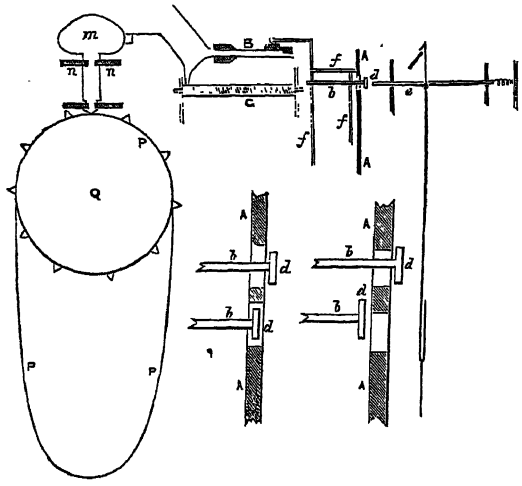


Fig. 17.

Such, in brief, is the arrangement for producing fabrics of not more than two colours, one in the warp and the other in the weft. When several colours are required, each separate colour is insulated from its neighbour by removing a thin slip of the foil at the margin. These insulated pieces of foil are connected by means of other small strips which pierce through the paper, and are conducted to another strip running along the edge of the band, in a way which serves to connect, by a conductor, each special colour with its special current of electricity.

How that which is at present a beautiful example of mechanical ingenuity may succeed in adapting itself to the hard and multifarious requirements of commerce, is a problem which only time can solve. But there seems to be good ground for anticipating very brilliant results.

III.—LEGAL REGULATION OF TEXTILE LABOUR IN FACTORIES.

British Factory Acts.

The hours and the conditions within which the textile labour of women and children may be employed in factories, and the hours within which such labour, as respects all work-people, must be restricted, are prescribed for the United Kingdom, by the Acts of Parliament, of the 3 and 4 Will. IV., c. 103 (29th August 1833), called *The Factory Act;* of the 7 and 8 Vict., c. 15 (6th June 1844), called *The Factory Regulation Act;* of the 10 and 11 Vict., c. 29 (8th June 1847), called *The Ten Hours Act;* of the 13 and 14 Vict., c. 54; and of the 16 and 17 Vict., c. 104 (20 August 1853), called the *Children's Labour Act.*

By the second of these Acts it is provided that the word "factory" shall be taken to mean all premises within which any mechanical power shall be used to work any machinery employed in any process incidental to the manufacture of cotton, wool, hair, silk, flax, hemp, jute, or tow, either separately or mixed together.

Regulation of Textile Labour in Factories.

The first steps towards legislation in this direction were taken as far back as 1802. At that period factory labour was little developed. But the evils, especially in relation to the treatment of children, were already frightful. The demand for labour had been for a time in excess of the supply, and had been fed by the most reckless means. The Act of the first Sir Robert Peel checked some of the grosser abuses, but it made no provision against many others. Small as was its scope, it met the very nearly unanimous opposition of the employers of that day, and excited almost as many prognostications of the consequent and inevitable ruin of trade as have uniformly attended every onward step in the same path, down to the year 1860.

The Factory Law of 1802.

The Commissioners of 1833, after a most elaborate and impartial inquiry throughout the kingdom, reported (1.) That the children employed in all the principal branches of manufacture were kept at work during the same number of hours as the adults; (2.) That the effects of that protracted labour on such children were permanent deterioration of their physical constitution; the production of disease often wholly irremediable; and their exclusion from the means of adequate education; (3.) That the provisions of the then existing law, such as they were, had been, "in country situations, seldom or never attempted to be enforced;" that in several principal manufacturing towns they were openly disregarded; that in others their operation was extremely partial and incomplete; and that, "even in Manchester, where the leading manufacturers felt an interest in carrying the act into execution as against the evasions practised by the small mill-owners, the attempt to enforce its provisions, through the agency of a committee of masters, had for some time back been given up." On the whole, they found that the existing law had been almost entirely inoperative with respect to its legitimate objects; and that "the large classes of work-people who came within its provisions had been familiarised with contempt of the law, and with the practice of fraud, evasion, and perjury."

The Factory Inquiry of 1833.

By the Act of 1833, and the amended Act of 1844, it is provided that no children under eight years of age shall be admitted into textile factories; that from eight to thirteen they shall work only 6½ hours a day, and shall receive educational instruction at prescribed hours, and for 3 hours daily at the least. By the Act of 1847, no person under the age of eighteen, and no female above the age of eighteen, shall be employed in any factory for more than 10 hours in any one day, nor for more than 58 hours in any one week. By the Act of 1850, it is provided that no young person, and no female above the age of eighteen, shall work in any factory before the hour of six in the morning, or after the hour of six in the evening (save to recover lost time, and then not later than seven in the evening). There are also provisions as to meal-times, as to holidays, and as to the proper condition and ventilation of the buildings.

Enactments as to the labour of women and children.

It is further enacted that no child or young person shall be allowed to clean any part of the mill gearing in a factory whilst the same is in motion; that no child or young person shall be allowed to work between the fixed and traversing parts of any self-acting machine, while the latter is in motion by the action of the mechanical power; and that every fly-wheel directly connected with such motive power, whether in the engine-house or elsewhere, and every part of a steam-engine, and every hoist or teagle near to which children or young persons are liable to pass or to be employed, and all parts of the mill gearing in a factory, shall be securely fenced.

Provisions against accidents by machinery.

Penalties are imposed for all breaches of the enactments as to the hours and methods of labour, and provision is

Regulation of Textile Labour in Factories.

made for the appointment of four inspectors of factories, to carry those enactments into effect; to examine from time to time the children and young persons so employed; to inquire into the causes of accidents by machinery; and generally to report to one of the principal Secretaries of State on all matters connected with the due execution of the Factory Acts.

Provisions for inspection of factories.

The evidence of existing evils which induced the legislature to pass these various repressive acts was of the most conclusive kind. The caution displayed in the gradual application of the principle which animates them, and in testing by actual experience the results of each step that had been taken, before taking another step in the same direction, was remarkable. The evidence of progressive reform, in proportion as the powers conferred by the Factory Acts have been made increasingly fitter for the attainment of their object, has been irrefutable. But the arguments by which it is sought to discredit this legislation, and to obstruct its progress, remain precisely what they were when it began. Because parliament once meddled too much with matters of trade, it is argued that it ought never to meddle with matters of trade at all. Because there are employments from which no human authority can ward off gross abuses, it is declared to be evident that no human authority ought to attempt to ward off abuses from any. But an enlightened public opinion has been found strong enough to extinguish, by inanition, an "Association of Factory Occupiers," which characterised the self-evident proposition that factory owners ought not to sit on the bench to decide factory prosecutions, as "a gross reflection upon the known character of the magistracy;" which raised a common fund to defray penalties, whenever they might deem such prosecutions to be improper and "vexatious;" and which sought, by destroying the independence of the inspectors, to emasculate the law. The contrast between the language of 1855[1] and that of 1860,—as seen, for example, in the recent debate on the Bleaching Works Bill,—is very significant. And the public opinion which has brought that contrast about, will assuredly be strong enough to extend the equitable provisions of the Factory Acts to those branches of textile industry which are yet in need of them.

Success of the British factory acts wholly due to inspection.

The total number of prosecutions and informations instituted by the inspectors under the Factory Acts, from 1836 until 1854 inclusive, was 3696. The circumstances of every prosecution and its results have been clearly recorded, and fully reported to parliament. To this vigilant inspection and unremitting enforcement of the Acts—as far as the legal machinery avails—the signal success of the legislation of 1833 is wholly due. All previous Acts, having no system of inspection, were utter failures. All similar laws in other countries, without inspection, have failed in like manner.

Factory legislation of France.

In France, the employment of children in textile factories is governed (theoretically) by a law of the 22d March 1841, which is framed partly on the model of the British law, but which extends to ordinary workshops as well as to factories possessing mechanical motive-power, provided that not less than 20 work-people are employed in them. No child under eight years of age can be employed at all. None between eight and twelve can be employed during more than 8 hours out of every 24 hours; and those 8 hours must be divided by sufficient intervals of rest. From twelve to sixteen years of age, the hours of labour may extend to 12, with similar intervals. No person under sixteen can be employed on Sundays or holidays. A subsequent law of the 8th Sept. 1848 limits the hours of labour of adults, in factories of all kinds, to 12; reserving to the government "power to declare exceptions to this enactment in those cases" where the nature of the work, or of the mechanism, may require it.[2]

Statistics of Textile Industry.

Mr Redgrave, in 1855, made a careful inquiry into the execution of these measures, and arrived at the conclusion that the law of 1841 has been obeyed very imperfectly; that of 1848 very fairly. In some important districts, indeed, he believes the former to have been inoperative. The law gave the government power to appoint inspectors. Usually they appointed local and unpaid committees, some of whose members were themselves manufacturers. They did, in fact, what the enlightened denouncers of "meddling legislation" and of "philo-operative cant" would gladly have seen done in England.

Operation of the French law.

In Prussia, the employment of children in textile factories is subject to the provisions of a law of the 9th March 1839, and of another of the 16th May 1853. The labour of children under twelve years of age is prohibited, and, when that age has been attained, they must produce, prior to employment, satisfactory evidence of school attendance and acquirement. From twelve to fourteen they must not work more than 6 hours daily, and must attend school for other three hours.[3]

Factory legislation of Prussia.

It is honourable to the United Kingdom that all that has yet been attempted in this direction on the Continent is in avowed imitation of British example. Very recently, a distinguished young advocate of Leyden, Mr Samuel Le Poole, has examined our factory districts in the hope of initiating in Holland a like policy. Whatever extension, under wise arrangements, that policy may anywhere receive, will prove in the long run to be as favourable to the true interests of commerce as it is congenial with the golden rule. To Lord Shaftesbury will always belong the honour of having mainly established and vindicated the factory law, and to Mr Leonard Horner that of having indefatigably executed it, in the face alike of good and of evil report.

IV.—STATISTICS OF TEXTILE INDUSTRY.

There are at present no means of indicating with completeness the amount of the textile *products* of any country. But a fair inferential approximation towards such a result may, as respects several countries, be derived from two independent sources: the one consisting in the statistics of textile labour; the other in those of textile imports and exports. For the United Kingdom, our system of factory inspection affords returns admirable for their fulness and accuracy as far as they go, but relating only to what may be termed the great trunk of textile industry. In the ordinary decennial census, however, we have other materials, less complete, but extending both to the trunk and to the branches. For most of the countries of Continental Europe the census is the main source of information. This section, like other sections of our subject, we can illustrate only by way of example.

---

[1] Probably few of our readers have any idea of the outrageous folly with which the existing laws were at that time denounced. "We must express," said one writer, "a strong hope that the Association will not relax in their exertions till they have brought the principle of special legislation, like that of the Factory Acts, to the most conclusive test before the eyes of the world, and, in freeing themselves from ignorant and factious interference, drawn off a fog from the mind of the nation, purged its legislation from a barbarism, and released its industry and independence from an oppression and a snare." (*The Factory Controversy; a Warning against Meddling Legislation*; issued, in 1855, by the "National Association of Factory Occupiers.")

[2] *Loi du 22 Mai* 1841 *relative au travail des enfants dans les Manufactures*; Block, *Dictionnaire de l'Administration Française* (§ "Louage d'Ouvrage), 1071–2; *Reports of Inspectors of Factories*, 31st Oct. 1855, p. 83, *et seq.*

[3] *Regulativ über die Beschäftigung jugendlicher Arbeiter in Fabriken; Gesetz betreffend einige abänderungen des Regulativs vom* 9 *Marz* 1839, &c.

Statistics of Textile Industry.

The Factory Returns of 1835, 1838, 1850, and 1856.

Factory returns for the whole of the United Kingdom have been submitted to parliament on four several occasions. In 1835, the inspection was in its infancy, and the occupiers of factories took little pains to supply the information which had been called for. The returns of that year, therefore, are of small authority. Those of 1838, of 1850, and of 1856, are full and trustworthy. They afford ample indications of the growth of our textile industry, in so far as it is carried on in factories. Of these, the aggregate number which, in 1838, had been 4217, and in 1850, 4600, had increased in 1856 to 5117. The power-looms, which in 1836 were but 115,801, had increased in 1850 to 301,445, and in 1856 to 369,205. The total number of persons employed in textile factories amounted in 1838, to 423,400; in 1850 to 596,082; in 1856 to 682,497.

Statistics of Textile Industry.

The details of the return of 1856 are as follows:—

Nature of the Fabric.	Number of Factories.	Number of Spindles.	Number of Power-looms.	Amount of Moving Power.		Number of Persons Employed.		
				Steam.	Water.	Males.	Females.	Total.
				Nom. H.P.	Nom. H.P.			
I. Cotton.....	2,210	28,010,217	298,847	88,001	9,131	157,186	222,027	379,213
II. Wool.....	1,505	1,786,972	14,453	17,490	8,411	45,583	33,508	79,091
II. Worsted.....	525	1,324,549	38,956	13,473	1,431	30,023	57,771	87,794
III. Flax.....	417	1,288,043	7,689	14,387	3,935	23,446	56,816	80,262
IV. Silk.....	460	1,093,799	9,260	4,360	816	16,899	39,238	56,137
Total.....	5,117	33,503,580	369,205	137,711	23,724	273,137	409,360	682,497

Comparative rates of increase in the various fabrics.

In 1838, the number of cotton factories was 1819; in 1850, 1932. The increase, therefore, was about 6 per cent. in 12 years; whereas from 1850 to 1856, the increase was 14·2 per cent. in 6 years. In 1838, the number of woollen factories was 1322; in 1850, 1497; showing an increase of 13 per cent. in 12 years. From 1850 to 1856, the number was almost stationary. In 1838, the worsted factories were 416; in 1850, 501; showing an increase of 20 per cent. From 1850 to 1856, the increase was but 4·7 per cent. In 1838, the number of flax factories was 392; in 1850, it was still but 393. From 1850 to 1856, there was an increase of 6 per cent. Finally, the silk factories which, in 1838 were 268, were in 1850 only 277; but in 1856, had risen to 460, being an increase of 66 per cent. in 6 years. The aggregate increase in the number of textile factories of all kinds during the 18 years from 1838 to 1856 was 21 per cent. The aggregate increase of nominal horse-power during the same period was 58 per cent. (namely, 161,435 in 1856, against 102,069 in 1838). That of power-looms during the 20 years from 1836 to 1856 was 219 per cent. That of persons employed, during the 18 years 1838 to 1856, 61 per cent.

Relative growth of the various branches of textile industry, from 1836 to 1856.

The greatest increase of the factory work-people has been in the worsted manufacture, which, during the same eighteen years, amounted to 177 per cent. To that branch of textiles belongs also the greatest increase of nominal horse-power, namely 108 per cent. The silk manufacture claims the largest increase of power-looms. There, for certain fabrics, the hand-loom has still its superiority. The number of power-looms applied to silk-weaving in 1836 was but 209; in 1856 they amounted to 7689; showing an increase of 3579 per cent. The power-looms employed on worsted were, in 1836, 2969; in 1856, 38,956; showing an increase of 1212 per cent. The power-looms employed on cotton were, at the former date, 108,751; at the latter, 298,847; being an increase of 175 per cent. The power-looms employed on woollen fabrics were, in 1836, 2150; in 1856, 14,453; being an increase of 572 per cent. The power-looms employed on flax were, in 1836, 1714; in 1856, 9260; showing an increase of 440 per cent.

To obtain a collective view of the amount of British labour which is employed on textile industry, as well in those branches to which the Factory Acts do not apply, as in those which are subject to their regulation, recourse must be had to the decennial census. The returns of 1851, as compared with those of 1841, give the best view on this point that is attainable, until the new census shall have been taken:—

Aggregate Numbers of the Work-people Employed on Textiles, in the United Kingdom, 1841 *and* 1851.

Comparative view of the work-people employed on textiles in 1841 and 1851.

Census of 1841. Total No. of Persons.	Fabric.	Census of 1851. Total No. of Persons.	Census of 1841. Total No. of Persons.	Fabric.	Census of 1851. Total No. of Persons.
	I. Cotton—			III. Silk—	
377,662.....	(1) Calico.....	501,465	83,773.....	(1) Silks.....	114,570
35,347..... (Not separately enumerated)...	(2) Lace.....	63,660		(2) Ribbands.....	10,074
	(3) Muslin	14,098		IV. Flax, &c.—	
	II. Wool—		85,213.....	Linens of all kinds.....	98,860
167,296.....	(1) Woollens.....	137,814	50,955.....	V. Stockings of all materials.....	65,499
	(2) Worsteds.....	104,061			
		Carried forward...	800,246[1].....	Total	1,110,101

Hitherto, every decennial census has been taken after a new method. Hence it has been necessary to restrict these comparative figures to persons engaged in the actual preparation, manufacture, or finishing of textile fabrics. If to these be added the dealers and other persons incidentally busied with those fabrics, the total number of persons employed upon *wool* (after it was taken from the sheep) will be found to have amounted, in 1851, to 295,276; that of persons employed upon *silk*, to 140,936; that of persons employed upon *cotton*, *flax*, and *hemp*, collectively, to 782,213; yielding an aggregate of persons variously employed on textile products, in 1851, amounting to 1,278,425.

Finally, the exports of textile fabrics from the United Kingdom, in the years 1853 to 1859, respectively, were as follows:—

[1] Each of the items which make up this total includes a rateable proportion of the 162,742 weavers, spinners, and factory-workers—fabric not specified—returned in 1841, in addition to the classified workers.

Statistics of Textile Industry.

Textile exports from United Kingdom.

Textile Exports from the United Kingdom, 1854 to 1859.

Fabric.	Declared Real Value.					
	1854.	1855.	1856.	1857.	1858.	1859.
	L.	L.	L.	L.	L.	L.
I. Woollens	9,120,759	7,718,374	9,500,428	10,703,375	9,776,944	12,053,708
II. Silks	1,236,564	1,082,592	1,758,657	1,803,210	1,305,899	1,562,152
III. Cottons	25,054,527	27,578,746	30,204,166	30,372,831	33,421,843	38,744,113
IV. Linens	4,108,457	4,118,013	4,887,780	4,516,880	4,124,356	4,604,587
Total of textiles[1]	39,520,307	40,497,725	46,351,031	47,396,296	48,629,042	56,964,560

There do not exist materials for the minute comparison of the growth of textile industry in France, over a term of years, like that which has been given for the United Kingdom, but there are ample materials for similar statements as applicable to a specific year. The Factory Returns of 1855 and the census of 1851 afford sufficient evidence for our purpose.

Textile Industry of France in 1855.

Statistical view of the textile industry of France.

Fabric.	No. of Factories	No. of Spindles.	No. of Looms.	Moving Power.			Number of Persons Employed.			
				Steam.	Water.	Other mechanical Power.	Men.	Women.	Children under 16 years of age.	Total.
				No. of Engines	No. of Engines					
I. Cotton	2,394	3,457,552	116,154	650	416	443	109,304	90,647	44,628	244,579
II. Wool	2,890	1,386,783	38,446	840	248	400	95,534	53,128	31,437	180,089
III. Silk	1,459	7,440	88,864	435	145	881	109,662	46,127	9,326	165,115
IV. Flax and hemp	5,576	210,282	20,901	64	90	124	33,067	15,868	7,232	56,167
V. Mixed fabrics	667	143,048	37,842	64	60	209	37,842	5,208	17,450	60,500
Total	12,986	5,205,105	302,207	2053	959	2057	385,409	210,978	110,073	706,450

It is obvious, on the face of this table, that the term "factory" designates in France something very different from its ordinary acceptation here. The number of persons directly employed on textiles is in France one-fifth greater than the number so employed in the United Kingdom. But the number of factories is almost three times as large. It has been shown, in the preceding section of this article, that every place in which 20 work-people are employed comes within the jurisdiction of the French factory law. Thus it is that in England every "factory" employs, on the average, about 130 persons; in France, only 54. But the most striking difference is in the employment of females. It is probable that of the children, as of the adults, the majority are males. But if we take only one-half of them to be males, the total number of females employed in textile *factories* will be but 266,014 against 385,409 males; whereas in the United Kingdom the females are 409,360, against 273,137 males.

The French census of 1851, like that of the United Kingdom, adds to the factory-workers employed on textiles all those who are so employed in their own homes, all dealers in them, and all who are employed in the auxiliary occupations; but it does not discriminate the fabrics. It gives the aggregate number as 969,863 persons, of whom 61,420 are masters, 431,380 journeymen and apprentices, and 477,063 women. Of this number the department of the Lower Seine alone comprises 261,082 persons, and that of the Nord, 113,791 persons.

The exports of textile fabrics of home manufacture from France, during the year 1857, were respectively as follows:—Woollens, L.7,199,392; silks, L.17,415,860; cottons, L.2,811,630; linens, L.731,429; total of textile fabrics, L.28,158,311.[2] The exports of like fabrics during the preceding year, 1856, amounted in the aggregate to L.29,379,574, showing a decrease in 1857 of nearly a million and a quarter.[3] Those of 1858 are not before us in a complete form, but it appears that in the article of woollens the exports had fallen from L.7,199,000 to L.6,320,000. Nothing is more salient in the history of the textile arts than is the evidence of their eminent congeniality with the powers, tastes, and predispositions of the French people, unless it be the evidence that their old "protective" system—now, it may be hoped, in a very decrepit condition—has most ingeniously diminished the natural results of that congeniality. Those branches which have been most protected have been least developed. The distinguished reporter of the 13th Jury at the Great Exhibition, M. Arles Dufour, took occasion to invoke "the attention and the meditation of those who are called to the government of France" to the fact, that her prosperous silk manufacture has "happily been forgotten when, with the view of protecting national industry, governments have established their prohibitions or prohibitive duties, and have given their bounties. This section of textile industry has never been shackled or lulled to sleep by any of those favours so onerous to the country at large, and so fatal to the receivers." It may now be added, that this neglected branch of the weaving arts shows an export of seventeen millions sterling, against the eleven millions of all the protected branches together. Certainly, it was time to direct attention to such facts as these, and it may well be imagined that they have not been without their influence on recent policy. (E. E.)

[1] Exclusive of such textile fabrics as may be included under the customs heading, "Apparel, Haberdashery, and Millinery." These figures are taken from the Seventh *Statistical Abstract for the United Kingdom*, published by the Board of Trade, and issued to the public in June 1860. They differ very materially from other statements purporting to represent the same facts, and also of recent but unofficial publication.

[2] *Tableau Général du Commerce de la France, ... pendant l'Année* 1857, pp. 283-301.

[3] Ibid., *pendant l'Année* 1856, p. 269

WEBER, Carl Maria Von, was born at Eutin, in Holstein, on the 18th[1] of December 1786. His father, a lover of music and a skilful violinist, not only had him carefully educated, but encouraged his musical pursuits, as well as his fondness for painting, in which last art it appears that he made considerable progress. The retired habits of his family threw him early upon his own resources for amusement, and his passion for music speedily became predominant, and exclusive of all other occupations. As his father often changed his place of residence, Weber's music-teachers were likewise often changed; and with this disadvantage, that as they did not agree in their methods and opinions, what one of them had taught, his successor untaught. This forced Weber to reflect, and to become his own instructor. In 1796–7 he received valuable lessons in pianoforte playing from Hauschkel of Hildburghausen. He was next placed under the care of Michael Hadyn at Salzburg for composition, but made little progress under that master, who was then very old. In 1798 his first work of six *Fughetti* was published at Salzburg, and was well received. Weber then proceeded to Munich, where Valesi became his master in singing, and Kalcher in composition. From Kalcher he acquired much knowledge of the art of counterpoint, which laid a solid foundation for his future studies. While under Kalcher's tuition, he composed his first opera, *Die Macht der Liebe und des Weins* (the Power of Love and Wine); besides a mass, sonatas, and variations for the pianoforte, violin trios, songs, &c., all of which he afterwards destroyed. His next opera, *Das Waldmädchen* (the Wood Girl), was performed in November 1800, and met with more success at Vienna and St Petersburg than he himself was pleased with afterwards, when his judgment had become more matured. In 1801 he composed at Salzburg his opera, *Peter Schmoll und seine Nachbarn* (Peter Schmoll and his Neighbours), which was performed at Augsburg, but with indifferent success. In 1802 he went on a musical tour with his father to Leipzig, Hamburg, and Holstein, and during this time studied a number of theoretical works, from which, it seems, he derived little benefit. Dissatisfied with these, he endeavoured to form a system of his own, and to apply it to an analysis of the works of the old composers. In this he succeeded to his own satisfaction. The next important step in his career was his visit to Vienna, where he became acquainted with several eminent musicians, among others Haydn and Vogler, under the latter of whom he studied hard for about two years, enriching his mind and developing his powers by a close examination of various masterpieces of composition. Meyerbeer, Gänsbacher, and G. Weber, were at this time his fellow-pupils under Vogler. During these studies he only published some variations and a pianoforte arrangement of Vogler's opera of *Samori*. Being called to Breslau as music-director, he availed himself of his new position to obtain a knowledge of choral and orchestral effects. At Breslau he composed the greater part of the opera of *Rübezahl* (Number Nip). In 1806 he was invited by Prince Eugene of Würtemberg to his court at Carlsruhe in Silesia, and there composed two symphonies, some concertos, and other pieces. War having driven him from this asylum, he resolved to abandon his public career till more favoured by circumstances; and he resided for some time in private tranquillity in the house of Duke Louis of Würtemberg. There he composed his opera of *Silvana*, on the basis of his *Die Waldmädchen*, and also wrote a piece named *Der erste Ton* (the First Tone), besides some overtures, choral pieces, and pianoforte works. In 1810 he again set out on a professional tour through Germany, and from this time devoted himself entirely to his art. At Frankfort, Munich, Berlin, Vienna, &c. he and his works were most favourably received. His opera of *Abu Hassan* was composed at Darmstadt in the same year. Between 1813 and 1816, he was opera-director at Prague; but giving up that post in 1816, he ceased from his musical occupations for a time, contenting himself with visiting various places, and quietly waiting till he should be called to new and greater exertions. At Prague he produced his celebrated cantata, *Kampf und Sieg* (Battle and Victory). He declined various liberal offers that were made to him, until he was induced to accept an invitation to form a German opera at Dresden. There he composed his opera, *Der Freyschütz*, which was first performed at Berlin in 1822, with extraordinary applause. At Dresden he produced in 1822 a drama called *Preciosa*, which was most favourably received. His opera of *Euryanthe* was also composed at Dresden, but first brought out under his direction at Vienna in 1823, where, as he himself says, "it was received with indescribable enthusiasm." At Berlin his Euryanthe was rather coldly received, and was there nicknamed by some musical critics *L'Ennuyante*. It has been said that the *Libretto* of this opera was so confused and ill constructed as to overpower the beauty of the music. A three-act comic opera, *Die drei Pinto* (the Three Pintos), which Weber had begun at Dresden, remained unfinished, and was bequeathed by its author to his friend Meyerbeer, with a request that he would complete it. In 1822 Weber suffered from pulmonary illness, and still more severely in 1825. He appears, from some expressions in his letters, to have anticipated a premature death; and, unhappily, his prognostics were too speedily verified. In 1824 he began his opera of *Oberon* for London, which he appears to have finished about the end of 1825 or the beginning of 1826. At the end of February 1826 he set out for London, where he made his first appearance on the 8th of March at Covent Garden, as conductor of a selection from *Der Freyschütz*, and was received in the most enthusiastic manner. At this time his countenance betrayed the deep impress of mortal disease. On the 12th of April 1826 his opera of *Oberon, or the Elf-king's Oath*, was performed at Covent Garden Theatre, and conducted by Weber himself, who was again greeted with the strongest testimonies of public favour. We now approach the melancholy close of this eminent artist's career. On the 26th May his benefit concert took place in the Argyll Rooms, but was very thinly attended. On this occasion, bodily illness and mental vexation so affected him that he was barely able to go through his duties as conductor. After the performance he sunk upon a sofa in an alarming state of exhaustion. Ten days afterwards, at seven o'clock in the morning of the 5th of June, he was found dead in his bed at Sir George Smart's house, where he had resided from the time of his arrival in London. On opening the body the same afternoon, the three physicians and the surgeon in attendance found the larynx and the lungs so diseased as sufficiently to indicate the cause of his death. Weber left a widow and two children. Unhappily he had no relative near him to close his eyes. His remains were interred in the vaults of the Catholic chapel, Moorfields.

The Oldenburg government ordered a bronze statue of Weber to be erected in Eutin; and also commanded that his works should be engraved on copper, and the plates preserved in the ducal library. Impressions were to be sent as presents only to the different sovereigns of Europe. The artists of the King's Chapel at Dresden raised a subscription for removing Weber's body from London, to a tomb which was erected for it in the public cemetery of that city.

Weber was an excellent pianist, but does not seem to have pushed himself forward in that capacity. He ex-

[1] According to Weber's own account, he was born on the 18th; according to another account, on the 16th of December.

Weber. pressed himself most vehemently against all those who composed music by the aid of any instrument. He is described as a man of small stature, very thin, with an intelligent countenance; sensible, well informed, and very unobtrusive. His temper seems to have been amiable, and we do not find any traces of its being seriously ruffled, except on the occasion of Castil Blaze's piracy of the *Freyschütz* for the Odéon at Paris. Then indeed he wrote two very sharp letters to Blaze, dated 15th December 1825, and 4th January 1826, but without obtaining answer or redress. A number of interesting particulars regarding him are to be found in some of his own letters and other papers, published under the title of *Hinterlassene Schriften von Carl Maria von Weber* (Posthumous Writings of C. M. von Weber), in 2 vols. 8vo, 1828. Among these are, his Autobiography, and "The Life of a Composer."

We have already mentioned his principal works, and their very favourable reception. It has been said that, in his Freyschütz and other operas, he borrowed largely from old popular German airs, and that he has no great claims to originality. If he adopted much from others, the children of his adoption were at least splendidly clothed and richly entertained. Still there is much of originality and beauty in Weber's works, though it may be granted that he more frequently depends upon bold effects of harmony and modulation than upon melodic invention and expression. The example of Mozart, extended by Beethoven, Rossini, and Weber, led to that system of unlimited modulation which has now become more familiarized to the musical public, though not yet relished except by the initiated. The whole history of music shows that the public ear is only gradually trained to innovations in harmony and modulation; and even at this day, some of the most elaborate works of Sebastian Bach, and his son Emanuel, are *caviare* to the multitude, from their extreme abstruseness.

Beethoven's magnificent opera of Fidelio, produced in 1805, gave a new impulse and direction to the German opera. The powerful influence of this great work is very perceptible in the operas of Weber and other German composers within the last thirty-five years. So is the influence of Beethoven's pianoforte music upon that of Weber and others. Although Weber cannot be compared with Beethoven for original and powerful genius, fertility and sublimity of invention, still he must be considered as a great master, possessed of much dramatic talent, great knowledge of his art and of orchestral effect, and a high degree of brilliancy and gracefulness in composition. His faults are, occasional dry and harsh construction, want of unity in melody and of determinate rhythm, and the occurrence of what are technically termed *strangled modulations*. Indeed, violent contrasts in harmony and modulation; fragmentary snatches of melody, often hard and dry, without leading and sustained subjects; the abuse of chromatic passages; vague and disjointed rhythm; are the faulty characteristics of too many composers of the modern German school when carrying license to extremes. This style may be called the transcendental dithyrambic of music; wild, disorderly, heterogeneous, anti-rhythmical. Weber, however, redeems his occasional faults by a profusion of beauties. His printed works are numerous. Besides the operas mentioned above, they consist of concertos, concertinos, pots-pourris for the pianoforte, the clarinet, the oboe, the bassoon, and the violoncello; sonatas, variations, polonaises, &c.; symphonies and overtures, among which last the overture *Der Beherrscher Geister* (the Ruler of the Spirits) is remarkably characteristic of Weber's peculiar style. Many of his songs published in collections are trifling; but his four-part songs, with pianoforte accompaniment, named *Leyer und Schwerdt* (Lyre and Sword), words by Körner, are excellent. A posthumous work of Weber's, a Stabat Mater for two soprana voices and one alto, was in 1826 intrusted by his widow to the music-director Rungenhagen of Berlin for publication. In his autobiography, he says that the following words may with justice be inscribed upon his tombstone: "Here lies one who meant honestly, and wished to act uprightly, both towards his art and towards his fellow-men." (G. F. G.) Webster.

WEBSTER, Daniel, one of the greatest of modern as assuredly of American statesmen, was born at Salisbury in New Hampshire in 1782. His birthplace was on the very outskirts of the civilized part of the country, and his early education was, therefore, necessarily very defective. He, however, made a good use of the opportunities which he enjoyed, and as his constitution was naturally weak, which disqualified him for robust labour, his father resolved to dedicate him to one of the learned professions. At the age of fourteen, he was placed for some time at a flourishing academy in Exeter, and the next year he was transferred to the charge of a clergyman in the town of Boscawen. While on the way to Boscawen, his father revealed his intention of even giving him what was then exceedingly rare in the States—a college education; and young Webster was so overpowered with a sense of his father's kindness, that he could not speak, but laid his head on his father's shoulder and wept. In 1797, he entered the college of Dartmouth, and passed the four years of his attendance there in regular study, occasionally varying the routine of a student's life by efforts at composition. On completing his college course, he entered the office of Mr Thompson to study law, but, unable to maintain himself, he became teacher of an academy at Fryeburg, and supplemented his pittance by copying law-deeds in the evenings for the county registrar. With the money thus honourably procured by unremitting labour, Webster returned to his law studies under Mr Thompson, where, besides mastering Coke and Blackstone, he acquired a considerable knowledge of the Latin classics, of English history, and Shakspeare. In 1804, he removed to Boston, and for a few months pursued his legal studies under the superintendence of Mr Gore—a lawyer of considerable experience, whose counsel he found of the greatest benefit. To his advice on one important occasion the future career of Webster is perhaps owing. Just before he was called to the bar, he was offered the post of clerk in the Court of Common Pleas for one of the counties in New Hampshire, and, at the earnest request of his friends, he was about to accept it, when Gore remonstrated, and, by pointing out the folly of sacrificing all his hopes of advancement, succeeded in inducing him to relinquish what was to him then a tempting offer. On his admission to the bar, Webster, in order to be near his father, who was in very infirm health, established himself at Boscawen, but, on his father's death in 1807, he removed to Portsmouth—the largest town in his native state. Here, for nine years, he applied himself to the routine of a professional life, and gradually acquired the reputation of the ablest lawyer in the state. Up to this period, Webster had taken no share in public business. In 1812, however, he was elected a member of Congress; and, in the important business on which Congress was consulted at its meeting the next year, he received his first initiation into the management of state affairs. All the talent of the States was then to be found in the House of Representatives—Clay, Calhoun, Lowndes, Pickering, and others of minor note, were among the members; yet, even among such rivals, Webster soon became conspicuous for his eloquence and ability; and the discerning eye of more experienced politicians could perceive in him one of the rising hopes of the statesmanship of the country. So highly was he appreciated, that Mr Lowndes said of him, "the North has not his equal, nor the South his superior." The States were then in a ferment from the injury done to their commerce by the notorious "Orders in Council," which the British government had issued; and Webster was one of

Webster. the most energetic in advising the increase of the national navy, so as to afford adequate protection to their commerce; and he had, of course, corresponding gratification in witnessing the success which attended the Americans in their early encounters by sea. On many other subjects that came before the house, Webster spoke with distinguished ability; and one important act, known as the "special resolution," which set the currency of the country on a sound basis, was owing, in a great measure, to his eloquent advocacy.

In 1816, Webster removed to Boston, where he devoted himself with unwearied assiduity to his professional duties, and soon became famous for his management of cases in which great constitutional points were involved. One of the earliest of these great cases was that which respected his *alma mater*, Dartmouth College. The legislature of New Hampshire had passed acts by which the charter of the college was considerably altered. The governors under the original charter appealed against the enactments of the Legislature, and the question was at length carried before the Supreme Court at Washington. Webster appeared as the advocate of the appellants; and a convincing oration, which is described as having produced an extraordinary effect upon all who heard it, procured a decision in his favour, and at once placed him in the foremost rank of American lawyers. From this period (1819), he was retained in almost all the important cases before the Supreme Court; and as most of those on which he was employed involved constitutional questions of general interest, his name was soon familiarly known over the whole Union. In consequence of the prominent position which he now occupied in public esteem, he was selected, in 1820, to deliver at Plymouth, on the 22d of December, the anniversary of the landing of the Pilgrim Fathers, an address commemorative of the great event of the day. For the same reason, he was invited to preside at the laying of the foundation-stone of the Bunker Hill Monument in 1825; and the eloquent addresses which, on both these occasions, he delivered, increased the reputation which he deservedly enjoyed. The estimation in which he was held in Boston was sufficiently indicated by his being elected in 1822, by a very large majority, member of Congress for the town; and their confidence was still further exhibited by his almost unanimous re-election to the office two years later. In 1827 he was, by a large majority, elected a member of the Senate; and all eyes were now turned to him as one of the most influential statesmen of the Union. In all the important transactions that came before Congress, he took a leading part; and his speeches on various subjects of national concern were read with interest throughout the States, and do not suffer by comparison with those of any parliamentary orator in our own country. His most famous oration was that delivered in 1830, nominally on a motion about the sale of the State lands, but in reality against what is called in the States the principle of "nullification," —the right, that is, of a particular state to dissolve its connection with the Union by treating the acts of Congress as null. All accounts represent this oration as having produced an extraordinary impression on its delivery; and though its eloquence would be considered too high-flown for a British senate, even the most fastidious taste cannot but admire the patriotic and noble sentiment which flows in such a copious stream from the lips of the impassioned orator.

In 1839, Webster crossed the Atlantic, and made a short tour in Britain and France. His fame had preceded him to this country, and he was accordingly received with a respect not usually accorded to foreigners who come to visit us in an unofficial capacity. On his return to America, he was appointed by the President Harrison, Secretary of State for Foreign Affairs. The relations of America with this country were then in a somewhat precarious condition. The boundary line between the British possessions and the United States had never been definitively settled, and, both on the north-east and north-west, disturbances were constantly occurring which threatened to involve the nations in war. Through the ability and courtesy of Webster and Lord Ashburton, the British minister, a treaty was negotiated which settled the north-eastern boundary in a manner satisfactory to all parties; and a proposal was at the same time made for the settlement of the Oregon boundary question, which was subsequently carried into effect. Having performed this service to his country, Webster, in 1833, resigned his office and retired to private life. In 1844, however, he again resumed his seat in the Senate, and signalized himself by his opposition to the unconstitutional annexation of Texas, and, of course, to the war with Mexico, which it provoked. In 1848, he was proposed as a candidate for the presidency against General Taylor, the hero of the Mexican war, but failed—for how could a mere civilian, backed only by forty years' reputation for eloquence and sense, stand a competition in popular favour with a conqueror fresh from the field of glory? Though naturally disappointed at the slight, Webster still gave his country the benefit of his talents and knowledge; and in 1850, on the president's death, Fillmore, who succeeded temporarily to the vacant honour, appointed him head of the administration which he formed. This office he retained till his death in 1852, at his estate of Marchfield, in the vicinity of Boston.

Webster || Wedgwood

His speeches were collected in six volumes at Boston the year before his death, and have been published with a short biographical memoir by Edward Everett. Of his ability as a statesman, only one opinion exists either in this country or America—all agree in placing him at the head of the statesmen which the United States have produced.

WEBSTER, *John*, a distinguished dramatic contemporary and successor of Shakspeare, of whom hardly anything is known, save that, after writing plays in conjunction with Dekker, Drayton, Middleton, Munday, Chettle, Heywood, and Wentworth Smith, he published, on his own account, the powerful dramas of *The White Devil*, in 1612; of *The Duchess of Malfi*, in 1623; and of *Appius and Virginius*, in 1654. If his pathos is sometimes too laboured, and if his command over terror is frequently overstrained, he at least pursues the high purposes of the drama throughout with an earnestness which few have equalled. Webster's works were first collected and edited in 1830, by the Rev. Alex. Dyce.

WEBSTER, *Noah*, author of the *New and Complete Dictionary of the English Language*, was born at West Hartford, Connecticut, United States, on the 16th of October 1758. He entered Yale College in 1774, where he graduated in 1778 with much distinction. Though called to the bar in 1781, he did not practise law, but turned aside to the profession of teaching. He wrote a number of elementary educational works, which were much esteemed during their day, besides taking a leading part in the discussion of American politics, of which his *Sketches of American Policy* still afford a monument. The great work of his life, however, was his *Dictionary*, published in 1828, at which he laboured for twenty-one years, and which, in its explanations, was considerably in advance of any English dictionary then in existence, but of which the etymological portion was more showy than profound. After receiving from his college the degree of LL.D., Webster died at Newhaven, May 28, 1843.

WEDGE. See MECHANICS.

WEDGWOOD, JOSIAH, the great improver of British pottery, was born at Burslem in 1730. His father was a potter, and, at the early age of eleven, Josiah was set to work at the wheel in his father's pottery. He subsequently began the same business on his own account, and,

Wednesbury || Weedon-Beck.

with characteristic love of improvement, he was the first to adopt a bell for assembling and dismissing the workmen,—a circumstance which procured for his manufactory the surname of the "Bell" works. His efforts were directed to the production of a new species of ware superior to that in ordinary use, and he was successful in producing a cream-coloured porcelain, which was called "Queen's ware," from the patronage extended to it by Queen Charlotte. Other improved materials were subsequently invented; and he was equally successful in improving the style and decorations of British pottery. For the tasteless forms which had hitherto characterized British ceramic art, he substituted graceful imitations of the antique; and ornamented his porcelain with the designs of Flaxman, instead of the tasteless decorations which uneducated artists had hitherto employed. His improvements were at once appreciated by the public, and were rewarded by a magnificent fortune. His manufactory had been established at Burslem; but in 1771 he removed to a village in the neighbourhood of his mansion, and which he named Etruria, in compliment to the state which had been most distingnished in the ancient world for the excellence of its pottery. Wedgwood's ingenuity was not confined to his own profession; he cultivated natural philosophy with distinguished ability, and invented a pyrometer for measuring high degrees of heat by an ingenious use of the contraction of clay when exposed to high temperatures. He was also distinguished for his public spirit; he was mainly instrumental in proposing and accomplishing the construction of the Grand Trunk Canal, which joins the Mersey, the Trent, and the Severn. He was a distinguished patron of merit, and distributed his private benevolence with princely liberality. Wedgwood may be considered a national benefactor, as through his labours the productions of the British potteries have become an important article of export, and their manufacture gives employment to a large population. He died in 1795.

WEDNESBURY, or WODENSBURY, a market-town of England, in the county and 21 miles S.S.E. of Stafford, near the source of the Tame. It stands on the slope of a hill, in a great coal and iron district, and most of the inhabitants are employed in the coalpits and ironworks in the vicinity. The church, which occupies the site of an ancient Saxon castle on the top of a hill, is a beautiful Gothic edifice, with a lofty and elegant spire. It contains some fine carved wood and ancient monuments. Two other churches have recently been erected; and the Methodists, Baptists, and Independents have places of worship in the town. Education is provided for by national, British, and other schools; and there are several charitable establishments, and a mechanics' institute. Valuable iron and coal, as well as limestone and other minerals, are obtained in the vicinity; and the principal manufactures of Wednesbury are those of various kinds of ironmongery, muskets, nails, tools, &c. A considerable trade is carried on; and several railways and canals facilitate the conveyance of the manufactured goods to other parts of the country. Pop. (1851) 11,914.

WEDNESDAY, the fourth day of the week, so called from the Scandinavian god *Woden*, supposed to be the Mars of the Romans.

Ash WEDNESDAY, the first day of Lent, so called from the custom observed in the ancient Christian church, of penitents expressing their humiliation at this time by appearing in sackcloth and ashes.

WEEDON-BECK, a village of England, in the county of Northampton, near the source of the Nen, 4 miles E.S.E. of Daventry. It has an ancient church, partially rebuilt in 1825; places of worship for Wesleyans, Independents, and Roman Catholics; an endowed school, infant school, and some charitable establishments. Here is the central military depôt for England, covering a space of 150 acres, and containing large and handsome barracks, storehouses for artillery and small-arms, powder magazines, hospitals, and various workshops. It is garrisoned by a regiment of the line. Weedon is a principal station on the London and North-Western Railway, and the Grand Junction Canal passes through the village. Pop. of the parish (1851) 2195.

Weighing Machine.

WEIGHING MACHINE. The common turnpike weighing machine is a compound *steelyard* (see BALANCE), and is used for ascertaining the weight of loaded carts. The apparatus, of which a ground-plan is here given (fig. 1), is arranged in a box A B C D, which is about 12 inches deep, and is sufficiently sunk in the ground to place the highest part of the completed machine on a level with the line of road. A fixed wooden bridge, by which the horse may pass across the machine, is laid over the middle part of the box. At each side of this bridge is a metal wheel-tract. On these the cart is rested by its two wheels and a prop-staff. The tracks are fixed to and borne up by a platform (or skeleton frame) placed below the wooden bridge, but above the works. The platform has four short feet, the lower ends of which are formed into small hemispherical cavities. These cavities rest at E F G H, on pointed studs about an inch long. The two studs at E and F are fixed on the crooked lever A K B, with their points upward, and the two at G and H are similarly fixed on the companion lever D I C. Sharpened studs, also about an inch long, project downward from the four extremities of the crooked levers. The points of these studs rest in small hemispherical cavities, formed at the upper ends of blocks which are fixed as bearers for them in each corner of the box. The short parts of the crooked levers parallel to O L, and near the middle of the box, have their under edges sharpened, and rest on the angle of a sustaining fulcrum I K, which passes through, and is fixed to the lever O M. This lever is also crossed at L by the fulcrum which forms the common centre of movement for the whole machine. The angle of the fulcrum points downward, and rests, as in the ordinary balance, on concave arcs, situated one on each side of the lever O M. These arcs are formed on the upper end of a block, which rises from and is fixed to the bottom of the box. The lever is again crossed at M, by a fulcrum having its angle pointing upward; and from this angle a receiving-scale for the weights is hung by a shears or double ring. In cases where it is wished that the machine when unloaded should preserve equilibrium, the lever O M is prolonged to the left, and loaded at that end, to the extent requisite to balance the weight of the levers.

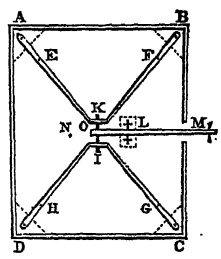


Fig. 1.

A side view of B K, one of the limbs of the crooked lever A K B is here given, in the direction of the diagonal B D. The lever, as shown in fig. 2, is kneed to an extent sufficient to admit of the angular points of the fulcra being placed in the same horizontal line. The other limb, A K, is of the same shape. The form of the entire lever, A K B, is thus easily understood. Its companion lever, D I C, is of the same construction. The limbs of the levers are therefore so shaped that the fourteen sharp bearing-parts of all the fulcra are situated, during equilibrium, in one horizontal plane. These bearing-parts, and the parts they bear against, are all formed of polished steel.


Fig. 2.

If now E A be supposed a tenth part of the length of E K, then 100 lb. placed on the platform, or on the wheel-tracks, and pressing, therefore, on the studs E F G H, will

be sustained by 10 lb. of an upward pressure at I K. And if, again, O L be a tenth part of L M, the 10 lb. of upward pressure will be given by 1 lb. placed in the receiving scale at M. These proportions are assumed, for easy arithmetical illustration; but in the practical construction of the machine, the distance between the resting-points at E A, and at O L, is made to bear a greater ratio to the distance between the resting-points at E K, and at L M, than has here been supposed. Instead of using a receiving-scale, the lever O M may be prolonged to the right, and graduated as a steelyard. And in machines where an upward instead of a downward pressure is given at M, the lever O M is prolonged to the left, and the fulcrum L and its resting-block removed to N.

Machines consisting of variously modified systems of levers have been used for a considerable period. The one above described is that generally employed. The arrangement of the levers is well conceived, and suited for the purpose to which the machine is chiefly applied. Its first contrivance and employment is said to have been for weighing the riders of race-horses.

H. D. Schmidt of Vienna exhibited a model of a weighing-table, in which the mode of suspending the platform on a quadruple lever, and connecting this lever with the steelyard, was the same as usual. But there was a good arrangement for relieving the steel fulcra of the levers when the machine is not in use from the weight of the platform, and of carriages passing over it. Under the points where the platform rests the four levers are furnished with bosses projecting downward, and nearly touching the upper surfaces of four short pillars of iron fixed in the masonry at the bottom of the pit. When the machine is not required for weighing, the long end of the lever is lowered, together with the steelyard, counterpoise, and framework, by means of a winch and screw, until the bosses of the levers rest on the pillars beneath, and these support the platform and any carriage moving over it. On raising the frame with the steelyard and the end of the long lever, the weight of the platform is thrown on its fulcra, and the machine is ready for use.

H. Pooly and Son exhibited a locomotive weighing-machine, consisting of a system of three tables, placed so that a locomotive running over them may have each pair of its wheels on a separate table. The three counterpoises may then be adjusted until each one correctly balances the proportion of the weight bearing on its table. A bar with a light lever, and a handle projecting from it over each steelyard, enables the attendant standing opposite the centre one to check the vibrations of all three, and inspect with accuracy the state of adjustment. By the use of this multiplied weighing-machine, the proportion of weight borne by each pair of wheels may be tested, and the inquirer is thus enabled to alter the adjustment of the springs, until he has secured such a distribution of the load as shall be most likely to lead to good working.

The principles on which weighing machines in general rest are briefly stated under MECHANICS, § 148 (D). See also BALANCE for a notice of *Steelyards*, the *Hydrostatic Balance*, the *Balance of Torsion*, &c.; while some other kinds of balance, employed for special purposes, will be found under different heads. (C. T.)

WEIGHTON, MARKET, a market-town of England, in the East Riding of Yorkshire, and 19 miles E. S. E. of York, on the small river Foulness. It is a small place, and has in the middle of the town an ancient church with a square tower. There are also Independent and Methodist places of worship, and national schools. Some trade is carried on in corn, cattle and sheep, which is facilitated by the Market Weighton Canal, extending to the Humber, and by the railway to York. Pop. of the parish (1851) 2269.

WEIGHTS AND MEASURES.

BY *weight*, or, as some call it, the *measure of weight*, is meant the apparent force or tendency which any body or commodity has to descend; and which, owing to the centrifugal force of the earth's rotation, and the buoyancy of the air or other medium in which the operation of weighing is performed, is somewhat less than its real force, the latter being always proportional to the intensity of gravity multiplied by the mass weighed. Accurate weighing is of great importance, since in general it affords one of the best practical means of ascertaining the quantity of matter in bodies, and thence the values of the greater part of the necessaries of life. But although, in most cases, the buoyancy of the medium may have some effect, however small, it is evident that any difference in the intensities of gravity, or of centrifugal force in different latitudes, or even on different planets, can, *cæteris paribus*, make no difference on the weights of bodies as obtained by counterpoising; but the weight, when indicated by the force or resistance of a spring, will, *cæteris paribus*, be proportional to the intensity of gravity. The term *measure* in the present article more properly applies to the three following kinds of magnitudes, sometimes called geometrical: 1st, linear extent, such as the length or other lineal dimensions of bodies; 2d, area, surface, or superficial extent; 3d, the bulk of bodies, or the solid space occupied by them, and which, when spoken of the vessels which measure or contain them, is called their contents or capacity. This article, then, is meant to treat of the usual standards of weights and measures, by comparison with which the amount of any article or commodity is ascertained, whether in the ordinary affairs of life, the more extensive transactions of commerce, or where greater nicety is required in the arts and sciences. Anciently standard weights or counterpoises were generally of stone, though sometimes of metal. At present mostly all the smaller standard weights are made of some metal possessing such a composition and hardness as may be less liable to be worn or corroded, counterfeited or altered; and one of the best is a mixture consisting principally of copper and tin. The larger weights are generally of iron, though sometimes of stone. The more accurate standards of length are likewise of metal, but the larger sort is very generally of wood: chains, cords, and tapes are also used. The nicer measures of capacity are formed of metal or glass, but the larger and more common sort is mostly all of wood. After what immediately follows on the equalization of the standards in the British empire, by the late Dr Thomas Young, and his very compendious general table, we have added a more particular though brief account of the principal weights and measures at present used in different parts of the world.

The preparation of the bill for ascertaining and establishing Uniformity of Weights and Measures, which passed the Imperial House of Commons in the session of 1823 (though without having been then carried through the House of Lords), had given occasion for a laborious and somewhat painful examination of the historical progress of the measures which have been taken respecting it, and especially of the laws of England respecting uniformity of practice in different parts of the country; for such a uniformity, though generally esteemed by all governments a thing to be encouraged and enforced, had often seemed to

Weights and Measures.

be no more subject to the control of legislative enactment than the introduction of a uniformity of language and a grammatical accuracy of speech would be in every part of an extensive empire.

Augustus is said to have endeavoured in vain to force a new Latin word into the language of ancient Rome: the French, on the other hand, after all their labours to recommend a uniform system of measures, have ended in such a complication, that, for the most simple purposes of practical mechanics and civil life, it is become usual to carry in the pocket a little ruler, in the form of a triangular prism, one of the sides containing the old established lines and inches of the royal foot, a second the millimetres, centimetres, and decimetres of the revolutionary school, and the third the new ultra-royal combination of the Jacobin measure with the royal division, the inches consisting of the 36th part of a metre, or the four-millionth of a degree of the meridian of the earth. If such occurrences as these be calmly considered, they will make us more disposed to diminish than to increase the number of penal statutes intended to compel the inhabitants of the different parts of a country to study their own convenience conjointly with that of their neighbours, and to spare themselves the necessity of a few arithmetical operations in the course of every market-day; and we shall feel that it is more incumbent on a wise government to endeavour to facilitate both the attainment of correct and uniform standards of legal existing measures of all kinds, and the ready understanding of all the provincial and local terms applied to measures, either regular or irregular, by the multiplication of glossaries and tables for the correct definition and comparison of such terms.

Measures have apparently always been derived, in the first instance, from some part of the human person. A foot, a pace, a fathom, the orgyia or stretch of the arms, a cubit, a palm, and a finger; these have probably all been used in the earlier states of society by each individual from the magnitude of his own person; and afterwards a standard measure has been established by authority from the real or supposed magnitude of the person of some king or hero, in order to the attainment of more perfect uniformity in practice; though it is said, that in some parts of the east the Arabs still measure the cubits of their cloth by the forearm, with the addition of the breadth of the other hand, which serves to mark the end of the measure, as the thumb which was formerly added at the end of the yard by the English clothiers. It ought not, however, to be forgotten, that any one of these terms possesses an advantage for popular use, and for the convenience of future ages and of remote countries, which would be lost by the introduction of any more arbitrary measurement. Thus a hand-breadth, or a foot, is always sufficiently understood, without any definition, to enable us to form to ourselves a tolerably accurate picture of the magnitude intended to be described; and there is scarcely an instance of the caprice of denomination having ever extended so far as to make the measure called a foot in any country so small as half a natural foot, or so great as two feet of an ordinary person, and certainly not of its amounting to three ordinary feet; while a metre, even to those who know that the word implies a measure, might as well have meant a mile, or an inch, or a quart, as a length somewhat greater than a yard.

The idea of accurately verifying the standard of a country by any other means than that of a comparison with some actually existing original, can scarcely have occurred, except in a very advanced period in the progress of civilisation. It was indeed enacted in the time of our Henry the Third, that an ounce should be the weight of 640 dry grains of wheat taken from the middle of the ear, that a pound should be twelve ounces, a gallon of wine eight pounds, and eight gallons of wine a bushel of London; but this seems rather a direction for making a single standard than a mode intended for the continual verification of the standard in case of any minute uncertainty. Again, in a statute of Henry the Seventh, a gallon of corn was mentioned as containing eight pounds of wheat: and this may perhaps serve to explain the origin of the two different gallons. But the substitution of an original standard derived from an object of definite magnitude, exterior to the human person, seems to have been reserved for the days of the French Revolution, though it has since been adopted in an improved form by the introduction of a foot equal to $\frac{12}{38}$ of the pendulum vibrating seconds, as a representative of the customary foot of the kingdom of Denmark. (*Quarterly Journal of Science* for 1821, *Astr. Coll.* No. V.)

Weights and Measures.

The Royal Society, under the presidency of Mr Folkes, made some very accurate comparisons of the English, and French, and old Roman standards, which are recorded in the *Philosophical Transactions* for 1736, 1742, and 1743; and George Graham, the eminent watchmaker, determined at the same time the length of the pendulum vibrating seconds to be 39·130 inches; but the standard with which he compared it requiring some reduction, it was afterwards ascertained that the length, as derived from these experiments, ought to have been more nearly 39·14 inches.

A committee of the House of Commons was appointed in 1758, of which Lord Carysfort was chairman. Their Report contains some important information respecting the standards then in use. They found that the customary ale and beer gallon of the Excise was estimated at 282 cubical inches, while the legal wine gallon of the Exchequer was computed at only 231, though the only existing standard of the wine gallon in 1688, which was kept at Guildhall, contained no more than 224 cubical inches. They suggested the adoption of this smaller gallon for the legal standard, perhaps as being more favourable to the revenue, though the gallon of 231 inches had been previously legalized by the act of the fifth of Queen Anne; and they employed the well known Mr Bird to prepare two standards, which were to be exact copies of that which was made by Graham for the Royal Society in 1742, from a very careful comparison of the various yards and ells of Henry the Seventh and Elizabeth, which were kept in the Exchequer. One of the copies was marked "Standard Yard, 1758," and was presented by the committee to the House with the intention that it should be adopted as the legal standard; the other was made "with cheeks" for common use, and proposed to be kept in the Exchequer.

A subsequent Report of a committee appointed in 1759, consists principally of proposals for some legislative regulations, tending to facilitate the equalization of weights and measures by the establishment of proper methods of checking and authorizing the standards to be employed. In 1765, two bills were brought into the House of Commons by Lord Carysfort, in conformity with the Reports of the committees; but, from some accidental circumstances, they were not passed into laws.

Another committee was appointed in 1790; but no minutes of their proceedings have been recorded. In 1814 however a very important Report was presented to the House by a new committee, who had called upon Dr W. Hyde Wollaston and Professor Playfair for their opinions on the subject; and it was principally in consequence of these examinations that the committee stated that the length of the pendulum vibrating seconds had been ascertained to be 39·13047 inches, and that the metre of platina measured, at the temperature of 55°, 39·3828 English inches, representing at 32° the ten millionth part of the quadrant of the meridian. They remarked with great truth, that although in theory the original standard of weight is best derived from the measure of capacity, yet in common practice it will generally be found more con-

Weights and Measures.

venient to reverse this order; and they recommended, upon the suggestion of Dr Wollaston, that a gallon containing ten pounds of pure water should be adopted as a substitute for the ale and corn gallons, which had become different rather from accident than from any direct legislative authority, the one containing a little more than ten pounds, the other a little less, though the standards of the latter were extremely discordant among themselves. It seems to have been intended to abolish the wine gallon, which is also that of the apothecaries; though it was recommended to retain the use of the Troy weight of the goldsmiths, employed also by the apothecaries. It had before been observed, that twelve wine gallons of distilled water weighed exactly 100 pounds avoirdupois; but Dr Wollaston's proposal to make an ale gallon exactly of ten pounds, afforded a greater facility in the operation of adjusting the measure, since it is not very easy to divide 100 pounds into twelve equal parts, with the weights in common use.

Some very important experiments on weights and measures had been made a little before the date of this committee, by Sir George Shuckburgh Evelyn, who had published an elaborate paper on the subject in the *Philosophical Transactions* for 1798; and by the ingenious Mr Whitehurst, who obtained the length of the pendulum by measuring the difference of two lengths affording vibrations of different frequency. There were still some minute discordances between the various measurements, which appeared to be of the highest authority; and some particulars in the Report of the committee of 1814 are manifestly erroneous. Thus the weight of a cubic foot of water is stated, from a mistake in computation, to be 1000 ounces at $56\frac{1}{2}°$ of Fahrenheit, while, in fact, it is less than this even at 39°, the maximum of density; and again, the customary length of the English foot, which has always been adjusted at the ordinary temperature of the atmosphere, and rather at that of the summer than that of the winter, as, for example, in the great trigonometrical operations of General Roy and his successors, at 60° of Fahrenheit, was, in the experiments, copied by the committee from Pictet, compared with the French standard, which was intended to be employed at the freezing point of water, without any correction for this diversity; though Dr Young had long before pointed out the omission both in the journals of the Royal Institution and elsewhere, and had computed the true length of the metre according to these operations of Professor Pictet, confirmed by some earlier ones of Bird, Maskelyne, and Landale, to be 39·3710 English inches, instead of 39·3828.

In order, therefore, to remove any doubt which might still be reasonably entertained on the subject, Mr Davies Gilbert moved the House of Commons, in the year 1816, to present an humble address to the prince regent, praying that he would give direction that proper measures should be taken for ascertaining the length of the pendulum vibrating seconds, and for comparing the French and English standards with each other. In consequence of this address, the astronomer royal was in the first instance directed to perform the necessary operations; and, upon his asking for some further assistance, the president and council of the Royal Society were requested to appoint a committee to co-operate with him. This committee consisted, besides the president and secretaries, of the late Sir Charles Blagden, Mr Gilbert, Dr Wollaston, Dr Young, Captain Kater, General Mudge, Mr Brown, Mr Rennie, and Mr Troughton. They began by discussing the several modes of making the requisite experiments which occurred to the different members; and it was resolved, that as many of these methods as were preferred by each of them, should be separately carried into execution, in order to obtain collateral determinations of the required length. Mr Pond pursued the method of the French astronomers, and obtained some very satisfactory results, with an apparatus such as they had employed; Dr Young proposed a method derived from that of Whitehurst, and very perfect in theory, but somewhat complicated, and which has never yet been practically executed; Captain Kater invented with great ingenuity, and employed with great mechanical skill, an apparatus which does as much credit to his talents in the arrangement as to his perseverance in the experiments which he performed with it, and the accuracy of his determinations has been fully appreciated by mathematicians and practical astronomers throughout the world; and his operations have been repeated by many observers in different countries. It owes no inconsiderable part of its advantage to the property supposed to have been subsequently demonstrated by Laplace, that, even if the opposite knife edges were considerably blunted and rounded off, supposing both to be equally affected, the distance between them would still afford the true measure of the length of the pendulum without any further correction for the change of the axis of motion. It has also been demonstrated in this country by means of the experiments of Chladni on the elasticity of metals, that the temporary change of form depending on the compression of the steel edge, would be too inconsiderable to produce any sensible alteration of the length in question.

Weights and Measures.

The object of Dr Young's apparatus was to obtain two or more fine lines, traced at different parts of a scale, which should exhibit between them a certain determinate portion of the length of a pendulum vibrating seconds. He apprehended that the accurate determination of the form and direction of the knife edges, and the measurement of the distance between any such edges, which was necessary in the method proposed by Prony, as well as in that which was subsequently invented by Captain Kater, would require more skill and delicacy in the execution and the observation than could be expected from any common workman or experimenter; and though Captain Kater, by his extreme care in combating every source of error, has, in point of fact, apparently obviated all these difficulties, yet it cannot be expected that so rare a combination of qualifications should again be found, in case of a repetition of the experiments, and Dr Young's apparatus may still, at some future time, be employed with advantage, at least for a collateral check upon the results.

The obstacle which prevented the completion of the observations which were made for some time with this apparatus at Greenwich, was the difficulty of obtaining a scapement so delicate as to count the number of vibrations without sensibly interfering with their frequency. A very ingenious clockmaker was employed to furnish a scapement, of which the intention was to strike the pendulum slightly and instantaneously at the lowest point of its vibration, and then to recoil from it, so that even a considerable impulse might have little or no effect in altering the rate of the pendulum; but it was in fact observed, upon comparison with the clocks of the observatory, that the vibrations in larger arcs were more frequent than those which were performed in smaller; so that the scapement must have exerted a very considerable influence on the time of every vibration. It was therefore found necessary to abandon this method of making the experiment; but there would be no difficulty in conducting it very satisfactorily by means of a journeyman clock, with a wooden or brass pendulum, capable of having its length altered so as to become comparable with the vibrations of Dr Young's pendulum in its different states; and it might even be found sufficient to observe the pendulum, with the same scapement, so altered as not to give any impulse whatever, but merely to reckon the vibrations by means of the detent during the spontaneous vibrations of the pendulum, which, on account of its great weight, would be continued

for a considerable time in consequence of the first impulse, taking care that the detent should be struck exactly at the middle of the vibration, and that it should rebound in some measure from the pendulum at the moment of contact.

Before any attempt was made to introduce any legislative regulations upon the foundation of the various scientific experiments which had been so accurately and satisfactorily conducted, it was thought advisible by his majesty's ministers that the subject at large should be submitted to the deliberate consideration of some competent persons, who might discuss it more minutely than could be done with convenience before a committee of either house of parliament; and that a commission should be appointed for this purpose, by a writ of the privy seal. The commissioners thus nominated in 1818 were, Sir Joseph Banks, Sir George Clerk, Mr Davies Gilbert, Dr W. Hyde Wollaston, Dr Thomas Young, and Captain Henry Kater. [Since this article was first published, Captain Kater has, in the Philosophical Transactions for 1826, given a detailed account of these operations; and in the Philosophical Transactions for 1830 and 1831 he has pointed out a variety of nice adjustments and corrections to be made on them, which fortunately are too minute to affect any ordinary weights or measures. But Mr Sang has lately communicated to the Edinburgh Society of Arts a notice of some defects in these last corrections of Captain Kater.] Dr Wollaston examined some of the authorized measures of capacity, and Dr Young offered his services as secretary to the committee, with the assistance of a clerk who had studied the law, while Sir George Clerk and Mr Gilbert were employed in preparations for carrying into effect, in their legislative capacity, such regulations as the commissioners at large might agree to propose. The first occupation of the clerk was to make copious extracts from the statutes at large, by means of which Dr Young drew up an abstract of the present state of the laws relating to weights and measures; and the next to select from the agricultural reports of the different counties such materials as afforded a glossary of all the terms employed in any part of Great Britain for denominating the irregular weights or measures which have acquired a local currency in the agricultural or other commercial transactions.

After this sketch of the previous history of the subject, we may now proceed to extract from the Reports of the Commissioners, and from the bills founded on them, such statements as may either serve in the place of canons for the regulation of weights and measures in general, or as documents respecting the actual value of the various standards possessing the highest degree of authenticity; and this article cannot be more properly concluded than by subjoining some further comparative tables of the standards of measures and weights adopted by different countries and at different periods.

First Report.—"I. Upon a deliberate consideration of the whole of the system at present existing, we are impressed with a sense of the great difficulty of effecting any radical changes, to so considerable an extent as might in some respects be desirable; and we therefore wish to proceed with great caution in the suggestions which we shall venture to propose.

"II. With respect to the actual magnitude of the standards of length, it does not appear to us that there can be any sufficient reason for altering those which are at present generally employed. There is no practical advantage in having a quantity commensurable to any original quantity existing or which may be imagined to exist in nature, except as affording some little encouragement to its common adoption by neighbouring nations. But it is scarcely possible that the departure from a standard, once universally established in a great country, should not produce much more labour and inconvenience in its internal relations than it could ever be expected to save in the operations of foreign commerce and correspondence, which always are and always must be conducted by persons to whom the difficulty of calculation is comparatively inconsiderable, and who are also remunerated for their trouble, either by the profits of their commercial concerns, or by the credit of their scientific acquirements.

"III. The subdivisions of weights and measures at present employed in this country appear to be far more convenient for practical purposes than the decimal scale, which might perhaps be preferred by some persons for making calculations with quantities already determined. But the power of expressing a third, a fourth, and a sixth of a foot in inches without a fraction, is a peculiar advantage in the duodecimal scale; and, for the operation of weighing and measuring capacities, the continual division by two renders it practicable to make up any given quantity with the smallest possible number of standard weights or measures, and is far preferable in this respect to any decimal scale. We would therefore recommend that all the multiples and subdivisions of the standard to be adopted should retain the same relative proportions to each other as are at present in general use.

"IV. The most authentic standards of length which are now in existence being found, upon a minute examination, to vary in a very slight degree from each other, although either of them might be preferred, without any difference that would become sensible in common cases; we beg leave to recommend for the legal determination of the standard yard that which was employed by General Roy in the measurement of a base on Hounslow Heath, as a foundation for the trigonometrical operations that have been carried on by the Ordnance throughout the country, and a duplicate of which will probably be laid down on a standard scale by the committee of the Royal Society appointed for assisting the astronomer royal in the determination of the length of the pendulum; the temperature being supposed to be 62 degrees of Fahrenheit when the scale is employed.

"V. We propose also, upon the authority of the experiments made by the committee of the Royal Society, that it should be declared, for the purpose of identifying or recovering the length of this standard, in case that it should ever be lost or impaired, that the length of a pendulum vibrating seconds of mean solar time in London, on the level of the sea, and in a vacuum, is 39·1372 inches of this scale; and that the length of the metre employed in France, as the 10,000,000th part of the quadrantal arc of the meridian, has been found equal to 39·3694 inches.

"VI. The definitions of measures of capacity are obviously capable of being immediately deduced from their relations to measures of length; but since the readiest practical method of ascertaining the magnitude of any measure of capacity is to weigh the quantity of water which it is capable of containing, it would, in our opinion, be advisable in this instance to invert the more natural order of proceeding, and to define the measures of capacity rather from the weight of the water they are capable of containing, than from their solid content in space. It will therefore be convenient to begin with the definition of the standard of weight, by declaring that 'nineteen cubic inches of distilled water, at the temperature of 50°,' must weigh exactly ten ounces troy, or 4800 grains, and that 7000 such grains make a pound avoirdupois; supposing, however, the cubic inches to relate to the measure of a portion of brass, adjusted by a standard scale of brass. This definition is deduced from some very accurate experiments of the late Sir George Shuckburgh on the weights and measures of Great Britain; but we propose at a future period to repeat such of them as appear to be the most important.

"VII. The definitions thus established are not calculated to introduce any variation from the existing standards

Weights and Measures.

of length and of weight, which may be considered as already sufficiently well ascertained. But with respect to the measure of capacity, it appears from the Report contained in the Appendix (A), that the legal standards of the highest authority are considerably at variance with each other; the standard gallon, quart, and pint of Queen Elizabeth, which are kept in the Exchequer, having been also apparently employed, almost indiscriminately, for adjusting the measures both of corn and of beer; between which however a difference has gradually, and, as it may be supposed, unintentionally, crept into the practice of the excise; the ale gallon being understood to contain about four and a half per cent. more than the corn gallon, though we do not find any particular act of parliament in which this excess is expressly recognised. We think it right to propose that these measures should again be reduced to their original equality; and at the same time, on account of the great convenience which would be derived from the facility of determining a gallon and its parts, by the operation of weighing a certain quantity of water, amounting to an entire number of pounds and ounces without fractions, we venture strongly to recommend that the standard ale and corn gallon should contain exactly ten pounds avoirdupois of distilled water at 62° Fahrenheit, being nearly equal to 277·2 cubic inches, and agreeing with the standard pint in the Exchequer, which is found to contain exactly twenty ounces of water.

"VIII. We presume that very little inconvenience would be felt by the public from the introduction of this gallon in the place of the customary ale gallon of 282 cubic inches, and of the Winchester corn gallon, directed by a statute of King William to contain 269, and by some later statutes estimated at $272\frac{1}{4}$ cubic inches; especially when it is considered that the standards by which the quart and pint beer measures used in London are habitually adjusted, do not at present differ in a sensible degree from the standard proposed to be rendered general. We apprehend also that the slight excess of the new bushel above the common corn measure would be of the less importance, as the customary measures employed in different parts of Great Britain are almost universally larger than the legal Winchester bushel.

"Appendix (A). The standards kept at the Exchequer, for the adjustment both of CORN and BEER measures, are a bushel, a gallon, and a quart, dated 1601, and a pint, dated 1602, all marked with an E and a crown. They were examined by Sir George Clerk and Dr Wollaston, and the weight of Thames water which they held, at the temperature of 52°, was found as in the subjoined table. Now, since, according to Sir George Shuckburgh's experiments, a cubic inch of distilled water at 60° weighs $252\frac{1}{2}$ grains, the specific gravity of the water being to that of distilled water as 1·00060 to 1, and the apparent specific gravity of distilled water, in a vessel of brass at 52°, being to that of water at 62° as 1·00046 to 1, it follows that the apparent specific gravity of the water employed was 1·00106, and that an ounce avoirdupois corresponded to 1·731 cubic inches. Hence we obtain the contents of the measures in cubic inches, which are compared in the table with the more direct measurement of Mr Bird and Mr Harris, reported to the House of Commons in 1758.

	Oz. Avoir.	Cub. In.		Gallon.	Rep. 1758.
Pint	20·00	34·6	(×8=)	276·9	34·8
Quart	40·35	69·8	(×4=)	279·3	70·0
Gallon	156·25	270·4	(=)	270·4	271·0
Bushel	1229·85	2128·9	(×$\frac{1}{8}$=)	266·1	2124·0

"The Exchequer standard WINE gallon is dated 1707, and was found to contain 133·4 ounces, answering to 230·9 cubic inches. An experiment of Dr Wollaston and Mr Carr, in 1814, gave 230·8, the mean being 230·85; while the measurement of 1758 made it 231·2. A duplicate of this measure, and of the same date, is kept at Guildhall.

"Dr Wollaston and Mr Carr examined also the three other WINE gallons at Guildhall. The oldest of these seems to be the same that was measured by Halley and Flamsteed in 1688, and was said to contain 224 cubic inches: its actual capacity is 224·4. The wine gallon of 1773, which is in daily use for adjusting other measures, was probably in the first instance a correct copy of the Exchequer gallon, but has been reduced by a bruise and by the wear of the brim to 230·0 cubic inches, having lost $\frac{4}{5}$ of a cubic inch, or $\frac{1}{300}$ of its whole capacity. The wine gallon of 1798 contains 230·8 cubic inches.

"The Excise WINE gallon was found by a similar experiment to contain 230·1 cubic inches, having partaken of the progressive deficiency of the Guildhall gallon, from which it was derived."

Second Report.—"We have examined, since our last Report, the relation of the best authenticated standards of length at present in existence, to the instruments employed for measuring the base on Hounslow Heath, and in the late trigonometrical operations; but we have very unexpectedly discovered that an error has been committed in the construction of some of those instruments. We are therefore obliged to recur to the originals which they were intended to represent, and we have found reason to prefer the parliamentary standard executed by Bird in 1760, which we had not before received, both as being laid down in the most accurate manner, and as the best agreeing with the most extensive comparisons which have been hitherto executed by various observers, and circulated throughout Europe; and, in particular, with the scale employed by the late Sir George Shuckburgh.

"We have therefore now to propose that this standard be considered as the foundation of all legal weights and measures, and that it be declared that the length of a pendulum vibrating seconds in a vacuum on the level of the sea, in London, is 39·13929 inches, and that of the French metre 39·37079 inches, the English standard being employed at 62° of Fahrenheit."

Third Report.—"The measurements which we have lately performed, upon the apparatus employed by the late Sir George Shuckburgh Evelyn, have enabled us to determine with sufficient precision the weight of a given bulk of water, with a view to the fixing the magnitude of the standard of weight, that of length being already determined by the experiments related in our former Reports; and we have found by the computations, which will be detailed in the Appendix, that the weight of a cubic inch of distilled water at 62° of Fahrenheit is 252·724 grains of the parliamentary standard pound of 1758, supposing it to be weighed in a vacuum."

Appendix.—The commissioners having been furnished, by the kindness of the Honourable C. C. C. Jenkinson, with the apparatus employed by the late Sir George Shuckburgh Evelyn in the determination of the magnitude of the standard weights, and there being some doubt of the perfect accuracy of his method of measuring the capacity of the bodies employed, it was judged necessary to repeat that measurement with greater precautions; and the results of Captain Kater's experiments have afforded some slight corrections of the capacities in question.

"The sides of Sir George Shuckburgh's cube were found by Captain Kater equal to 4·98911, 4·98934, and 4·98935 inches, the diameter of the cylinder 3·99713, and its length 5·99600 inches; and the diameter of the sphere 6·00759 inches. Hence the content of the cube appears to be 124·1969 inches; that of the cylinder 75·2398; and that of the sphere 113·5264 inches of Bird's parliamentary standard of 1760, recommended in the last Report of the commissioners, or of the standard made by Troughton for Sir George Shuckburgh.

"The difference of the weight of the cube in the air at 62°,

Weights and Measures.

with the barometer at 29·0, and in water at 60·2°, was 31381·79 grains; and adding to this the weight of an equal bulk of the air at 62°, which is $\frac{1}{834}\cdot\frac{29}{30}$ of that of the water, or 36·26 grains, and subtracting from it $\frac{1}{8·5}$ of this, or 4·26 grains, the buoyancy of the brass weights, we obtain 31413·79 grains for the weight of the cube of water in a vacuum at 60·2°. Now this cube is less than the supposed measure, at the standard temperature of 62°, in the ratio of 1 to 1·0000567, on account of the contraction of the brass, and the water is denser than at the standard temperature, according to Mr Gilpin's experiments, in the ratio of ·99998 to ·99981, or of 1·00017 to 1; the whole correction for the difference of 1·8° being ·0001133, or 3·55 grains, making 31410·24 for the weight of the cube of water in a vacuum at 62°; which, divided by 124·1969, gives 252,907 for the weight of a cubic inch, in Sir George Shuckburgh's grains.

"In the same manner, we obtain for the cylinder, which was weighed in air under the same circumstances, and in water at 60·5°, the difference being 19006·83 grains, the correction $\frac{1}{834}\cdot\frac{29}{30}\cdot\frac{7·5}{8·5}$ for the effect of buoyancy, amounting to 19·43 grains; and for the difference of temperature of the water and brass conjointly, the densities being ·999955 and ·999810, the correction ·000145 — ·000047 = ·000095, or 1·80 grains, leaving + 17·63 grains for the whole correction of the weight, as reduced to a vacuum at 62°, and making it 19024·46, which, divided by 75·2398, the content of the cylinder, affords us 252·851 for the cubic inch in a vacuum at 62°.

"The sphere was weighed in air at 67°, the barometer standing at 29·74; the correction for the buoyancy is here $\frac{7·5}{8·5}\cdot\frac{29·74}{30}\cdot\frac{1}{843}$, or, for 28673·51 grains, 29·72; while the temperature of 66° requires, for the difference between the expansion of brass and water, the addition of ·00042 — ·000126, or ·000294 of the whole, that is, + 8·43 grains, making the whole correction 38·15, and the weight in a vacuum 28711·66; which, divided by 113·5264, gives us 252·907 for the cubic inch in a vacuum.

"The mean of these three measures is 252·888, giving for the three errors + ·019, — ·037, and + ·019; and this mean, reduced to the parliamentary standard, makes 252·722 grains for the cubic inch of distilled water at 62°, weighed in a vacuum, or 252·456 in air, under the common circumstances of the atmosphere, when weights of brass are employed. In a vacuum, at the maximum of density, that is, at 39°, the weight of a true cubic inch will be 253 grains, and of a cubic decimetre 15,440.[1] The proposed imperial gallon of ten pounds, or 70,000 grains of water, will contain very nearly 277·3 cubic inches, under common circumstances."

In conformity with these Reports, a bill was brought into the House of Commons in 1822 by Sir George Clerk, and again, with a few alterations, in 1823, which appears to have been drawn up with great care and judgment, and which comprehends a statement of the true ground of the proposed measures, and of the determinations which are intended for their bases.[2]

"Whereas notwithstanding it is provided by the Great Charter, that there shall be but one measure and one weight throughout the realm, and by the Treaty of Union between England and Scotland, that the same weights and measures should be used throughout Great Britain as were then established in England, yet different weights and measures, some larger and some less, are still in use in various places throughout the united kingdom of Great Britain and Ireland, and the true measure of the present standards is not verily known, which is the cause of great confusion and of manifest frauds: Be it therefore enacted, That the straight line or distance between the centre of the two points in the gold studs in the straight brass rod now in the custody of the clerk of the House of Commons, whereon the words and figures 'Standard Yard, 1760,' are engraved, shall be, and the same is hereby declared to be, the original and genuine standard of that measure of length or linear extension called a yard; and that the same straight line or distance between the centres of the said two points in the said gold studs in the said brass rod, the brass being at the temperature of sixty-two degrees by Fahrenheit's thermometer, shall be and is hereby denominated the 'Imperial Standard Yard,' and shall be, and is hereby declared to be, the unit or only standard measure of extension wherefrom or whereby all other measures of extension whatsoever, whether the same be linear, superficial, or solid, shall be derived, computed, and ascertained; and that all measures of length shall be taken in parts or multiples, or certain proportions of the said standard yard; and that one third part of the said standard yard shall be a foot, and the twelfth part of such foot shall be an inch; and that the pole or perch shall contain five such yards and a half, the furlong 220 such yards, and the mile 1760 such yards....

"And whereas it is expedient that the said standard yard, if lost, destroyed, defaced, or otherwise injured, should be restored of the same length by reference to some invariable natural standard; and whereas it has been ascertained, by the commissioners appointed by his majesty to inquire into the subject of weights and measures, that the said yard hereby declared to be the imperial standard yard, when compared with a pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea,...is in the proportion of thirty-six inches to 39·1393; Be it therefore enacted and declared, That if at any time hereafter the said imperial standard yard shall be lost, or shall be in any manner destroyed, defaced, or otherwise injured, it shall and may be restored by making, under the direction of the Lord High Treasurer...for the time being, a new standard yard, bearing the same proportion to such pendulum as aforesaid, as the said imperial standard yard bears to such pendulum.

"And whereas the commissioners appointed by his majesty to inquire into the subject of weights and measures have recommended that the standard brass weight of two pounds troy weight, made in the year 1758, and now in the custody of the clerk of the House of Commons, shall be considered as authentic; Be it enacted, That a brass weight equal to one half of the said brass weight of two pounds, gravitating in air (the barometer being at thirty inches, and the thermometer being at 62° by Fahrenheit's scale), 1822 [1823, be it further enacted, That the standard brass weight of one pound troy weight, made in the year 1758, now in the custody of the clerk of the House of Commons], shall be, and the same is hereby declared to be, the original and genuine standard measure of weight; and that such brass weight...shall be and is hereby denominated the Imperial Standard Troy Pound, and shall be, and the same is hereby declared to be, the unit or only standard

[1] It appears, however, from an official Report obligingly communicated to us by Dr Kelly, that the actual standard chiliogramme has been found to contain only 15,433 English grains.

[2] [This bill, of which only partial quotations of the principal provisions are given here, is nearly the same with the 5th Geo. IV. cap. 74, which was passed 17th June 1824, to come into operation 1st May 1825, but postponed by 6 Geo. IV. cap. 12, to 1st January 1826. Most of its provisions are still in force, and indeed were only rendered compulsory by 5 and 6 Will. IV. cap 63, from 1st January 1836; the principal parts repealed by the latter statute being the use of heaped measure, and of local and customary weights and measures.]

Weights and Measures.

measure of weight, from which all other weights shall be derived, computed, and ascertained; and that $\frac{1}{12}$th of the said troy pound shall be an ounce, and that $\frac{1}{20}$th of such ounce shall be a pennyweight, and that $\frac{1}{24}$th of such pennyweight shall be a grain, so that 5760 such grains shall be a troy pound; and that 7000 such grains shall be, and are hereby declared to be, a pound avoirdupois; and that $\frac{1}{16}$th of the said pound avoirdupois shall be an ounce avoirdupois; and that $\frac{1}{16}$th of such ounce shall be a dram.

"And whereas it is expedient that the said standard troy pound, if lost, destroyed, defaced, or otherwise injured, should be restored of the same weight, by reference to some invariable natural standard; and whereas it has been ascertained by the commissioners appointed by his majesty to inquire into the subject of weights and measures, that a cubic inch of distilled water in a vacuum, weighed by brass weights, also in a vacuum, at the temperature of 62° of Fahrenheit's thermometer, is equal to 252·72, 1822 [1823, 252·724] grains, of which, as aforesaid, the imperial standard troy pound contains 5760; Be it therefore enacted, That if at any time hereafter the said imperial standard troy pound shall be lost...it shall and may be restored.... by making, under the directions of the Lord High Treasurer, ...a new standard,"...determined according to this proportion.

"And be it further enacted, That the standard measure of capacity, as well for liquids as for dry goods, shall be the gallon, containing ten pounds avoirdupois weight of distilled water, weighed in air, at the temperature of 62° of Fahrenheit's thermometer, the barometer being at thirty inches; and that a measure shall be forthwith made of brass, of such contents as aforesaid,...and such brass measure shall be, and is hereby declared to be, the imperial standard gallon, and shall be, and is hereby declared to be, the unit and only standard measure of capacity, from which all other measures of capacity to be used, as well for wine, beer, ale, spirits, and all sorts of liquids, as for dry goods, shall be derived, computed, and ascertained; and that all measures shall be taken in parts or multiples, or certain proportions, of the said imperial standard gallon; and that the quart shall be the fourth part of such standard gallon, and the pint shall be one eighth of such standard gallon; and that two such gallons shall be a peck, and eight such gallons shall be a bushel, and eight such bushels a quarter of corn or other dry goods.

Weights and Measures.

"And be it further enacted, That the standard measure of capacity for coals, culm, lime, fish, potatoes, or fruit, and all other goods and things commonly sold by heaped measure, shall be the aforesaid bushel, containing eighty pounds avoirdupois of water as aforesaid, the same being made round, with a plain and even bottom, and being 19½ inches from outside to outside of such standard measure as aforesaid.[1]

"Provided always, and be it enacted, That in all cases of dispute respecting the correctness of any measure of capacity, arising in a place where recourse cannot conveniently be had to any of the aforesaid verified copies or models of the standard measures of capacity, it shall and may be lawful to and for any justice of the peace, or magistrate, having jurisdiction in such place, to ascertain the content of such measure of capacity by direct reference to the weight of pure or rain water which such measure is capable of containing; ten pounds avoirdupois weight of such water, at the temperature of 62° by Fahrenheit's thermometer, being the standard gallon ascertained by this act, the same being in bulk equal to 277·276, 1822 [1823, 277·274] cubic inches, and so in proportion for all parts or multiples of a gallon."

The slight discordance between the numbers of the two successive years depends merely on the adoption of a standard troy pound, better authenticated than the two-pound weight particularly employed by Sir George Shuckburgh, which was finally preferred, both as representing a unit, and as being more simple in its form than the two-pound weight.

TABLES OF VARIOUS MEASURES, IN ENGLISH FEET AND DECIMALS.

From Folkes, Raper, Shuckburgh, Vega, Hutton's Ozanum, Cavallo, and others. Young's *Nat. Phil.* ii. 152, 150.

Ancient Measures.

	English Feet.	
Arabian foot,	1·095	H.
Babylonian foot,	1·144	H.
	1·135	H.
Drusian foot,	1·090	H.
Egyptian "foot,"	1·421	
... stadium,	730·8	H.
Greek foot,	1·009	H.
	1·006	Folkes. = $1\frac{1}{4}$ of Roman ft.
	1·007	
	1·007	C.
... phyleterian f.	1·167	H.
Hebrew foot,	1·212	H.
... common cubit,	1·817	H.
... sacred cubit,	2·002	H.
... great cubit = 6 common,		H.
Macedonian foot,	1·160	H.
Natural foot,	·814	
Ptolemaic = Greek foot,		H.
Roman foot,	·970	Bernard.
	·967	Picard and Greaves, H.
	·966	Folkes.
	·967	
	·970	before Titus, Raper.

	English Feet.	
Roman foot,	·965	after Titus, Raper.
	·9672	from rules, Sh.
	·9681	from buildings, Sh.
	·9696	from a stone, Sh.
Roman mile of Plin.	4840·5	C.
... ... of Strabo,	4903·	C.
Sicilian foot of Archimedes,	·730	H.

Modern Measures.

Altdorf foot,	·775	H.
Amsterdam foot,	·927	H.
	·930	C.
	·931	Howard on Lazarettos.
Amsterdam ell,	2·233	C.
Ancona foot,	1·282	H.
Antwerp foot,	·940	H.
Aquileia foot,	1·128	H.
Arles foot,	·888	H.
Augsburg foot,	·972	H.
Austria. See Vienna.		
Avignon = Arles.		
Barcelona foot,	·992	H.
Basel foot,	·944	H.

	English Feet.	
Bavarian foot,	·968	Beigel. See Munich.
Bergamo foot,	1·431	H.
Berlin foot,	·992	H.
Bern foot,	·962	Howard.
Besançon foot,	1·015	H.
Bologna foot,	1·244	H.
	1·250	C.
Bourg en Bresse foot,	1·030	H.
Brabant ell, in Germany,	2·268	V.
Bremen foot,	·955	H.
Brescia foot,	1·560	H.
... braccio,	2·092	C.
Breslau foot,	1·125	H.
Bruges foot,	·749	H.
Brussels foot,	·902	H.
	·954	V.
... greater ell,	1·278	V.
... lesser ell,	2·245	V.
Castillian vara,	2·746	C.
Chambery foot,	1·107	H.
China mathematical foot,	1·127	H.
... imperial foot,	1·051	H.
	1·050	C.
... li,	606·	C.
	1600·	Q. *Rev.* vi.

[1] [Although the act 5 and 6 Will. IV., cap. 63, has abolished the use of heaped measure, it enacts that this form and size of bushel shall still be used for such goods sold by measure as are neither liquid nor admit of being stricken. But it is obvious, that when there is to be no heap, it is not the outside diameter, but the inside one, that ought to have been fixed for such goods; whereas the statutes have left this so indeterminate, that it may vary an inch or more according to the thickness of the materials.]

Weights and Measures.

English Feet.

Cologne foot, . . ·903 H.
Constantinople foot, 2·195 H. / 1·165 H.
Copenhagen foot. See Denmark, 1·049 H.
Cracau foot, . . 1·169 H. V.
... greater ell, 2·024 V.
... smaller ell, . 1·855 V.
Dantzig foot, . . ·923 H.
Dauphiné foot, . . 1·119 H.
Delft foot, . . ·547 H.
Denmark old foot, . 1·047 H.
... new foot, 1·036
Dijon foot, . . 1·030 H.
Dordrecht foot, . . ·771 H.
Dresden foot, . . ·929 Wolfe, *Ih. Tr.* 1769, v.
... ell = 2 feet, 1·857 V.
Edinburgh. See Scotland.
Ferrara foot, . . 1·317 H.
Florence foot, . . ·995 H.
... braccio, . 1·900 / 1·910 C.
... barilo of wine weighs 140 Fl. pounds = 20 fiaschi.
... cogno = 10 barili.
... rubbio of wheat 640 Roman pounds.
Franche Comté foot, 1·172 H.
Frankfort = Hamburg, H.
Genoa palm, . . ·812 H. / ·800 / ·817 C.
... carna, . . 7·300 C.
Geneva foot, . . 1·919 H.
German mile = $\frac{1}{15}$ degree.
Grenoble = Dauphiné, H.
Halle foot, . . ·977 H.
Hamburg foot, . . ·933 H.
Heidelberg foot, . ·903 H.
Inspruck foot, . . 1·101 H.
Ireland, perch 7 yards.
... acre, 7840 sq. y. E.
Italy, old common mile, . 5299·
Leghorn foot, . ·992 H.
Leipzig foot, 1·034 H.
... ell, . 1·833 H.
Leyden foot, 1·023 H.
Liege foot, . ·944 H.
Lisbon foot, ·925 H.
Lombardy mile = $\frac{1}{67}$ degree.
Lucca braccio, . 1·958 C.
Lyon = Dauphiné.
Madrid foot, . ·915 H. / ·918 Howard.
... vara, . 3·263 C. / 3·285 Laconda-mine, from Juan.
Mæstricht foot, ·916 H.
Malta palm, . ·915 H.
Mantua brasso, 1·521 H.
Mantuan braccio = Brescian, C.
Marseilles foot, ·814 H.
Mechlin foot, ·753 H.
Mentz foot, . ·988 H.
Milan decimal foot, ·855 H.
... aliprand foot, 1·426 H.
... braccio, 1 725 C.
Modena foot, 2·081 H.
Monaco foot, ·771 H.
Montpellier pan, ·777 H.
Moravian foot, ·971 V.
... ell, 2·594 V.
Moscow foot, ·928 H.
Munich foot, . ·947 H.
Naples palm, ·861 H. / ·859 C.
... canna, 6·908 C.
... mile = " $\frac{1}{60}$ degree," rather $\frac{1}{66}$.
... barilo of wine = 60 carafe.
... carafa = $\frac{2}{3}$ Parisian pint.
... botto = 12 barili.

English Feet.

Naples carro = 2 botti.
... tumulo of wheat 3 cubic palms, or 40 rotoli.
Nuremberg town foot ·996 H. / ·997 V.
... country foot, ·907 H.
... artillery foot, ·961 V.
... ell, . 2·166 V.
Padua foot, . . 1·406 H.
Palermo foot, ·747 H.
Paris old foot, 1·066 H. / 1·06578 = $\frac{8}{7}\frac{1}{6}$ V.
... ... point, ·0148 E. inches.
... ... line, . ·0888, or $\frac{8}{90}$ E. inch.
... ell = 44 Fr. inches, or = 43·9 V.
... sonde 5 Fr. feet = $\frac{8}{9}$ E. fathom.
... toise 6 Fr. feet = 76·736 E. inches.
... perche 18 Fr. feet.
... perche royale 22 Fr. feet.
... league 2282 toises = $\frac{1}{25}$ degree.
... square foot or inch 1·13581 E.
... cubic foot or inch 1·21061 E.
... arpent, 100 square perches, about $\frac{5}{6}$ E. acre; mesure royale about $\frac{5}{4}$.
... pint, 48 cubic inches, Dict. Acad. = 58·11 English.
... litron 74·375 cubic inches English.
... boisseau 1190 = 16 litrons.
... minot = 2 boisseaux, nearly a bushel English, = 2380 cubic inches Eng.
... mine = 2 minots = 4760 cub. in. Eng.
... septier = 2 mines = 9520 cubic inches English, = 1·56 hecatol. Annuaire: for oats double.
... muids = 12 septiers.
... ton of shipping 42 cubic feet.
... metre 3·07844 feet Fr. = 3·281 feet E. = 39·3708 inches E. Kater. Hence, correcting the unclassical orthography of the new school:
... millimetre, . ·03937 E. inches.
... centimetre, ·39371
... decimetre, 3·93708
... metre, 39·37079
... decametre, 393·70790
... hecatometre, 3937·07900
... chiliometre, 39370·79000
... myriometre, 393707·90000
8 chiliometres are nearly five miles.
1 inch is ·0254m; 1000 feet nearly 305m.
1 centimetre = ·39371 E. inches.
2 ... ·78742
3 ... 1·18113
4 ... 1·57483
5 ... 1·96854
6 ... 2·36225
7 ... 2·75596
8 ... 3·14966
9 ... 3·54337
10 ... 3·93708
1 square centimetre = ·155006 square inch.
... are, or square decametre, 3·95 E. perches.
... hecatare 2 acres 1 r. 35·4 p.
... millilitre, ·06103 cubic inches E.
... centilitre, ·61028
... decilitre, 6·10279
... litre, or cubic decimetre, 61 02791
... decalitre, 610·27900
... hecatolitre, 6102·79000
... chiliolitre, 61027·90000
... myriolitre, 610279·00000
a litre is nearly 2$\frac{1}{8}$ wine pints; a chiliolitre 1 tun 12$\frac{3}{4}$ wine gallons.
... decistere of fire-wood, 3·5317 cubic feet E.
... stere, or cubicmetre, 35 3171

English Feet.

Parma foot, . 1·369 H.
..., braccio, 2·242 C.
Pavia foot, . 1·540 H.
Piedmont old mile = 1$\frac{1}{2}$ m. E.
Placentia = Parma. C.
Prague foot, ·987 H. / ·972 V.
... ell, . 1·948 V.
Provence = Marseilles.
Rhinland foot, 1·030 V. Eytelwein.
Riga = Hamburg.
Rome palm, . ·733 H.
... foot, ·966 Folkes.
... oncia $\frac{1}{11}$ f. ·0805 F.
... deto, $\frac{1}{12}$ f. ·0604 F.
... palmo, . ·2515 F.
... palmo di architettura, ·7325 F.
... canna di architettura, 7·325 F.
... staiolo, 4·212 F.
... braccio dei mercanti, 2·7876 F. "4 palms." / 2·856 C.
... canna dei mercanti, 6·5365 F. "8 palms."
... braccio di tessitor di tela, 2·0868 F.
... braccio di architettura, 2·561 C.
... mile $\frac{1}{75}$ degree.
Rouen = Paris. C.
Russian arschin, 2·3333 *Ph. M.* xix. / 2·3625 C.
... rerschock $\frac{1}{15}$ arschen, ·1458
... werst, 3508·
Savoy = Chambery. H.
Scotland, ell, 37 Sc. i. = 37·06 Eng. inches = 3·088
... fall, 6 ells, 222·3 18·530
... furlong, . . . 741·
... mile, . . . 5929·
... link, . 8·89435
... chain, 889·435
... long rood, 133·92
... acre, 54929·1 sq. f. E. = 1·26 acre E.
... gill, 6·462 c. i. E.
... mutchkin, 25·85
... choppin, 51·7
... pint, . 103·4
... quart, . 206·8
... gallon, . 827·23
... hogshead, 13235·7, 16 g.
... gallon of the Union, 799· = $\frac{1}{7}\frac{1}{2}$ E. barrel.
... lippie, or feed, 200·345
... pint jug of Stirling, 103·72 c. i. E.
... pint jug of Aberdeen, 105·30
... firlot of Linlithgow, for bear, 3205·5 = 31 pints.
... firlot for wheat, 2150· / 2197·3
... firlot of Edinburgh 1$\frac{1}{2}$ per cent. greater.
Seville = Barcelona, H.
... vara, . . 2·760 C.
Sienna foot, . . 1·239 H.
Spain league = 4 miles E.
Stettin foot, . . 1·224 H.
Stockholm foot, . 1·073 H.
... canne 106 c. i. Sw.
Strasburg town foot, ·956 H.
... country foot, ·969 H.
Toledo = Madrid, . . H.
Trent foot, . . 1·201 H.

Weights and Measures.

Weights and Measures.

	English Feet.	
Trieste ell for woollens,	2·220	H.
... ... silk,	2·107	H.
Turin foot,	1·676	H.
	1·681	C.
... ras,	1·958	C.
... trabuco,	10·085	C.
Tuscany mile,	5329·	
See Florence.		
Tyrol foot,	1·096	V.
... ell,	2·639	V.
Valadolid foot,	·908	H.
Venice foot,	1·137	H.
	1·140	Bernard,
	1·167	C. [How. v.
... braccio of silk,	2·108	C.
... ell,	2·089	V.
... braccio of cloth,	2·250	C.
... mile = $\frac{1}{2^{\frac{1}{2}}}$ or $\frac{1}{6^{\frac{1}{7}}}$ degree.		
... moggio of wheat weighs 528 pounds.		V.
Verona foot,	1·117	H.
Vicenza foot,	1·136	H.
Vienna foot,	1·036	H.
	1·037	Howard, C. V.
... ell,	2·557	V.
... postmile,	24888·	V.
... yoke of land, 1600 square fathoms.		
... metz, or bushel, 1·9471 c. f. of Vienna.		
... eimer = 40 kannen = 1·792 c. f.		V.
... fass = 10 eimer. Vega.		
Vienne, Dauphiné, foot,	1·058	E. f. H.
Ulm foot,	·826	H.
Urbino foot,	1·162	H.
Utrecht foot,	·741	H.
Warsaw foot,	1·169	H.
Wesel = Dordrecht,		H.
Zürich foot,	·979	H.
	·989	*Ph. M.* viii.

TABLE OF VARIOUS WEIGHTS.

Ancient Weights.

	English Grains.	
Attic obolus,	8·2	Christiani.
	9·1	Arbuthnot.
Attic drachma,	51·9	Chr.
	54·6	Arb.
... lesser mina,	3892·	75 dr. Chr.
... greater mina,	5189·	100 dr. Chr.
	5464·	Arb.
... medical mina,	6994·	Arb
... talent = 60 minæ = ½ cwt. E.		
Old Greek drachm,	146·5	E. gr. Arb.
	62·5	= Roman denarius, Arb.
Old Greek mina,	6425·	Arb.
Egyptian mina,	8326·	
Ptolemaic mina of Cleopatra,	8958·	
Alexandrian mina of Dioscorides,	9992·	
Roman denarius,	51·9	Chr. $\frac{1}{8}$ oz.
	62·5	Arb. $\frac{1}{7}$ oz.
... ounce,	415·1	Chr.
	437·2	Arb. = av. oz.
... pound of 10 oz.	4150·	Chr.
... pound of 12 oz.	4981·	Chr.
	5246·	Arb.

Modern Weights.

From Hutton, Cavallo, Vega, and others.

Pounds.	English Grains.	
Aleppo rotolo,	30985·	H.
Alexandria,	6159·	H.
Alicant,	6909·	H.
Amsterdam,	7461·	H.

English Grains.

Amsterdam commercial pound,	7636· = 10280 ases = 494·048 grammes. Coquebert, = 493·93 grm. Vega.	
Troy pound, 7602· E. gr adjusted at Brussels, 1553, = 10240 ases, = 491·96 grm. Coq. = 492·0044 grm. V.		
stone 16 pounds,		
ounce $\frac{1}{16}$ pound,		
drop $\frac{1}{16}$ ounce.		
Apothecaries' pound 369 grm		V.
See Brabant.		
Antwerp,	7048·	E. gr. H.
Avignon,	6217·	H.
Basel,	7713·	H.
Bayonne,	7461·	H.
Bergamo,	4664·	H.
	11660·	H.
Bergen,	7833·	H.
Berlin,	7232·	Eytelw.
A cubic foot French of water weighing 65·9368 Berlin lbs.		
Bern,	6722·	
Bilboa = Bayonne,		H.
Bois le Duc,	1705·	H.
Bordeaux = Bayonne.		
Bourg,	7074·	H.
Brabant pound of Amsterdam.	7249· = 469·12 grm.	Coq.
Brescia,	4497·	H.
Brussels heavy pound = Troys,		V.
... light pound,	7201· = 466·3 grm.	V.
Cadiz,	7038·	H.
China, kin,	9223·	H.
	5802· = 375·708 grm.	Coq.
... leang = $\frac{1}{10}$ kin,		
... tsien = $\frac{1}{10}$ leang.		
Cologne,	7220·	H.
	7218·	Eytelwein,
... A c. f. French of water weighing 66·0656 Cologne lbs.		
	7223· = 467·74 grm.	V.
... grain, $\frac{1}{331}$ of the weight of a cubic inch French of water at 57°. *Studer in Gilb.* xi.		
Constantinople,	7578·	H.
Copenhagen,	6941·	H.
Cracau, commercial pound,	6252·	H.
	404·85 grm.	V.
... mint mark,	3071·198·82 grm.	V.
Damascus,	25613·	H.
Dantzig,	6574·	H.
Dresden,	7210·468·83 grm.	V.
Dublin,	7774·	H.
Florence,	5287·	H.
ounce $\frac{1}{12}$ pound (440·6) = 24 denari of 24 grains each.		
France. See Paris.		
Geneva,	8407·	H.
Genoa,	4426·	H.
	6638·	H.
= 12 ounces.		
rotolo = 18 ounces.		
rubo = 25 pounds.		
cantaro = 6 r.		
peso = 5 cantari.		
Germany, apothecaries,	5523·357·66 grm.	V.
Hamburg,	7315·	H.
Ireland. See Dublin.		
Königsberg,	5968·	H.
Leghorn,	5146·	H.
Leyden,	7038·	H.
Liege,	7089.	H.
Lille,	6544·	H.
Lisbon,	7005·	H.
London, avoirdupois,	7000·453·61 grm.	V.
troy,	5760·373·14 grm.	V.

English Grains.

Lucca,	5273·	H.
Lyon, silk,	6946·	H.
... town weight,	6432·	H.
Madrid,	6544·	H.
Marseilles,	6041·	H.
Melun,	4441·	H
Messina,	4844	H.
Montpellier,	6218·	H.
Namur,	7174·	H.
Nancy,	7038·	H.
Naples,	4952·	H.
= 12 oncie.		
rotolo = 33½ 0.		
staro = 10⅓ r.		
cantaro = 100 r.		
oncia = 30 trapesi.		
trapeso = 20 acini,		
Nuremberg,	7871· 509·78 grm.	V.
Paris,	7561· H. or 7560 = 1·08 lb. av.	
... marc ½ a pound,		
.. ounce ⅛ marc,		
... gros ⅛ ounce,		
... denier $\frac{1}{24}$ gros,		
... grain $\frac{1}{24}$ denier,	= .8203 gr. E.	
... milligramme,	·0154 gr. E.	
... centigramme,	·1543	
... decigramme,	1·5433	
... gramme,	15·4330, 18·837 gr. Fr.	
... decagramme,	154·3300 5·65 dr. av.	
... hecatogramme,	1543·3000	
... chiliogramme,	15433·0000, 2lb. 3½ oz. av.	
	2·0429 lb. Fr.	
... myriogramme,	154330·0000; according to Dr Kelly's experiments on the actual weights in use, but according to the English experiments, the gramme ought to weigh 15·4400 grains E.	
... quintal = 10 myriogrammes.		
... millier = 1000 chiliogrammes; about a ton.		
... sous = 5 grammes of copper.		
... franc = 5 grammes of silver, with $\frac{1}{10}$ of copper.		
Prague commercial pound,	7947· E. gr. 514·35	grm. V.
Revel,	6574·	H.
Riga,	.6149·	H.
Rome,	5257·	H.
= 12 oncie,		
oncia = 8 dramme,		
dramma = 3 scrupoli,		
scrupolo = 2 oboli,		
obolo = 4 silique,		
siliqua = 12 grani.		
Rouen,	7772·	H.
Saragossa,	4707·	H.
Scotland, Troy pound, Dutch,	7621·8	
... Trone pound = ⅘ Troy,	9527·25	
... ... ounce,	476·3	
Seville = Cadiz.		
Smyrna,	6544·	H.
Stettin,	6782·	H.
Stockholm,	9211·	H.
Strasburg,	7277·	H.
Toulouse,	6323·	H.
Troys. See Amsterdam, Scotland.		
Turin,	4940·	H.
Tunis,	7140·	H.
Tyrol,	8693·562·92 grm.	V.
Venice,	4215·	H.
	6827·	H.
... libra sottile of 12 ounces, 302·03 grm.		V.
... common pound of 12 ounces, 358·1 grm.		V.
... pound of 12 ounces, peso grosso, 468·17 grm.		V.
... libra grossa, 477·49 grm.		V.
Verona,	5374·	V.

Weights and Measures.

Weights and Measures.

	English Grains.
Vicenza,	4676· H.
	6879· H.
Vienna, commercial pound,	8648·560·01 grm. V.
... Apothecaries' pound,	420·01 grm. V.
... Mint mark,	280·64 grm. V.
... carat of the jewellers,	·206085 grm. V.

Apothecaries' Grains of different Countries.

From Vega.

Austria,	1·125 = 9/8
Bern,	·956
France,	·981
Genoa,	·850
Germany,	·958
	·959 Gilb.
Hanover,	·978
Holland,	·989
Naples,	·860
Piedmont,	·824
Portugal,	·864
Rome,	·909
Spain,	·925
Sweden,	·955
Venice,	·809

Weights and Measures.

The preceding part of this article was furnished by the late Dr Thomas Young, for the Supplement to the former editions, in such a form as not to supersede any thing previously given on the same subject in the body of the work; so that, both for this reason, and on account of the changes which have taken place since Dr Young wrote, some additions are required. Indeed, excepting the comparative table, his supplementary article was almost entirely confined to the then only proposed equalization of the very different weights and measures employed in different parts of the British empire, but on which four successive legislative enactments have since taken place. These are, 5 Geo. IV. c. 74, 6 Geo. IV. c. 12, 4 and 5 Will. IV. c. 49, and 5 and 6 Will. IV. c. 63. The first two of these statutes were exceedingly inert, being little better than mere recommendations or abstract speculations, from the circumstance that every one was still allowed to use whatever weight or measure his fancy, habits, or interest led him to prefer. The third has been repealed or superseded by the fourth; and the latter, which was passed in 1835, besides abolishing heaped measures, declares all bargains or transactions to be illegal, or null and void, which are made by any other weights or measures than the imperial. But although this law, which came into operation 1st January 1836, has certainly placed the matter on a very different footing from what it was before, the equalization is so far from being yet complete, that two, and in some respects three, different sorts of weights are very needlessly allowed; which tends to create confusion, and affords opportunity for fraudulent transactions. This, it seems, was done principally in compliance with the wish of the College of Physicians, who had long been in the habit of using the troy weight in their prescriptions. It seems quite clear, that if any class of the community was to be so indulged, it should have been such as were ready to plead being so far behind the rest that they could not reduce the troy to avoirdupois. There is however no good reason why physicians' prescriptions should in this respect always continue antiquated, and lagging behind every thing else, any more than there is that physicians should always continue to use unclassical Latin instead of their mother tongue.

The parliamentary commissioners on weights and measures think there is reason to believe that the word Troy has no reference to any town in France, but rather to the monkish name of *Troy Novant* given to London, as founded on the legend of Brute. Troy weight would thus mean London weight. But some would derive Troy or Troyes, from *trois* (three), alleging it has reference to the three principal divisions of penny, shilling, and pound, or penny, ounce, and pound, used in money weight. The commissioners, with great probability, suppose the avoirdupois weight, by which heavy and bulky goods have very generally been weighed for a long time past throughout this country, to be derived from *avoirs* (*averia*), the ancient name for goods and chattels, and *poids*, weight.

The act 5 and 6 Will. IV. cap. 63, contains several important provisions, the substance of which we shall now endeavour to state briefly. Weights and measures verified and stamped at the exchequer as copies of the imperial standards shall be taken to be legal weights and measures, to be used for comparison, although not similar in shape to those required under the provisions of former acts, except, as will be afterwards explained, those measures used for such articles as were formerly heaped, and now are neither weighed nor stricken; and the comptroller-general, or other duly authorized officer of the exchequer, may compare and verify, and stamp as correct standards, any weights and measures which respectively correspond in weight, length, and capacity, with the standards, or parts, or multiples thereof, deposited in the exchequer, under the 5th Geo. IV. cap. 74, although, with the exception above noticed, such weights and measures may not be models or copies in shape or form of the standards so deposited.

All copies of the imperial standard weights and measures which have become defective, or have been mended, in consequence of wear or accident, shall forthwith be sent to the exchequer, for the purpose of being again compared and verified, and shall be stamped as re-verified copies of such standards, provided the officer appointed for such verification deem them fit for the purposes of standards, and every new comparison and verification shall be indorsed upon the original indenture of verification; and such weights and measures shall be stamped upon fees of verification only, unless they have been found incorrect; for in that case an extra charge is to be made for adjusting them.

The Winchester bushel, the Scotish ell, and all local or customary measures, are now abolished; and every person who shall sell by any other than one of the imperial measures, or some multiple or aliquot part thereof, shall be liable to a penalty not exceeding 40s. for every such sale; but nothing herein shall prevent the sale of any articles in any vessel, where such vessel is not represented as containing any amount of imperial measure, or of any fixed local or customary measure formerly in use.

The use of heaped measure is now abolished, and all bargains, sales, and contracts by heaped measure are null and void, under a penalty not exceeding 40s. for every such sale.

Some articles formerly sold by heaped measure do not admit of being stricken, and cannot conveniently be sold by weight. It is enacted that all such articles may in future be sold by the imperial bushel, but as having its form defined by the act 5 Geo. IV. cap. 74, for the sale of heaped measure, the diameter being nineteen and a half inches outside, or any multiple or aliquot part thereof, also defined by the same act, such being filled in all its parts as nearly even with the brim as the size and shape of the articles will admit (see foot-note, p. 804); but nothing herein shall prevent the sale by weight of any article formerly sold by heaped measure. All coals, slack, culm, and cannel of every description, shall be sold by weight and not by measure, under a penalty of 40s. for every sale.

All articles sold by weight shall be sold by avoirdupois weight, except gold, silver, platina, diamonds, or other precious stones, which may be sold by troy weight; and drugs, which, when sold by retail, may be sold by apothecaries' weight. The weight denominated a stone shall in all cases consist of fourteen standard pounds avoirdupois; the hundredweight of eight such stones, or 112 lbs.; and the ton of twenty such hundredweights; but nothing herein shall prevent any bargain, sale, or contract being made by any multiple or aliquot part of the pound weight.

All weights of one pound avoirdupois, or more, shall have the number of pounds contained in them stamped or cast

on the top or side, in legible figures or letters; and all measures of capacity shall have their contents stamped or marked on the outside in legible figures and letters.

The stamping of weights entirely composed of lead or pewter, or of any mixture thereof, is prohibited; but nothing herein shall prevent the use of lead or pewter, or any mixture thereof, in the manufacture of weights, if these are wholly and substantially cased with brass, copper, or iron, and legibly stamped or marked "cased;" or shall prevent the insertion of such a plug of lead or pewter into the weights as shall be *bona fide* necessary for adjusting them, and receiving the impression of the stamp. Nothing herein shall require any single weight above fifty-six lbs. to be inspected or stamped, nor any wooden or wicker measure used in the sale of lime, or other articles of the like nature; or any glass or earthenware jug or drinking cup, though represented as containing the amount of any imperial measure, or of any multiple thereof; but any person buying by any vessel represented as containing the amount of any imperial measure, or of any multiple thereof, is authorized to require the contents of such vessel to be ascertained by comparison with a stamped measure, to be provided by the person using such wooden or wicker measure, glass jug, or drinking cup, and if such comparison be refused, or the measure be found deficient, the person using the same shall be liable to the penalties imposed on those using unjust weights or measures.

The following is a tabular view of the weights and measures, according to the present state of the law, throughout the British empire. In some of the colonies, however, and particularly in India, a variety of other weights and measures besides is still in use, as will be noticed in the sequel. It is only necessary to observe, that all the quantities in the same horizontal line of the same table are equal to each other.

Troy Weight.

Grains.	Dwts.	Oz.	Lb.
24	1	...	...
480	20	1	...
5760	240	12	1

Apothecaries' Weight.

Troy Grains.	Scruples.	Drams.	Oz.	Lb.
20	1	...	...	...
60	3	1	...	...
480	24	8	1	...
5760	288	96	12	1

In these two weights the grain, ounce, and pound are the same. The troy is used for the precious metals and for jewels, as also in trying the strength of spirituous liquors, and for comparing different weights with each other. Four grains troy make a carat. But this term when applied to gold denotes its degree of fineness. Thus, the weight of any quantity or compound of that metal being supposed to be divided into 24 equal parts, if the mass be pure gold, it is said to be 24 carats fine. If it consist of 23 parts of pure gold and 1 of alloy, it is said to be 23 carats fine, and so on. Diamonds and pearls are also weighed by carats of 4 grains, but 5 diamond grains are only equal to 4 troy grains. This sort of weight is not very different all over the globe. There are 150 diamond carats in the troy ounce. Apothecaries' weight is chiefly used for medical prescriptions; but drugs are mostly bought and sold, especially in wholesale, by avoirdupois weight.

Avoirdupois or Commercial Weight.

Troy Grains.	Drams.	Oz.	Lbs.	Stones.	Qrs.	Cwts.	Ton.
437 5	16	1	...	...	...	...	...
7000	256	16	1	...	...	...	...
98000	3584	224	14	1	...	...	...
196000	7168	448	28	2	1	...	...
784000	28672	1792	112	8	4	1	...
15680000	573440	35840	2240	160	80	20	1

The above lb. of 7000 troy grains was formerly subdivided into 7680 avoirdupois grains, 10 of which made a scruple, 30 a dram, and 480 an ounce. The troy pound is less than the avoirdupois in the proportion of 144 to 175, or of 14 to 17 nearly; but the troy ounce is greater than the avoirdupois in the proportion of 192 to 175, or of 79 to 72 nearly.

Measures of Length.

Inches.	Links.	Feet.	Yards.	Pole or Perch.	Chains.	Furlongs.	Mile.
7·92	1	...	...	...	...	...	...
12	1·515	1	...	...	...	...	...
36	4·545	3	1	...	...	...	...
198	25	16·5	5·5	1	...	...	...
792	100	66	22	4	1	...	...
7920	1000	660	220	40	10	1	...
63360	8000	5280	1760	320	80	8	1

Three inches make a palm, 4 inches a hand, 5 feet a pace, and 6 feet a fathom. In cloth measure, 2¼ inches = 1 nail 4 nails = 1 quarter, and 4 quarters = 1 yard.

Measures of Surface.

Square Inches.	Square Links.	Square Feet.	Square Yards.	Square Pole or Perch.	Square Chain.	Square Rood.	Acre.
62·726	1	...	...	...	...	...	...
144	2·295	1	...	...	...	...	...
1296	20·661	9	1	...	...	...	...
39204	625	272·25	30·25	1	...	...	...
627264	10000	4356	484	16	1	...	...
1568160	25000	10890	1210	40	2·5	1	...
6272640	100000	43560	4840	160	10	4	1

In the superficial measurement of stone, brick, or slate work, 36 square yards are termed a rood, and 100 square feet of flooring a square. There are 1728 cubic inches in the cubic foot, and 27 cubic feet in the cubic yard; 40 cubic feet of rough, or 50 of hewn timber, make a load or ton. A cubic yard of earth is called a load.

Imperial Liquid and Dry Measure, deduced from the Standard Gallon containing 10 *lbs. avoirdupois of distilled water at the temperature of* 62° *Fahrenheit, and barometer* 30 *inches.*

Pounds of Water.	Cubic Inches.	Gills.	Pints.	Quarts.	Pottles.	Gallons.	Pecks.	Bushels.	Coombs.	Quarter.
1·25	34·659	4	1		...	...	...	...	...	...
2·5	69·318	8	2	1	...	...	...	...	...	...
5	138·637	16	4	2	1	...	...	...	...	...
10	277·274	32	8	4	2	1	...	...	...	...
20	554·548	64	16	8	4	2	1	...	...	...
80	2218·191	256	64	32	16	8	4	1	...	...
320	8872·763	1024	256	128	64	32	16	4	1	...
640	17745·526	2048	512	256	128	64	32	8	2	1

This measure came first into operation 1st January 1826, but has only been compulsory as the sole legal measure of capacity since 1st January 1836. The peck, bushel, coomb, and quarter are dry measures only.

In beer measure, the barrel consists of 36 gallons = 4 firkins, and the hogshead contains 1½ barrel or 54 gallons. The anker, tierce, hogshead, puncheon, pipe, butt, and tun, used for wine and spirits, are so vague and variable in their contents, that they are to be considered rather as the names of the casks than as expressing any fixed or definite measures. However, such vessels are usually gauged, and have their contents, whatever they may be, marked on them. But for a great variety of local and customary weights, measures, and packages of a less general nature, we beg to refer to the Second Report of the Parliamentary Commissioners on Weights and Measures, to Buchanan's Treatise on the same subject, and to Waterston's Manual of Commerce.

In the old English wine measure, 32 gills = 8 pints = 4 quarts = 1 gallon = ·83311 imperial gallon; so that 6 old wine gallons were very nearly equal to 5 imperial.

In the old English ale measure, 8 pints = 4 quarts = 1 gallon = 1·01704 imperial gallon.

All the denominations of the old English or Winchester dry measure were the same as those of the imperial, but each of the former was less than the latter in the proportion of 32 to 33 nearly, or, more accurately, of ·969447 to 1. Wherefore, each of the Winchester measures will be reduced to imperial by multiplying it by ·969447.

Weights and Measures.

In Scotish troyes, or Dutch weight (which, under the name of French troys, was, by the acts of the Scotish parliament of 1617 and 1618, declared to be the only legal weight for Scotland, and the standard of which was committed to the keeping of the borough of Lanark), 4096 drops = 256 ounces = 16 lbs. = 1 stone = 17·391885 lbs. avoird., according to the verdict of the Edinburgh jury (4th February 1826), from weighing the original Lanark stone, then in the custody of the Dean of Guild of Edinburgh. But in practice the Dutch stone was more generally reckoned, and probably was adjusted to, 17·5 lbs. avoirdupois; or 4 Dutch stones were = 5 imperial stones of 14 lbs. each. In this way although 8 Dutch stones were said to form the standard Scotish meal boll, it was commonly reckoned to be just ten imperial stones, or 140 lbs. avoirdupois.

The tron weight, although condemned to be utterly abolished by the statutes above cited, continued in use, and varied throughout Scotland from 21 to 28 ounces avoirdupois to the pound, which in Edinburgh contained 22 of these ounces. It was generally used for butter, cheese, and in many places for butcher-meat, hay, &c. Its multiples and subdivisions were similar to those of the Dutch. A stone of 16 lbs. avoirdupois, called customary weight, was also to be met with in many places both in England and Scotland. Nay, in some places this went by the name of Dutch weight, while the Dutch, again, was called Edinburgh weight.

The Scotish ell was = 37·0598 imperial inches; and 1920 ells = 320 falls = 8 furlongs = 1 mile = 1·123024 imperial mile. The Scotish chain for land measure, like the imperial, consisted of 100 links, and though often reckoned to have been just 74 imperial feet, was more correctly = 24 ells = 74·1196 feet; and 5760 square ells = 160 falls = 10 square chains = 4 roods = 1 acre = 1·261183 imperial acre. Scotish acres will therefore be reduced to imperial, by multiplying them by 1·261183. Twenty-three Scotish acres made about 29 imperial, or, more nearly, 134 Scotish = 169 imperial.

Weights and Measures.

In the old Scotish liquid measure, 128 gills = 32 mutchkins = 16 chopins = 8 pints = 1 gallon = 3·00651 imperial gallons.

Although several of the old Scotish dry measures were very different in different districts, most of them were similarly subdivided, having 64 lippies or forpets = 16 pecks = 4 firlots = 1 boll. In some of them, however, the bolls, especially where they were large, had very different sorts of subdivisions. But for an account of these, we must, for brevity's sake, refer to Mr Buchanan's very complete treatise on the subject. The proportion of an entire boll of each to the imperial measures, as determined by the verdicts of the juries in the different counties, in terms of the act 5 Geo. IV., cap. 74, will be seen from the following table, which may often be of use in interpreting contracts or leases based on the old measures.

Table shewing how many Imperial Bushels, Pecks, Gallons, and Decimals, are contained in one Boll of each of the Old Scotish Local Measures for Barley, Oats, Wheat, &c.

One Boll.	Barley, Oats, &c.			Wheat, &c.			One Boll.	Barley, Oats, &c.			Wheat, &c.		
	B.	Pk.	Gall.	B.	Pk.	Gall.		B.	Pk.	Gall.	B.	Pk.	Gall.
Aberdeen	6	1	1·544	4	3	1·416	Kincardine, north part	6	1	1·544	3	3	1·944
Argyll, Inverary	6	1	0·411	...		...	Kincardine, south part	6	0	0·104	4	0	1·072
Achnabreck	6	2	0·426	...		...	Kinross	5	3	0·565	3	3	1·919
Cantire	7	3	1·014	...		...	Kirkcudbright,				...		...
Ayr	7	3	0 045	3	3	1·022	Between the rivers Orr & Fleet	10	2	1·311	...		...
Banff	6	1	0·256	4	1	0·551	West of Fleet	11	2	1·067	...		...
Berwick	5	3	0·667	3	3	1·111	East of Orr	9	2	1·556	...		...
Bute	7	3	0·759	3	3	1·379	Linlithgow	5	3	0·601	3	3	1·944
Caithness	6	1	0·566	...		...	Nairn { Barley	6	0	1·097	4	2	0·823
Clackmannan	6	0	1·418	...		...	Nairn { Oats	7	2	1·371			
Dunbarton	6	1	1·019	3	3	1·943	Renfrew	6	1	0·445	3	3	1·944
Elgin and Moray	6	0	1·006	4	0	1·691	Ross and Cromarty	5	3	1·735	3	3	1·699
Fife	5	3	0·957	4	0	0·188	Roxburgh	6	0	0·442	6	0	0·442
Forfar,							Teviotdale	7	2	0·552	5	0	1·508
Dundee	5	3	1·353	4	0	0·320	Selkirk	7	1	1·274	4	3	0·765
Other places	6	0	0·104	4	0	1·072	Stirling	6	0	1·181	3	3	1·919
Inverness	6	0	0·917	4	0	0·484	Sutherland	6	0	0·102	3	3	1·944

The old Linlithgow corn measures (which by acts of the Scotish parliament of 1617 and 1618 were declared to be the only legal measures for Scotland, the wheat firlot heaped having till then been used for barley and oats, when an equivalent separate firlot for these was first introduced) were also, previously to the imperial measures, used in the counties of Dumfries, Edinburgh, Haddington, Lanark, Peebles, Perth, and Wigton. They differed little from the one of the two bolls used in several other counties, especially that for wheat, as will be seen from the table. The term *boll* is still retained, six imperial bushels being generally reckoned to the boll of barley or oats, and four such bushels to the boll of wheat, &c.

In the old Irish measures, 11 miles were equal to 14 imperial miles, and 121 acres made 196 imperial acres. Twenty imperial stones were reckoned a barrel of wheat, peas, beans, or rye; 16 a barrel of barley, bere, or rapeseed; 14 a barrel of oats; and 12 a barrel of malt. To the Winchester quarter were reckoned 41 stones of wheat or rye, 24 of barley, 22 of oats, and 20 of malt. Of the old Irish gallons, 200 made 157 imperial gallons.

The troy grain is equal to ·064792 French gramme, the troy lb. = ·373202 kilogramme; the avoirdupois lb. = ·453544 kilogramme. The British yard = ·914379 metre; the mile = 1·609305 kilometre; the acre = ·404667 hectare; the gallon = 4·543389 litres; the bushel = ·363471 hectolitre; and the quarter = 2·907769 hectolitres. The reduction of French to British is subsequently given.

In the following general comparison of the principal foreign weights and measures with the British, instead of the term *imperial*, which alone must be nearly unintelligible to foreigners, and indeed has become next to superfluous after every other standard has ceased to be legal in this country, we shall use the term *British* to denote such of the standards as are uniform, and *troy* and *avoirdupois* to express the two different kinds of weights respectively.

Algiers.—Since the French conquest, the metrical system and *système usuel* of France are generally used by European merchants. The metalli of oil = 37·375 lbs. avoirdupois; and 100 rotoli = 119 lbs. avoirdupois. The metical = 73 troy grains. The Turkish pic used for cloth = 24·5 British inches; but the Moorish pic is only three fourths as long; and 16 tarries = 1 caffise = 8·75 British bushels.

Argentine Republic.—Same as in Spain.

Arabia.—The weights and measures of Egypt are much used where the sway of Mehemet Ali has extended. Besides these, 200 rattles = 100 maunds = 10 frazils = 1 bahar = 222·5 lbs. avoird.

Austria.—Of the weights, 32 loths = 16 oz. = 4 quarters = 1 commercial lb.; and 100 lbs. = 1 centner = 123·56 lbs. avoird. Also 20 lbs. = 1 stone. The Vienna mark of 4333 grains troy is used for gold and silver. Five such marks make nearly 6 marks of Cologne. Of Vienna measures, 6 feet make one klafter or fathom = 6·23 Brit. feet; 1 ell = 30·6 Brit. inches; 4000 klaftern = 1 posting mile = 4·71 Brit. miles; and the joch = 6889 Brit. sq. yds. Also 70 kopfen = 40 maasses = 4 viertels = 112·46 Brit. gall. Of wine, 32 eimers = 1 fuder; and 30 eimers = 1 dreyling. Eight achtels of corn = 4 viertels = 1 metzen = 1·69 Brit. bushel, and 30 metzen make 1 muth. At Trieste, the woollen ell = 26·6 Brit. inches; the silk ell = 25·22 Brit. inches; the eimer or orna of wine = 12·45 Brit. gallons; the barile = 144·5 Brit. gall. The orna of oil = 14·17 Brit. gall.; and the stajo of corn = 2·272 Brit. bushels. But sometimes the weights and measures of Venice, about to be described, are used here.

In public and official matters, the decimal system of France was in effect adopted, though under a different nomenclature, in the Austrian states of Italy in 1804. Thus 10,000 grani = 1000 denari = 100 grossi = 10 oncie = 1 libra nouva = 1 kilogramme = 2·2086 lbs. avoird.; 1000 atomi = 100 diti = 10 palmi = 1 metre = 39·3708 Brit. inches; and 1000 copi = 100 liti = 10 mine = 1 soma = 1 hectolitre = 2·7512 Brit. bushels. The decimal

Weights and Measures.

system is principally used in public affairs, the old weights and measures being in more general use for ordinary trade. In Milan, the mark = 3627 grains troy; the lb. peso grosso = 2·3343 lbs. sottile = 1·6818 lb. avoird.; and the oil rubio = 47·5 same lbs. The wine brenta = 15·72 Brit. gall.; the corn stajo = 2·008 Brit. pecks. In Venice, the lb. peso grosso = 1·0519 lb. avoird.; the lb. sottile = ·6643 lb. avoird.; and the mark = 3681·5 grs. troy. The woollen braccio = 26·6 Brit. inches; the silk braccio = 24·8 same inches; the wine secco = 2·376 Brit. gall.; the oil miro = 3·554 Brit. gall.; and the corn stajo = 2·20 Brit. bushels.

Australia.—Same as in Britain.

Baden.—One hundred lbs. = 10 stones = 1 centner = 50 kilogrammes = 110·2429 lbs. avoird. There are 2 feet in the new aune = 6 decimetres = 23·62 Brit. inches. The morgen of land = 36 French ares = ·8896 Brit. acre. Also 150 litres = 1 ohm = 33·015 Brit. gallons; and 20 malters of corn = 1 last = 30 hectolitres = 10·32 Brit. quarters.

Bavaria.—The centner or quintal = 100 lbs. = 5 stones = 56 kilogrammes = 123·5 lbs. avoird. Gold and silver are weighed by the Cologne mark of 3608 troy grains. The ell = 32·8 British inches; the eimer of wine = 60 maas = 8·12 Brit. gallons; and 12 viertels = 6 metzen = 1 scheffel = 9·98 Brit. bushels. In the old system of Augsburg, 100 lbs. heavy weight = 108·3 lbs. avoird.; and 100 lbs. light weight = 104·23 lbs. avoird. The mark = 3643 troy grains, and is divided into 16 loths = 64 quintins.

Belgium.—In 1820, this country and Holland being under one government, the French metrical system was introduced into both, but with the old Dutch nomenclature, as follows. Ten korrels = 1 wigtje = 1 gramme = 15·434 troy grains; and 1000 wigtjes = 100 loods = 10 ons = 1 pond = 1 kilogramme = 2·20486 lbs. avoird. The apothecaries' new pound is divided into 12 oz. = 96 drams = 288 scruples = 5760 grains = 5787 grains troy. Ten palms = 1 elle = 1 metre = 39·3708 Brit. inches; also 1 mijle = 1 kilometre = 1093·633 Brit. yds.; and 100 square elles = 10 sq. roedes = 1 sq. bunder = 1 are = 119·6033 Brit. sq. yds. The cubic elle = 1 stère = 1·30802 Brit. cubic yd.; and 100 vingerhoeds = 10 maatjes = 1 kan = 1 litre; and 100 kans = 1 vat liquid measure = 1 hectolitre = 22·009 Brit. gallons. Also 100 kops = 10 schepels = 1 mudde or zak dry measure = 1 hectolitre = ·3439 British quarter.

Of the old systems still partially in use in many places, the Brabant lb. = 1·0335 lb. avoird.; the ell = 27·58 Brit. inches; and the league = 6076 Brit. yds. The aam of 50 stoops = 32·4 Brit. gallons; the velte = 4·1 Brit. gall.; and 37·5 viertels = 1 last = 32 Brit. bushels. The Antwerp silk ell = 27·32 Brit. inches, and the woollen ell = 26·97 of same inches.

Brazil.—In general the same as in Portugal. But in trade the following are also in use. The lb., of which 99 = 100 lbs. avoird. Five varas = 6 British yds.; and 4 covados = 3 Brit. yds. The medida of Rio Janeiro, of which 100 = 61·1 Brit. galls.; and 12 alqueires = 12·86 Brit. bushels. The canada of Bahia = 1·667 Brit. gall.; and 7 alqueires = 5·817 Brit. bushels. The alqueire of Maranham = 1·11 Brit. bushel.

Bremen.—The lb. consists of 16 ounces, and the lispond of 14 such lbs., of which 116 = 1 centner = 127·44 lbs. avoird. Hence 10 lbs. of Bremen make nearly 11 avoird. The Cologne mark is used for gold and silver. The ell of 2 feet = 22·76 Brit. inches, and 180 quarts = 45 stubchens = 20 viertels = 1 ahm = 31·5 Brit. gallons. Six ahms = 1 fuder of Rhenish wine, and 44 stubchens = 1 ahm of French wine. In corn measure, 640 spinets = 160 viertels = 40 scheffels = 4 quarts = 1 last = 9·77 British quarters.

Brunswick.—The centner consists of 114 lbs., and 100 lbs. = 103 lbs. avoird. Two feet = 1 ell = 22·46 Brit. inches. Forty stubgens = 1 wine ahm = 32·28 Brit. gall. Forty himtens of corn = 4 scheffels = 1 wispel = 34·2 Brit. bushels.

Buenos Ayres.—The same as in Spain.

Burman Empire.—Most commodities are bought and sold by weight. Of rice, 64 sales = 16 vis = 4 saits = 1 ten or basket = 57·36 lbs. avoird., but generally reckoned at half a cwt. Other grain, pulse, fruit, salt, and also lime, are measured. One hundred kaits = 1 vis or paiktha = 3·59 lbs. avoird.; and 150 vis = 1 candy = 500 lbs. avoird.

Canada.—The same as in Britain, except that the old English measures of capacity are still partially used, as also the old French minot = 1·0556 Brit. bushel; or 45 minots = 49 Winchester bushels, though commonly reckoned at 50.

Canary Isles.—The same as in Spain; but in the corn trade, 4·5 fanegas of wheat or barley, and 3·167 of maize or Indian corn, are reckoned to the Winchester quarter.

Candia.—The oke = 2·75 lbs. avoird., and the quintal = 126 of same lbs. The ell or pik = 25·11 Brit. inches; the dennum measure of surface = 40 sq. yds. The mistach is a variable measure of wine from 3 to 5 Brit. gall.; that of oil is more nearly 3 gall. Corn is measured by the carga = 4·19 Brit. bushels.

Cape of Good Hope.—The Dutch standards, which were formerly used here, have now in a great measure been superseded by the British. One hundred Dutch lbs. = 103·923 lbs. avoird. The muid of wheat weighs about 110 lbs. Dutch, or fully 119·6 avoird.; and 100 Dutch ells = 75·47 Brit. yds.; also 100 morgen = 201 Brit. acres. In corn measure, 4 schepels = 1 mudde or muid = 3·06 Brit. bushels; and 4 ahms = 1 leaguer = 126·63 British gallons.

Ceylon.—For foreign commodities, the British weights are generally employed. The candy or bahar = 500 lbs. avoird., and the garce = 82 cwts. 2 qrs. 16·5 lbs. The bale of cinnamon = 92½ lbs. avoird. Of the native measures, 192 seers = 8 parrahs = 1 amomam = 5·57 Brit. bushels; the last of corn = 6·54 Brit. quarters; and 300 canadas = 75 welts = 1 leaguer in the retail of arrack = 125 Brit. gall.; but in wholesale, the leaguer of arrack = 80 welts. Besides the British standards of length and surface, 40 coornies in the land measure of Kandi = 4 peylas = 1 amomam = 2·7344 Brit. acres.

Chili.—In general the same as in Spain. But 24 lbs. of Chili = 25 of Spain = 25·36 lbs. avoird., and 27 varas = 25 British yards.

China.—Liquids and grain are bought and sold by weight, of which 1000 cash = 100 candereens = 10 mace = 1 tael = 583·33 grains troy; and 1600 taels = 100 catties = 1 pecul = 133·33 lbs. avoird.; so that 3 peculs = 400 lbs., 84 catties = 1 cwt., and 12 taels = 1 lb. But in money weight, the tael is about 3·5 grains less. Of the measures, 10 punts = 1 covid = 14·625 Brit. inches; or 32 covids = 13 Brit. yds. The li = 180 fathoms = 632 Brit. yds., and 200 lis = 1 degree of the meridian.

Corsica.—In general the same as in France. At Bastia, the stajo of corn = 4·125 Brit. bushels, and the barile of wine = 30·8 Brit. gallons.

Cuba.—Generally the same as in Spain. The following are also used in trade: 100 lbs. = 4 arrobas = 1 quintal = 101·75 lbs. avoird. The vara = 33·333 Brit. inches; the fanega = 2·9 Brit. bushels; the arroba for wine or spirits = 3·42 Brit. gallons.

Denmark.—Of the weights, 320 lbs. = 20 lisponds = 1 shippond = 3·143 British cwts.; and 100 lbs. = 1 centner = 110·25 lbs. avoird. Gold and silver are weighed by the Copenhagen mark of 8 ounces = 3633 grains troy. Two Rhinland feet = 1 ell = 24·75 Brit. inches; and 2400 ruthes = 1 mile = 4·684 Brit. miles. Eight pots = 4 kans = 1 viertel = 1·7 Brit. gall.; 30 viertels = 1 hogshead = 51 Brit. gall.; 4 ankers = 1 ahm = 33·25 Brit. gall.; and 144 pots = 8 skieps = 1 barrel or toende = 3·83 Brit. bushels. Also 12 barrels = 1 last of corn = 5·739 Brit. quarters.

Egypt.—Of the weights, 144 dirhems = 12 oockeeyehs = 1 lb. or rutl = 15·75 oz. avoird.; and 400 dirhems = 1 oke or oockckah = 2·78 rutls = 2·75 lbs. avoird. Also 100 rutls = 1 cantar or ckuntar, from 98 to 99 lbs. avoird. The common cubit = 22·667 Brit. inches; the cubit used for Indian goods = 25 Brit. inches; the cubit of Constantinople used for European cloth = 26·5 Brit. inches. Of corn measure, 24 roobas = 6 weybehs = 1 ardeb = 4·847 Brit. bushels. But various other weights and measures are to be found in some parts of Egypt.

France.—The metrical system, whose multiples and subdivisions all proceed decimally, was instituted in 1795, and is founded upon the dimensions of the earth: the ten millionth part of the meridian arc between the pole and equator, being denominated a *mètre*, forms the unit of length. The other units, all derived from it, are, 1st, that of surface, the *are*; 2d, of solidity, the *stère*; 3d, of capacity, the *litre*; and, 4th, of weight, the *gramme*. The Latin derivatives *deci* to denote the tenth part, *centi* the hundredth, and *milli* the thousandth part, being prefixed to any of these units, serve to denominate its decimal subdivisions; while the sort of Greek derivatives *deca* to denote ten times, *hecto* an hundred, *kilo* a thousand, and *myria* ten thousand times, being prefixed, express its decimal multiples. Thus, a decimetre means the tenth of a metre, and a decametre is 10 metres. So far as it goes, a tolerably correct summary of this system is given in the preceding part of this article. But being exceedingly brief, and involving several terms very different from those actually used by the French, we have here endeavoured to state the matter so as to be more intelligible to the general reader.

The metre is then equal to 10 decimetres = 100 centimetres = 1000 millimetres = 1·093633 Brit. yard, or 39·37079 Brit. inches; and 32 metres = 35 Brit. yards nearly. Also 1000 metres = 100 decametres = 10 hectometres = 1 kilometre or metrical mile = 3280·899 Brit. feet = 1093·633 yards, or nearly 5 furlongs.

The are or metrical perch, consisting of 100 square metres, = 10 deciares = 100 centiares = 119·6033 Brit. sq. yards. Also 100 ares = 10 decares = 1 hectare = 2·471143 Brit. acres; and 17 hectares are nearly equal to 42 Brit. acres.

The stere or cubic metre = 10 decisteres = 1·308022 Brit. cubic yard; and 10 steres = 1 decastere.

Weights and Measures.

The litre or cubic decimetre = 10 decilitres = 100 centilitres = 61·027052 Brit. cubic inches; and 50 litres are nearly 11 Brit. gallons. Also 100 litres = 10 decalitres = 1 hectolitre = 2·751207 Brit. bushels; and 32 hectolitres are nearly equal to 11 Brit. quarters, and 100 hectolitres = 10 kilolitres or cubic metres = 1 myrialitre = 34·390086 Brit. quarters.

The gramme is a weight equal that of 1 cubic centimetre of water at its maximum density. It contains 10 decigrammes = 100 centigrammes = 15·434 troy grains; and 1000 grammes = 100 decagrammes = 10 hectogrammes = 1 kilogramme = 2·679514 lbs. troy = 2·204857 lbs. avoird. Also 100 kilogrammes = 10 myriagrammes = 1 metrical quintal = 220·486 lbs. avoird.; and 10 quintals = weight of a cubic metre of water = 1 millier or marine ton = 19 Brit. cwt. 2 qrs. 20 lbs. 13·75 oz.

The *Système Usuel*, or Binary System, of the French, was introduced in 1812, for the accommodation of retail trade, to make a sort of compromise with the common people, who shewed an irreconcileable aversion to the innovations of the metrical or decimal system. It has the metrical standards for its basis; but their divisions, &c. instead of being decimal, are chiefly binary, that is, they proceed principally by continually halving or doubling some of these standards, though partly according to other divisions of the old system; and instead of the metrical vocabulary, the names of ancient weights and measures are employed, annexing the term *usuel* to each. Thus, the toise usuelle = 2 metres = 78·74158 Brit. inches. The pied usuel is one sixth of the toise, and is subdivided into twelfths or inches, &c. The aune usuelle = 12 decimetres = 1·2 metre = 47·2449 Brit. inches. The litron usuel = 1 litre = 1·7608 Brit. pint. The Boisseau usuel is one eighth of the hectolitre, and = 2·7512 Brit. gallons. The livre usuelle is half the kilogramme, and = 1·10243 lb. avoird. The halves, quarters, eighths, &c. of the most of the above are also in use. A summary of the ancient French system will be found in the preceding part of this article.

Frankfort on the Maine.—Of the weights, 128 drachmes = 32 loths = 2 marks = 1 heavy lb. = 1·1143 lb. avoird. The light lb. is similarly divided, but only = 1·0318 lb. avoird., so that 108 of the light lbs. make only 100 of the heavy or centner weight. The Cologne mark, here reckoned = 3611 grains troy, is used for gold and silver. The Frankfort foot contains 11·42 Brit. inches, and the ell 21·54. The Brabant ell is generally used for Dutch goods, and the Paris aune for French. Eighty old or 90 new mass (each of 4 schoppen) are equal to 20 viertels = 1 ohm = 31·57 Brit. gall.; and 16 sechters = 8 metzen = 4 simmers = 1 malter or achtel = 3·16 Brit. bushels.

Genoa.—There are two sorts of pounds, the peso sottile lb., and the peso grosso lb. The latter is a tenth part heavier than the former, so that the cantaro of 100 lbs. peso sottile = 69·89 lbs. avoird., and the cantaro of 100 lbs. peso grosso = 76·88. The latter is used for bulky commodities, and the former for gold, silver, and all articles of small bulk. The palmo = 9·725 Brit. inches, and 2·333 palmi = 1 braccio. The canna is of three sorts: the canna piccola used by tradesmen = 9 palmi, the canna grossa of the merchants = 12 palmi, and the custom-house canna = 10 palmi. Of corn measure, 96 gombette = 8 quarti = 1 mina = 3·31 Brit. bushels. Also 100 pints = 2 barili = 1 mezzarola of wine = 32·67 Brit. gall.; and 64 quateroni = 4 quarti = 1 oil barile = 14·23 Brit. gall.

Germany.—Considerable diversity of weights and measures is to be found in the various states into which this extensive country is divided, and the most important of them will be found noticed separately. But not a few of their standards, though differing in amount, are similar in their multiples and subdivisions. Of the weights, 1024 hellers = 312 pfennings = 128 quentins = 32 loths = 16 ounces = 2 marks = 1 commercial lb.; and 5760 grains = 288 scruples = 96 drams = 12 oz. = 1 apothecaries' lb.; also 4352 eschen = 512 hellers = 256 pfennings = 64 quentins = 16 loths = 8 oz. = 1 Cologne mark = 3608 grains troy. By this gold and silver are weighed; and the fineness of gold is expressed by 24th parts or carats as in Britain, but the fineness of silver by 16th parts. For jewellery there is a carat of 3·171 grs. troy. Of the measures, 144 inches = 12 feet = 6 ells = 2 clafters = 4 ruthe. The Rhinland foot used by surveyors = 12·36 Brit. inches; the long mile = 10,126 Brit. yds., the short mile = 6859, and the geographical mile = 8101 Brit. yds. The Rhinland morgen of land = 10,185 Brit. sq. yds.

Gibraltar.—Besides the British standards, the following Spanish are also used: The arroba = 26 lbs. avoird.; the quintal = 100 lbs. = 101·75 lbs. avoird.; the corn fanega = 1·55 Brit. bushel; the pipe of 117 gallons = 105 Brit. gall.; the liquid arroba = 2·77 Brit. gall.; and the wine gallon = 1·094 Brit. gall.

Goa.—The same as in Portugal, except that the candy of 20 maunds = 495 lbs. avoird. This, in the measurement of grain, is reckoned to be nearly 14 Winchester bushels.

Greece.—The same as in France.

Guiana (British).—In general the same as in Britain; but the following, originally introduced by the Dutch, are also used: the lb. = 1·09 lbs. avoird.; and the ell of 26 inches = 27 British inches.

Guiana (Dutch).—In general the same as in Holland, but chiefly upon the old system.

Hamburg.—Of the weights, 128 drachmes = 32 loths = 16 oz. = 2 marks = 1 lb. = 1·0682 lb. avoird.; 112 lbs. = 8 lisponds = 1 centner = 119·64 lbs. avoird.; and 5 centners = 2 shipfunds. Ten lbs. = 1 stone of wool or feathers = half a stone of flax. Of butter, 280 lbs. form the great, and 224 the small tonne. A pipe of oil is reckoned at 820 lbs. Gold and silver are weighed by the Cologne mark, and their fineness valued as explained under the head Germany. Of measures, 6 palms = 2 feet = 1 ell = 22·578 Brit. inches. The Rhinland foot of engineers and surveyors = 12·36 Brit. inches. The Brabant ell, commonly used for piece goods, = 27·585 Brit. inches. Also 160 quarters = 40 stubgens = 20 viertels = 5 eimers = 4 ankers = 1 ahm = 31·87 Brit. gall.; and 24 ankers or 6 ahms = 1 fuder. Of wine, 6 tierces = 4 oxhofts or hogsheads = 1 faas; but these are of various sizes. Of corn, 160 spints = 40 himtens = 20 faas = 10 scheffels = 1 wisp or wispel = 29 Brit. bushels; two wisps = 1 last of barley or oats = 7·25 Brit. quarters; and 3 wisps = 1 last of wheat or rye = 1 stock of barley or oats = 10·87 Brit. quarters.

Hanover.—The lb. = 1·073 lb. avoird.; 112 lbs. = 1 centner; and 20 lbs. = 1 stone of flax or 2 stones of wool. Also 600 lbs. = 51 stubgens = 2 tonnes of honey; and 3360 lbs. = 240 lisponds = 12 shipfunds = 1 last. The Cologne mark is used for gold, silver, and silk. Two feet = 1 ell = 22·91 Brit. inches; the mile = 6·5676 Brit. miles. The morgen land measure = 2·5625 Brit. roods. Also 80 kannen = 40 stubgens = 4 ankers = 2·5 eimers = 1 ahm = 34·24 Brit. gallons; and 6 ahms = 4 oxhofts = 1 fuder of wine. Of corn, 96 himtens = 16 malters = 2 wisps or wispels = 1 last = 82 Brit. bushels.

Hayti.—Port-au-Prince.—Principally the old system of France, together with the old English wine gallon.

Hesse-Cassel.—The lb. = 17·08 oz. avoird. The ell = 22·59 Brit. inches; the acre = ·5894 Brit. acre; the liquid ohm = 34·94 Brit. gall.; and 16 corn metzen = 4 himtens = 1 viertel = 4·42 Brit. bushels.

Hesse-Darmstadt.—Two lbs. = 1 French kilogramme = 2·20486 lbs. avoird. Ten feet = 1 klafter = 2·5 metres = 8·2023 Brit. feet; five ells = 3 metres = 3·2809 Brit. yds.; four morgens = 1 hectare = 2·47114 Brit. acres. The liquid ohm = 160 litres = 35·22 Brit. gallons; the corn malter = 1·28 hectolitre = 3·522 Brit. bushels.

Holland.—In 1820, the decimal system of France was introduced, but with the old Dutch nomenclature, as explained under the head Belgium. Of the old weights still used in many places, 10,240 aas = 320 engels = 16 oz. = 2 marks = 1 Dutch lb. troy = 1·0851 lb. avoird. There are also 16 oz. in the commercial lb. = 1·0893 lb. avoird., and 100 commercial lbs. = 1 centner. The old Amsterdam foot = 11·15, and the ell = 27·08 Brit. inches; the Rhinland foot = 12·36, and the Flemish or Brabant ell = 27·58 Brit. inches. Nineteen Dutch leagues make one degree of the meridian.

Japan.—The weights are almost the same as in China. The inc = 6·25 Brit. feet; but the measures of capacity have not been compared.

Java.—In this and the other Dutch colonies in India, the weights of China are ordinarily employed; but the pecul, instead of being exactly 133·33 lbs. avoird. is = 135·625 lbs. Of rice, the coyang = 3581 lbs. avoird. and the timbang = 10 sacks = 5 peculs = 678·125 lbs. The Dutch troy mark of 9 reals, = 3798 Brit. troy grains, is used for gold and silver. The foot = 12·36, and the ell = 27·75 Brit. inches. The kanne, liquid measure, = ·3282 Brit. gall., and 396 rands = 1 leaguer of arrack = 133·33 Brit. gall.; but 360 rands = 1 leaguer of wine.

India.—Grain is generally sold by weight, as also liquids, except wines and spirits, which at all the three presidencies are sold by British measures. Of the Bengal weights, 940 chittacks = 40 seers = 1 factory maund = 74·67 lbs. avoird. or two thirds of a British cwt. The bazaar maund is one tenth greater than the factory, and similarly divided. Gold and silver are weighed by the new tola or sicca of 180 grains troy. Two cubits = 1 guz = 1 Brit. yd. The coss or mile of Bengal = 2000 yards, and 1600 sq. yds. = 20 cottahs = 1 biggah. At Bombay 40 seers = 1 maund = one quarter of a British cwt., and 20 maunds = 1 candy = 5 cwts., which in corn is counted at 24·5 Brit. bushels. At Madras, 320 pollams = 8 vis = 1 maund = 25 lbs. avoird., and 20 maunds = 1 candy. The covid = 18·6 inches, but the British yard is used for cloth; and in land measure, 24 maunies = 1 cawney = 6400 Brit. sq. yds. Also 320 measures = 400 marcals = 80 parahs = 1 garse

Weights and Measures.

or gursay. The marcal = 750 Brit. cubic inches. When grain is sold by weight, 9256·5 lbs. avoird. are reckoned to the garse.

Commercial Weights, &c. of India, and of several adjacent States, with their equivalents in British, Bengal Factory, Madras, and Bombay Weights.

Commercial Weights, &c.	Avoirdupois.			Bengal Factory.			Madras.			Bombay.		
	Lbs.	Oz.	Dr.	Mds.	S.	Ch.	Mds.	Vis.	Pol.	Mds.	S.	Pice.
Acheen bahar of 200 catties	423	6	13	5	26	13	16	7	19	15	4	27
Acheen guncha of 10 nelly	220	0	0	2	37	13·7	8	6	16	7	34	8·6
Anjengo candy of 20 maunds	560	0	0	7	20	0	22	3	8	20	0	0
Batavia pecul of 100 catties	135	10	0	1	32	10	5	3	16	4	33	22·4
Bencoolen bahar	560	0	0	7	20	0	22	3	8	20	0	0
Bengal factory maund	74	10	10·7	1	0	0	2	7	35·7	2	26	20
Bengal bazaar maund	82	2	2·1	1	4	0	3	2	11·3	2	37	10
Bombay candy of 20 maunds	560	0	0	7	20	0	22	3	8	20	0	0
Bussorah maund of 76 vakias	90	4	0	1	8	5·6	3	4	35·2	3	8	27·9
Bussorah maund of 24 vakias	28	8	0	0	15	4·3	1	1	4·8	1	0	21·4
Calicut maund of 100 pools	30	0	0	0	16	1·1	1	1	24	1	2	25·7
China pecul of 100 catties	133	5	5·3	1	31	6	5	2	26	4	30	14·3
Cochin candy of 20 maunds	543	8	0	7	11	2·6	21	5	36·8	19	16	12·9
Gombroon bazaar candy	7	8	0	0	4	0	0	2	16	0	10	21·4
Goa candy of 20 maunds	495	0	0	6	25	2 9	19	6	16	17	27	4·3
Jonkceylon bahar of 8 capins	485	5	5·3	6	20	0	19	3	12	17	13	10
Madras candy of 20 maunds	500	0	0	6	28	0	20	0	0	17	34	8·6
Malacca bahar of 3 peculs	405	0	0	5	16	15	16	1	24	14	18	17·1
Mocha bahar of 15 frazils	450	0	0	6	0	1	18	0	0	16	2	25·7
Muscat custom-house maund	8	12	0	0	4	11	0	2	32	0	12	15
Mysore candy of 7 morahs	560	0	0	7	20	0	22	3	8	20	0	0
Pegu candy of 150 vis	500	0	0	6	28	0	20	0	0	17	34	8·6
Penang pecul of 100 catties	133	5	5·3	1	31	6	5	2	26	4	30	14·3
Surat maund of 40 seers	37	5	5·3	0	20	0	1	3	37·9	1	13	10
Surat pucca maund	74	10	10·7	1	0	0	2	7	35·7	2	26	20
Tillycherry candy of 20 maunds	600	0	0	8	0	2	24	0	0	21	17	4·3

Ionian Isles.—The present British system was introduced in 1828, when the libbra sottile was made equal to 1 lb. troy, the libbra grossa to 1 lb. avoird., the talanto to 100 lbs. avoird., the stadio of 40 carnaco to 1 Brit. furlong, the barrel to 16 Brit. gallons, and the kilo of corn to 1 Brit. bushel. Of the old weights, 44 okes = 1 quintal = 123·15 lbs. avoird., or 40 okes = 1 cwt. nearly. Of the old measures, the Zante braccio for cloth = 27·18 Brit. inches, the silk braccio = 25·37 Brit. inches; the Zante barile = 14·68, and the Corfu barile = 15 Brit. gallons. Also 8 misure = 1 corn moggio of Zante = 4·63 Brit. bushels. In land measure, 24 zappade = 8 misure = 1 moggio = 2·4 Brit. acres.

Lubeck.—The Cologne mark of 3608 troy grains is used for gold and silver, and 112 lbs. = 8 lisponds = 119·67 lbs. avoird. Two feet = 1 ell = 22·7 Brit. inches; and 80 kannes = 40 stubgen = 20 viertels = 1 ahm = 31·87 Brit. gall. Also 96 scheffels = 24 barrels = 8 dromts = 1 last of wheat or rye = 11·04 Brit. quarters. The last of oats = 12·95 quarters, and is similarly subdivided.

Lucca.—The common lb. = 0·7448 lb. avoird., but the lb. peso grosso = 8·234 lbs. avoird. or 11 Leghorn lbs. The braccio for woollens = 23·8 Brit. inches, but that for silk is an inch less. There are 4 braccio in the canna. The coppo for oil = 21·97 Brit. gall. Wine is sold by the Leghorn barile of 20 fiasci, and corn by the staja = two thirds of a Brit. bushel.

Madeira.—In general the same as in Portugal; but in corn measure 23 alquieres are = 24 of Lisbon, and in wine measure 12 almudos are = 13 of Lisbon.

Majorca.—One hundred rottolos or lbs. = 1 cantaro Berberesco = 88·2 lbs. avoird.; 104 rottolos = 4 arrobas = 1 quintal = 91·73 lbs. avoird.; and 312 rottolos = 3 quintals = 1 carga. Also 108 rottolos = 12 quartins or cortans = 1 odor of oil. The canna = 67·5 Brit. inches. Of wine, 6·5 corters = 1 quartin = 5·97 Brit. gall.; and 6 barcellas of corn = 1 quartera = 1·94 Brit. bushel.

Malacca.—One hundred catties = 1 pecul = 135 lbs. avoird.; 3 peculs make 1 bahar; and 500 gantons = 50 measures = 1 last = 29 Brit. cwts. nearly. Also 40 peculs = 1 coyau of salt or rice. A kip of tin = 41 lbs. avoird. The buncal, = 832 grains troy, is used for gold and silver. The covid = 18·125 Brit. inches.

Malta.—One hundred rottoli or lbs. = 1 cantar = 174·5 lbs. avoird. Gold and silver are weighed by the lb. of 12 oz. = 4886 grains troy. Eight palmi = 1 canna = 82 Brit. inches; and 16 square tumoli = 1 salma land measure = 4·44 Brit. acres. The wine barile contains 9·17, and the oil caffiso 4·375 Brit. gall. Two caffisos make a barile. The salma corn measure = 7·875 Brit. bushels.

Marocco.—The rottolo or commercial lb. = 1·19 lb. avoird., and 100 such lbs = 1 quintal. The market lb. is one half heavier, or = 1·785 lb. avoird. By it iron, bees' wax, and provisions are sold. The canna for cloth = 21 Brit. inches, but the measures of capacity are very variable.

Mauritius.—In government affairs the British system is used, but in ordinary business something near the old system of France, reckoning the quintal of 100 lbs. poids de marc = 108 lbs. avoird.; 20 quintals = 1 French ton; 100 lbs. French to the bag of coffee, 150 to the bag of rice, and 250 to the bale of cotton. Also 15 French feet are reckoned = 16 Brit. feet, 7 aunes = 9 Brit. yds., 1 arpent = 1·04375 acre, one velt = 2 old English wine gallons, and 30 velts = 1 cask.

Mecklenburg.—The weights are chiefly those of Lubeck and Hamburg, but 100 Rostock lbs. = 1 Brit. cwt. There are 2 feet in the Rostock ell = 22·67 Brit. inches, and 1 scheffel of corn = 1·07 Brit. bushel. The liquid measures are those of Lubeck.

Mexico.—In general the same as in Spain; but the British yd. and French aune are also in use for European goods.

Minorca.—The weights and dry measures are the same as in Majorca; and, except the gerra or jar of two quarters, = 2·65 Brit. gall., the other measures are the same as in Spain.

Mocha.—Of the weights, 150 maunds = 15 frazils = 1 bahar = 450 lbs. avoird.; 48 carats = 3 coffola = 2 miscals = 146·74 grains troy; 10 coffolas = 1 vakia, and 87 vakias = the weight of 100 Spanish dollars. The covid = 19, the guz = 25 Brit. inches; 8 noosfias = 1 gudda = 1·8 Brit. gallon; and 40 kellas dry measure = 1 tomand, which, of rice, is reckoned to weigh 168 lbs. avoird.

Modena.—The Modena libbra or lb. = 0·7045 lb.; the Reggio lb. = 0·7274 lb. avoird., and 100 lbs. = 1 quintal. The Modena braccio = 24·31; and the braccio of Reggio = 20·85 Brit. inches. In land measure, 72 tavole = 1 biolca = 2·8036 Brit. roods. Corn is sold by the stajo, = 1·94 Brit. bushel.

Moldavia.—In general the same as in Turkey; but in common trade 25 okes of Galatz are reckoned = 2 Russian poods; 2400 okes = 7 centners = 700 lbs. of Vienna.

Montevideo.—Same as in Spain.

Mozambique.—One frazil = 12 lbs. avoird., and 20 frazils = 1 bahar.

Muscat.—Twenty-four cuchas = 1 maund = 8¾ lbs. avoird.

Naples.—One hundred rottoli or lbs. = 1 cantaro grosso = 196·45 lbs. avoird.; 1800 oz. = 150 lbs. = 1 cantaro piccola = 106·07 lbs. avoird.; and 7200 acini = 360 trapesi = 12 oz. = the lb. of 4950 grains troy, by which gold and silver are weighed. Of the measures, 96 inches = 8 palmi = 1 canna or ell = 83·05 Brit. inches; 15 palmi make 2 passi, and 7000 palmi = 1 mile = 2018 Brit. yds. There are 900 sq. passi in the moggia of land = ·8315 Brit. acre. Sixty caraffi = 1 baril of wine or brandy = 9·6 imp. gall.; 24 barili = 2 botte = 1 carro; 14 barili = 1 pipe; and 256 quarti = 16 staja = 1 salma of oil = 34·91 Brit. gall., and is reckoned to weigh 324 lbs. avoird. Four quarti of corn = 2 mezzetti = 1 tomolo = 1·519 Brit. bushels. At Gallipoli, 320 pignatti = 10 staja = 1 salma of oil = 34·11 Brit. gall. The salma at Bari = 36·42 such gallons.

Nassau.—The standards are founded on the metrical system of France. Ten inches = 1 foot = half a metre = 19·685 Brit. inches; 10 feet = 1 perch, and 100 square perches = 1 morgen = 25 ares = ·6178 Brit. acre.

New Brunswick.—Same as in Britain.

Newfoundland.—Same as in Britain.

New Granada.—Same as in Spain.

Norway.—The same as in Denmark.

Nova Scotia.—The same as in Britain.

Oldenburg.—The weights are those of Hamburg. Twelve inches = 1 foot = 11·65 Brit. inches; and the ell contains 22·76 of same inches. Also 104 kannes = 4 ankers = 1 ohm; 3 ohms = 2 oxhofts; and 144 scheffels = 18 tonnes = 12 malters = 1 last = 80·69 Brit. bushels.

Parma.—Of the weights, 300 ounces = 25 lbs. = 1 rubbio = 18·08 lbs. avoird. The braccio for measuring cloth = 25·35 Brit. inches, which exceeds that used for silk by 1·95 inch. There are 12 inches in the braccio di ligno used by surveyors, = 21·34 Brit. inches; and 6 bracci = 1 perch. Also 288 sq. perches = 72 tavole = 6 tari = 1 biolca = nearly ·75 Brit. acre; and 16 quarterole = 1 stajo of corn = 1·413 Brit. bushel.

Persia.—The weight chiefly used in commerce is the batman, which not only is of different amount in different districts, but depends also on the kind of article to be weighed. At Tabriz, 600 miscals = 300 derhams = 6 rattles = 1 batman = 6·34 lbs. avoird., which is only half the batman of Cherray. There is a derham of nearly 150 grains troy, by which gold and silver are weighed, and

which exceeds the derham of Bushire by nearly 7 grains. Pearls are weighed by the abas of 2·25 troy grs. The measures are not less variable than the weights. The guz or common cubit = 25 Brit. inches, and the royal guz is one half longer. The archin of Tabriz = 44 Brit. inches. There are 20 leagues or parasangs in a degree of the equator; but it is by the fursoch or augage, that is, the space of about four or five Brit. miles walked over by a horse in an hour, that moderate distances are usually reckoned. Greater distances are estimated by the day's march of a caravan, which may be about 30 miles. In corn measure, 200 sextarios = 50 chenicas = 25 capichas = 1 artaba = 1·939 Brit. bushels.

Peru.—The same as in Spain.

Philippine Isles.—The same as in Spain, except that the Chinese pecul is sometimes used.

Poland.—Of the weights, 128 drachms = 32 loths = 16 oz. = 1 lb. = 0·89414 lb. avoird.; 32 lbs. of Poland = 1 stone, and 160 such lbs. = 1 centner. The Cologne mark is used for coined gold and silver, but the Warsaw mark = 3113 grains troy for the uncoined. Two feet = 1 ell or lokci = 22·68 Brit. inches. The mile is the twentieth part of a degree of the meridian. There are 300 perches in the acre or morgen, = 1·384 Brit. acre: and 30 morgens make 1 wloka. Also 16 liquid kwaterkas = 4 kwartas = 1 garniec = 4 French litres = 0·88039 Brit. gall.; and 25 garniecs = 1 becsksa. Of corn, 128 kwartas = 32 garniecs = 4 cwiercs = 1 korsec = 3·5214 Brit. bushels.

Popedom or Papal States.—Of the commercial weights, 6912 grani = 288 denari = 12 once = 1 Roman lb. = ·7477 lb. avoird. The same lb. is also used by apothecaries and for gold and silver; and 100 such lbs. = 10 decine = 1 quintal. The foot = 11·72 Brit. inches; 8 palmi = 1 mercantile canna = 6·52917 Brit. feet. The Roman mile = 1628 Brit. yds. Also 128 fogliette = 32 boccali = 1 barile of wine = 12·84 Brit. gall.; 80 boccali = 1 soma of oil = 36·14 Brit. gall; and 88 quartucci = 22 scorzi = 4 quarte = 1 corn rubbio = 8·1 Brit. bushel. In Ancona, 100 lbs. = 73·75 lbs. avoird.; the braccio = 25·33 Brit. inches; and 24 boccali = 2 barili = 1 wine soma = 18·9 Brit. gall. Also 8 coppe = 1 corn rubbio = 7·87 Brit. bushels. In Bologna, the lb. = ·798 lb. avoird., and the foot = 15 Brit. inches.

Portugal.—Of the commercial weights, 32 marks = 16 oz. = 1 arratel or lb. = 1·0119 lb. avoird.; and 32 arratels = 1 arroba. There are 4 arrobas in the quintal, and 54 in the tonelada. The apothecaries' lb. is only three fourths of the commercial. There are 8 inches in the palmo craveiro, = 8·622 Brit. inches; the pe or foot = 1·5 palmo; 5 palmos = 1 varo; and though three palmos are usually said to form the varo, it is more nearly 26·67 Brit. inches. Ten palmos = 1 braço; the mile = 2253 Brit. yds.; and 3 miles = 1 league. Of land, 4840 square varos = 1 geira; and 7 geiras make nearly 10 Brit. acres. Of liquids, 48 quartilhos = 12 canadas = 2 pots = 1 almude of Lisbon = 3·64 Brit. gall.; there are 18 almudes in the baril, 26 in the pipe, and 52 in the tonelada. In dry measure, 240 quartos = 60 alquieres of Lisbon = 15 fanegas = 1 moyo = 22·39 Brit. bushels. The almude of Oporto = 5·61 Brit. gall., and the alquiere of Oporto = ·465 Brit. bushel.

Prussia.—Of the commercial weights, 128 quintins = 32 loths = 2 Cologne marks = 1 lb. = 1·0311 lb. avoird.; and 110 lbs. = 1 centner or quintal = 113·42 lbs. avoird. There are 4000 lbs. in the ship last; and the apothecaries' lb. is only two thirds of the commercial. The Cologne mark is used for gold and silver. The Rhinland foot = 12·356 Brit. inches; the ell = 26·26 of such inches; and 2000 perches = 1 mile = 8237 Brit. yds. There are 180 sq. perches in the morgen or acre, = 3054 Brit. sq. yds.; and 30 morgen = 1 hufe. Also 120 quarts = 4 ankers = 2 eimers = 1 liquid ohm = 30·23 Brit. gall.; 3 eimers = 1 oxhoft; 100 quarts = 1 tun of beer; and 48 quarts = 16 metzen = 1 corn scheffel = 1·512 Brit. bushel. Various old measures are still partially in use.

Prusso-German commercial league or Zoll-Verein is composed of Anhalt Bernbourg, Anhalt Cothen, Anhalt Dessau, Baden, Bavaria, Birkenfeld (part of Oldenburg), Frankfort, Hesse Cassel, Hesse Darmstadt, Hesse Homburg, Hohenzollern Hichengen, Hohenzollern Sigmaringen, Nassau, Prussia, principalities of Reuss, Saxony, Saxe-Altenburg, Saxe-Coburg Gotha, Saxe-Meiningen, Saxe-Weimar, Schwarzburg Rudolstadt, Schwarzburg Sondershausen, Waldeck (exclusive of Pyrmont), Würtemberg. The basis of their tariff is the centner of Baden = 50 French kilogrammes, and divided into 100 pounds or livres usuelles of France. Hence the zoll centner of 100 lbs. = 110·2429 lbs. avoird. The following relative values are given in the tariff:—

935·422	zoll lbs.	=	1000 Prussian lbs.
1120·	... ...	=	1000 Bavarian lbs.
2000·	... ...	=	1000 kilogrammes.
935·456	... ...	=	1000 Würtemberg lbs.
933·673	... ...	=	1000 Saxon (Dresden) lbs.
Or 14	zoll lbs.	=	15 Prussian lbs. nearly.
28	... ...	=	25 Bavarian lbs.
2	... ...	=	1 kilogramme.
14	... ...	=	15 Würtemberg nearly.
14	... ...	=	15 Saxon (Dresden) lbs. nearly.

Russia.—Of the weights, 96 zolotnicks = 32 loths = 1 lb. = 90264 lb. avoird.: 40 lb. = 1 pood, and 10 poods = 1 berkovetz or 3·612 cwt. With this lb., which is used for most purposes, gold and silver are also weighed, it being divided into 6528 grains. The Nuremberg lb. of 5527 grains troy is used by the apothecaries. The duim and foot correspond to the English inch and foot; 1¾ duim = 1 verschock, 16 verschocks = 1 archine, 3 archines = 1 sagene or 7 English feet, and 500 sagenes = 1 verst or 663 English miles. Also 2400 sq. sagenes = 1 deciatine = 2·7 Brit. acres; and 100 tcharkeys = 2·705 Brit. gall. Of corn, 64 garnietz = 32 tchetverkas = 8 tchetveriks = 4 payaks = 2 osmines = 1 chetwerk = 5·77 Brit. bushels. Various old standards are partially in use in different parts of the empire.

Sardinia.—In Turin, 12 oz. = 1·5 mark = 1 lb. = ·8133 lb. avoird.; 25 lbs. = 1 rubbio; and the mark of 3795 grs. troy is used for gold and silver. The raso or ell = 23·6 Brit. inches; the mile = 2697 Brit. yds.; the giornate = ·938 Brit. acre; the wine rubbio = 2·07 Brit. gall.; and the corn sacco = 3·17 Brit. bushels. In Nice, 150 lbs. = 1 quintal = 103·14 lbs. avoird.; the ell = 3·8975 Brit. feet; 12 rubbi = 1 charge = 20·75 Brit. gall.; but the charge of corn = 4·4 Brit. bush. In Cagliari, 12 oz. = 1 lb. = ·875 lb. avoird.; the raso = 21·63 Brit. inches, and the restiere = 4·04 Brit. bushels.

Saxony.—In Dresden, the lb. = 1·0293 lb. avoird.; 110 lbs. = 1 centner; the mark = 3602 grs. troy; two feet = 1 ell = 22·3 Brit. inches; 3200 feet = 1 mile = 9914 Brit. yds.; the morgen or acre = 1·261 Brit. acre; the liquid eimer = 14·84 Brit. gall.; the scheffel = 2·859 Brit. bushels. In Leipzig, 32 loths = 1 lb. = 1·0301 lb. avoird.; the centner = 110 lbs. = 113·32 lbs. avoird. Two feet = 1 ell = 22·24 Brit. inches; 60 ells = 1 schock; the liquid eimer = 16·69 Brit. gall.; the old scheffel for corn = 3·812 Brit. bushels. The Dresden scheffel, which is one third greater, is now the general standard.

Siam.—The common weight is the catty = 2·67 lbs. avoird., which is double the Chinese catty; but the pecul, containing only 50 catties, is just equal the Chinese pecul. Also 8 spans = 4 cubits = 1 fathom = 6·5 Brit. feet; 20 fathoms = 1 sen; but a square area of 20 fathoms to the side is likewise named a sen.

Sicily.—The cantarro grosso = 192·53 lbs. avoird.; the cantarro sottile = 175·03 lbs. avoird. The lb. = ·7014 lb. avoird. Gold and silver are weighed and valued as at Naples; 94 cubic French feet of the old standard = 5 salmes = 1 ship ton. Oil is sold in Messina by the caffiso, = 2·58 Brit. gall. The canna = 81·35 Brit. inches; the wine tonna = 31·24 Brit. gall.; the corn salma = 7·61 Brit. bush., and the salma grossa of Leghorn = 9·47 Brit. bushels.

Sincapore.—The Chinese pecul of 133·33 lbs. avoird. is the usual weight. The covid for cloth = 18 Brit. inches; the gantang, by which corn, fruit, and liquids are occasionally sold, = 1·04 Brit. gall. European commodities are often sold by British weights and measures.

Spain.—Two marks = 1 lb. = 1·01443 lb. avoird.; the arroba consists of 25, and the quintal of 4 lbs. The mark used for gold and silver is = 3550 grains troy. Twelve pulgados = 1 Burgos foot = 11·128 Brit. inches; 4 palmos = 1 vara or ell = 33·38 Brit. inches. The estadale = 12 feet; 8000 varas = 1 league = 7418 Brit. yds. A degree is divided into twenty marine leagues; 5378 sq. varas = 1 aracada of vine land; and 6000 sq. varas = 1 fanegada of corn land. The greater or wine arroba = 3·54 Brit. gall., the less or oil arroba = 2·77; the pipe = 27 of the greater arrobas, or 34·5 of the less; the corn fanega = 1·55 Brit. bushels; and 12 fanegas = 1 cahiz. But a variety of local standards is also in use.

Sweden.—The lb., victual weight, = 6563 grains troy; the lispund contains 20, the sten 32, the centner 120, the waag 165, and the skeppund 400 such lbs. Two feet = 1 ell = 23·38 Brit. inches; 8 ells = 1 ruthe; 2250 ruthes = 1 mile = 11,689 Brit. yds.; the tunnaland = 1·22 Brit. acre. The liquid kann = ·5756 Brit. gall.; the fuder contains 300, the pipe 180, the oxhufvud 90, and the ahm 60 kanns. The corn tunna = 4·029 Brit. bushels. But various other measures and local standards are in use.

Switzerland.—In 1837 the 12 cantons, Berne, Zürich, Lucerne, Friburg, Zug, Soleure, Basel, Aargau, Thurgau, Schaffhausen, Glarus, and St Galen, adopted the following standards, founded on the decimal system of France: 32 loths = 1 lb. = half a kilogramme = 1·1024 lb. avoird.; 2 feet = 1 ell = 6 decimetres; and 1 stund = 4800 metres = 5249 Brit. yds. The liquid mass = 1·5 litre = 2·64 Brit. pints; ten mass of corn = 1 viertel = 15 litres = 1·65 Brit. peck. In Geneva, besides the French system, 100 lbs. gros poids = 121·43 lbs. avoird.; 100 lbs. petit poids = 101·19 lbs.

Weimar ‖ Weisse.

avoird. The winechar = 120·71 Brit. gall.; the coup of corn = 2·13 Brit. bushels.

Tripoli.—One hundred rottoli = 1 cantar = 109·71 lbs. avoird.; the caraffa of oil weighs 3·125 rottoli. The great pik = 26·42. and the small = 19·03 Brit. inches; the wine barile = 14·25 Brit. gall.; and 4 temen = 1 corn hueba = 2·95 Brit. bushels.

Tunis.—One hundred rottoli = 1 cantaro = 111·75 lbs. avoird.; for cotton the pik or ell = 19·23, for silk and linen = 25, and for woollen = 26·5 Brit. inches. The wine millerole = 14·15, and the oil mettar = 4·27 Brit. gall. The corn caffiz = 1·918 Brit. quarter.

Turkey.—The oke = 2·8286 lbs. avoird.; 1 oil almude should weigh 8 okes; 100 rottoli = 44 okes = 1 quintal = 124·46 lbs. avoird. The great pik = 27·9, the small = 27·06 Brit. inches; the berri or mile = 1826 Brit. yds.; the liquid almude = 1·143 Brit. gall.; the corn fortin = 3·84 Brit. bushels.

Tuscany.—The quintal or cantaro = 100 lbs. = 74·86 lbs. avoird.; 20 soldi = 1 braccio = 22·979 Brit. inches; the mile = 1808 Brit. yds.; the sacato of land = 5928 Brit. sq. yds.; the bari for wine = 10·03, and for oil = 7·36 Brit. gall. The corn stajo = 2·676 Brit. Pecks; and 24 staja = 1 moggio.

United States of America.—Chiefly the same as in England prior to the imperial system. But instead of the cwt. they generally use simply 100 lbs., which are sometimes called a quintal. The barrel of flour weighs 196 lbs.; the hhd. of Indian meal 800 lbs.; and the barrel of salt meat 200 lbs.

Walachia.—The weights are those of Moldavia. The killow of Brailow, of about 400 ocche = 1·5 killow of Galatz = 18 killows of Constantinople = 9 sacchi of Leghorn. In other respects the same as in Turkey.

Weissenburg ‖ Wellesley.

West Indies (British).—In general the same as in Britain; but Spanish measures are partly used in Trinidad, and the old system of France in St Lucia.

West Indies (French).—Same as in France.

West Indies (Dutch).—Chiefly the old system of Amsterdam. In Curaçoa the Spanish varo is also employed.

West Indies (Danish).—Same as in Denmark. The British yard and French aune are sometimes employed.

West Indies (Swedish).—Chiefly the same as in Sweden.

Würtemberg.—The lb. = 1·0314 lb. avoird.; the foot = 11·25 Brit. inches. The toise = 6 feet; the ell = 24·18 Brit. inches. The mile is the fifteenth of a degree. The morgen or acre = 31·518 French ares; and 1·5 morgen = 1 juchart. The fuder of wine = 388·16 Brit. gall. The scheffel of corn = 4·88 Brit. bushels.

For further particulars we beg to refer to Kelly's *Metrology*, and his *Universal Cambist*; the *Parliamentary Reports*, particularly those relating to the Board of Trade; Buchanan on *Weights and Measures*; M'Culloch's *Commercial Dictionary*; Waterston's *Manual of Commerce*; and, above all, the *Dictionnaire Universel des Poids et Mesures Anciens et Modernes*, par Horace Doursther, Bruxelles, 1840.

(T. Y.) (H. M—E.)

WEIMAR, a city of Germany, capital of the grand duchy of Saxe Weimar, in the midst of hills partially wooded, on the left bank of the Ilm, 13 miles E. of Erfurt. This little town is justly famous as having been at one time the residence of the most illustrious men of letters in Germany, under the patronage of the duke Charles Augustus; but though the names of Goethe, Schiller, Herder, and Wieland will always shed a lustre on Weimar, its celebrity is now a thing of the past rather than of the present, and the town itself contains little that is interesting or attractive. It is well built, but irregularly laid out, and contains a number of handsome public edifices. Among these are the grand-ducal palace, a simple and elegant building, with rooms adorned with fine frescoes, and a large park attached to it; the city church, built in 1400, containing the graves of the Elector John Frederick, the patron of Luther, of Duke Bernhard, who was celebrated in the thirty years' war, and of Herder; the public library of 148,000 volumes, occupying a circular tower, formerly a powder magazine; the town hall; and the theatre, which was erected in 1825 under the influence of Goethe. Weimar has a gymnasium, a normal seminary, a geographical institution, and the *Landes-industrie-comptoir*, an institution for the publication of works chiefly geographical and statistical. There are also several charitable establishments. The town has manufactures of metallic goods, cards, and hosiery, and some trade in corn and wool; but its prosperity depends chiefly on its being the residence of the court. The houses of Goethe, Schiller, Herder, and Wieland are to be seen here, and statues of these poets adorn the public places. Goethe and Schiller are buried in the large new churchyard. Pop. (1853) 12,954.

WEISSE, Christian Felix, a German writer for children, was born at Annaberg in Saxony on the 8th of February 1726. After studying at Altenburg and Leipzig, he became suddenly smitten by a passion for the drama. His friend Lessing tried by public and private criticism to moderate or direct his thirst, but it was all in vain. After frequent attempts at tragedies, comedies, and vaudevilles, and as frequent failures, he resolved to give over writing for adults, and try writing for children. Here he was much more at home than in the drama. Basedow did the intellectual portion of education, while to Weisse was committed the domestic. The Spelling-book, the Little Reading-book, the Children's Friend, had an unbounded popularity. The author, however, was much better fitted to drill children than to form their character. He died on the 16th of December 1804. A list of his numerous works will be found in Jörden's *Lexicon*.

WEISSENBURG, a town of Bavaria, in the circle of Middle Franconia, on the Rezat, 27 miles S.E. of Anspach. It is defended by walls and towers, and entered by four gates, and it contains two churches, a school, and the ruins of a castle. Here are extensive breweries, and manufactories of gold and silver lace and other articles. Weissenburg was formerly an imperial free city. Pop. 4300.

WEISSENFELS, a fortified town of the Prussian monarchy, in the province of Saxony, government and 11 miles S. of Merseburg, on the Saale, here crossed by an elegant bridge. It is a well built town with several suburbs, and it has two churches, one of which contains the remains of Gustavus Adolphus, a gymnasium, normal seminary, and several hospitals. Woollen fabrics, leather, jewellery, and porcelain are manufactured here, and there is an important trade in timber. Outside the town stands the old castle of the dukes of Weissenfels-Querfurt, a branch of the Saxon family now extinct. The castle is at present used for barracks. Pop. 10,291.

WEISSKIRCHEN, a town of the Austrian empire, Moravia, on the Betschwa, 22 miles E.S.E. of Olmütz. It has two churches, a synagogue, gymnasium, Piarist college, and several hospitals. Dyeing and weaving are carried on here, and there is an extensive and active trade. Pop. 5727, among whom are many Jews.

Weisskirchen, a town of the Austrian empire, in the Military Frontier of the Hungarian Banat, county of Temes, on the Nera, 56 miles S.S.E. of Temesvar. It has Roman Catholic and Greek churches, a school, hospital, and barracks. The neighbouring country is beautiful, and occupied chiefly with gardens and vineyards. The making of wine and spinning of silk are the principal occupations of the people, and there is a considerable trade. Pop. 6313.

WELLESLEY, Richard Colley, *Marquis*, was the eldest son of the first Earl of Mornington, and brother to the Duke of Wellington, and was born at Grafton Street, Dublin, on the 20th of June 1760. Passing from Eton and Oxford, where he was highly distinguished as an elegant scholar, he by the death of his father unexpectedly found himself second Earl of Mornington. He took his seat in the Irish House of Peers, and soon after entered the British House of Commons. Having attracted the notice of the king during the regency debates of 1789, he was soon after appointed one of the Lords of the Treasury, was made a member of the British Privy Council, and was raised to the British peerage by the title of Baron Mornington.

Lord Mornington was made Governor-General of India on the 4th of October 1797, and he reached that country next year, whither his brother, Colonel Arthur Wellesley,

Wellington had a short while preceded him. He began his work of the government of India with much vigour, and carried it out, until his recall in 1805, with great energy. The Marquis Wellesley, for such he was made in 1799, reduced the forces of Tippoo Saib, parted that chief's dominions, raised the revenue of the East India Company from seven to fifteen millions, quelled the Mahrattas, and compelled Scindia and the Rajah of Berar, to make peace. On his return from India, the Marquis was received with much approbation by the government and by the East India Company. His rule, on the whole, though expensive, was wise and just; and, after all allowance has been made for the splendid military genius of his brother, which served so effectually to support his own measures, it cannot be doubted that his government marked the beginning of a better era of British rule in India. In 1808 he was sent as ambassador to Spain, but was recalled next year, and made Secretary of State for Foreign affairs. Under Lord Liverpool's government he gave his hearty support to the claims of the Roman Catholics, which, on his becoming Lord-Lieutenant of Ireland in 1821, created much bitterness and animosity against him by the Protestant community of that country. An Insurrection Act was deemed necessary before the rioters could be quelled. After a short recess from the cares of government during the Grey ministry, the Marquis was again appointed in 1833 to the lord-lieutenancy of Ireland, but resigned on Sir Robert Peel coming to power in 1834. Except the office of lord-chamberlain, which Marquis Wellesley filled for a short time under the second Melbourne ministry in 1835, he never afterwards was appointed to any public employment. He died at his residence in London on the 26th of September 1842, in the 83d year of his age. Besides a number of occasional pamphlets written by his lordship, a quantity of *Despatches*, &c., were published after his death, purporting to be written by him while governor-general of India, in 5 vols. in 1836, and in 1 vol. in 1838.

Wellingborough Wellington

WELLINGBOROUGH, a market town of England, in the county and 9 miles N.E. of Northampton, 67 N.W. by N. of London. It stands on an eminence above a rivulet flowing eastwards into the Nen; and consists of a number of streets diverging irregularly from the market-place, and lined with houses generally well built of red sandstone. The church, a large and handsome edifice, with a tower and spire, is in several different architectural styles. It is richly ornamented, and has some ancient carved work. The Independents, Wesleyans, Baptists, and Quakers have places of worship in the town. There are several free schools, National, British, and infant schools, a mechanics institute, and various charities. The manufacture of boots and shoes was formerly carried on here to a large extent, and though this has somewhat fallen off, it still forms the principal employment of the people. Some trade in corn, cattle, and cheese is carried on. Wellingborough derives its name from the mineral springs near it, one of which was formerly in high repute, and was drunk by Charles I., who resided here for some time in 1626. Pop. of the parish (1851) 5061.

WELLINGTON.

WELLINGTON, *Arthur Wellesley, Duke of.* If the settlement of a family for several centuries in a particular country entitles its members to consider themselves natives of the soil, Arthur, Duke of Wellington, unquestionably might regard himself as an Irishman; for on both sides he was descended from stocks which, if radically English, had been long transplanted, and had spread and flourished in the sister kingdom, retaining few tendrils of connection with the land whence they came, and intertwining themselves closely in the great growth of the Anglo-Irish nation, as distinguished from the compound Irish nation in the same island formed out of the more ancient inhabitants and those descendants of the earliest English settlers, who alike adhered to the Church of Rome. In fact, Arthur Wellesley was in one sense as Irish as Burke, and more so than Goldsmith or Swift. But in no respect could he be regarded as one of those Anglo-Irish who, in violent political animosities, and in national peculiarities, were said to be *ipsis Hibernis Hiberniores.* He was of a race which, in literature, in science, in art, in the senate, and in the field, have singularly illustrated the land to which, at all events, they owed their birth, whilst serving the country to which they owned allegiance. He had no political sympathies either with the descendants of the old Lords of the Pale, or with the mass of the population, which, for the want of a better or more popular name, may be called Celtic; and his mind, trained in the doctrines, or at least the practices, of the ascendency school, was thoroughly imperialized even in youth.

It was probably about 1535 that two young gentlemen from Rutlandshire, named Walter and Robert Cowley, or Colley, or Coolley, migrated, to advance their fortunes, to the kingdom of Ireland, and there, somehow or other, they appear to have got such landed possessions as enabled them to educate their descendants for the learned professions and for the service of arms, as we find several of that name, hitherto unknown, cropping out here and there, in subsequent years, in local history. No antiquarian with whose works we are acquainted has ascertained with whom Walter Cowley married; and the Duke of Wellington would have given little encouragement to such investigations; for he seems to have been singularly indifferent as to the history of his progenitors. We know, however, that of Walter Cowley was descended a great-granddaughter, who wedded Garret Wesley, a gentleman of Meath, descended from an English family which came from Sussex in the latter part of the fifteenth century, and which seems to have thriven in Ireland. There were no children born of this marriage, and Garret Wesley, in default of issue, adopted the nephew of his wife, one Richard Cowley, and made him heir to his estates, on condition that he assumed the name and arms of the Wesley family. That the possessions thus acquired in 1728 by Richard Cowley Wesley were not inconsiderable, or that his political services were of importance, we may conclude, from the fact that in 1747 he was elevated from a seat in the Irish House of Commons to the peerage by the title of Baron Mornington; but there is reason to believe that his activity and zeal as a Hanoverian had more to do with his honours than the extent of his fortune; for his son, also named Garret, who succeeded him, could not boast of any large property. The second Baron Mornington displayed the same political bias as his father, and rendered similar services; so that, having strengthened his position in 1759 by a marriage with Anne the daughter of Arthur Hill, Viscount Dungannon, he also was advanced in the peerage, and in 1760 was created Earl of Mornington. Perhaps he was in some degree indebted to the musical ear of George III. for the advancement, inasmuch as the earl was a composer of no ordinary merit, and excelled in the species of composition which was most pleasing to the king. In no other way does he appear to have benefited by the royal favour, as his means were scarcely adequate to maintain the large family which grew up around him in the style suited to their position. Three

Wellington

Birth.

sons had been born to him, when, on a day yet undetermined, in 1769, Arthur Wesley was brought into the world. In reference to the controversy, or rather difference of opinion, which has arisen on that question, it is permitted to observe, that the circumstances relied on to fix the 1st May as the date of Arthur Wesley's birth, do not seem to us to weigh against the evidence that it occurred earlier in the year, towards the end of the month of April. It is said that his mother long afterwards declared her son Arthur was born on 1st May. To this it may be rejoined, that, as opposed to the entry in the register of St Peter's, Dublin, such an assertion is no valid reply, as it is not unfrequent for mothers to forget the dates of such events. To the inference to be drawn from the fact that the duke supported his mother's declaration, it may be urged, that he obviously followed a statement which may have been erroneous. Whether he was born at Dangan Castle, in the County Meath, or at Mornington House, Dublin, he was assuredly baptized by Isaac Mann, archdeacon, according to the register, on 30th April 1769, in St Peter's, Dublin. It has been attempted to argue, that the change of new for old style may have led to confusion in the register; but if so, the good dean was a man of extraordinary obtuseness, for the change had long taken place, and the dates in the register preceding the entry would have corrected the error, or the whole register is erroneous. However that may be, of the duke's early life we know very little. When Arthur Wesley was twelve years old he lost his father; but it may be questioned if, independently of his years, he felt the blow in all its real severity, because he had been exiled

Education.

to a private school in England whilst he was a mere child, and little care seems to have been bestowed on him at home. His mother, a harsh, determined matron—at least to him — believed the slender, blue-eyed, hawk-nosed, and rather sheep-faced boy, was hopelessly deficient in mental ability; and conceiving she had discharged all a mother's duty to him, when, out of her slender resources, she gave him a short residence at Eton, Lady Mornington finally despatched him to the military college at Angers, that he might be fitted "to become food for powder."

For several years he studied under Pignerol the great engineer, but we have no trace of his progress; and in

Enters the army.

March 1787 he became an undistinguished ensign in the 73d regiment. His promotion was rapid, for in less than a year he became lieutenant in the 76th regiment, from which he was moved into the 41st—not then as now a so-called Welsh battalion—regiment of foot. From that regiment he exchanged into a cavalry regiment, the 12th light dragoons, as a subaltern; but he did not long remain in that rank, for on 30th June 1791 he got his company in the 58th regiment, and in 1792 he changed his company of foot for a troop in the 18th light dragoons, and in another year or so obtained his majority in the 33d regiment, to the command of which, as lieutenant-colonel, by purchase, in which he was aided by his brother, he attained in September 1793.

Already aid-de-camp to the Marquis of Camden, the Lord-Lieutenant, whose court in Dublin was at that period both brilliant and expensive, Arthur Wesley, in 1790, on coming of age, took his seat for the family borough of Trim,

Enters the Irish House of Commons.

and for three years danced at court balls, flirted with the women, drank and gambled with the men, and voted with his party, as a lively young military and aristocratic Whig member of the Irish House of Commons might have been expected to do. One serious attachment fixed his affections. Among the court beauties, Catherine Pakenham, third daughter of the Earl of Longford, was conspicuous. Arthur Wesley sought her hand, but Lady Longford would not consent to bestow her daughter on the young soldier, and Lieutenant-colonel Wesley was obliged to make up his mind to accompany his regiment on foreign service, and to hope for more prosperous times. He was, indeed, it is said, indebted to the kindness of some Dublin tradesmen for the means of leaving the country, when the 33d regiment was ordered to proceed as portion of Lord Moira's force to the Low Countries, to strengthen the army of the Duke of York, who, worsted by the republicans, and by his own incapacity, as well as by the false position of the allies, had been forced to fall back towards Maestricht, after the loss of his original position at Oudenarde.

Wellington

Colonel Wesley sailed with the 33d regiment from Cork in June 1794, and, according to orders, occupied Ostend, which soon became untenable owing to the defeat and retirement of the allies, so that the garrison was compelled to embark and sail round to Antwerp, whilst Lord Moira marched with the main body of his troops, pursued and harassed by the French, to join the Duke of York near Malines. Scarcely had the 33d regiment reached Antwerp, when the whole garrison of the place was ordered out to reinforce the Dutch under the Prince of Orange, who had been driven from Fleurus by the republicans; and there, although not actively engaged, Arthur Wesley saw, twenty-one years before his crowning victory, the enemy whom he was to meet so often, and at last to crush decisively in the field of battle. The inactivity of the French, mainly caused by the profound folly of the Committee of Public Safety, subsequently gave the allies a respite of nearly two months, and it was not till September that the British troops in front of Antwerp began to fall back towards the north, followed by the enemy. In an unsuccessful attack made by Abercromby with the guards and a considerable force of infantry on Bockstel, Wesley displayed such energy in checking the republicans, that he attracted the attention of General Dundas, who soon afterwards procured for him the command of a brigade, which had the difficult task of covering the rear of the retreating army. It was in disaster and something like disgrace, for the gallantry of our soldiers only seemed to develop more strongly the inability and ignorance of their leaders, that Arthur Wesley made his first essay of arms. From the Meuse the Duke of York fell back upon the Waal, which he crossed in October; in December he returned to England to take the command of the army, but happily not in the field, and General Walmoden continued the retrograde movement to the Leck, whilst the Dutch on all sides began to give in their adhesion to the republic. In January 1795, the English army crossed the Leck, and after a continuous retreat, which has been likened to the miserable flight from Moscow, and in which our soldiers endured in their wintry marches nearly all the wretchedness which their descendants suffered in the camp before Sebastopol in 1854—drew breath at Emden, and reimbarked for England in the spring. Such grimness was there in that aspect of war, that the resolute and gallant young soldier, whose good conduct was almost the sole redeeming point of the campaign, was nigh disgusted with his profession. He was probably more than disgusted with the presumptuous inefficiency of the government, with the utter incapacity of the generals, and with the stupendous blunders and mismanagement of the authorities. Certain it is, at all events, that after his re-

Resolves to leave the army.

turn on the 25th June 1795, he wrote from Trim to Lord Camden, asking him for a civil employment at either the Irish Revenue or Treasury Boards. "It certainly," he says, "is a departure from the line I prefer, but *I see the manner in which the military offices are filled;* and I don't wish to ask you for that which I know you cannot give me." He alludes to necessities which are scarcely intelligible, unless they were of a pecuniary nature, or referred to his engagement with Lady Catherine Pakenham. But well may the Rev. Mr Gleig raise up his hands in astonished

Wellington

speculation at the consequences of Lord Camden's acquiescence! It is impossible to follow him through all the mazes of conjecture. The fact remains, that the favour of letting Arthur Wesley become a civilian was asked and was refused, and he was compelled to remain in the army. An attempt to send out an expedition from Southampton under Admiral Christian, to act against the French West Indies, in 1795, having been rendered abortive by violent storms, Colonel Wesley, whose regiment had formed a portion of the land-forces embarked for the purpose, had not long returned from shipboard to his quarters at Poole, ere he received orders to proceed to India. His state of health at the time appears to have been by no means robust, for he was not able to go out with the 33d; but he followed and overtook it at the Cape, and landed at Calcutta in February 1797. At that time India was a glorious field for the soldier, European or native; and bold adventurers, sword in hand, fought their way to fame and fortune, and jostled each other on the road to the gold pagoda tree. The traces of French influence were fast becoming obliterated by the tramp of our victorious Europeans and their Sepoy battalions. Dupleix, Labourdonnais, Lally Tallendal, Bussy, had been obliged to yield to Clive, to fortune, or to the folly of their own government; and the French generals who were engaged in training the armies of the native princes of India, perceived with apprehension the rise of British power, which threatened to engulf them. Tippoo Sahib, the sultan of Mysore, animated by a hatred to England, which was founded perhaps on the fact, that Lord Cornwallis had compelled his father, Hyder Ali, to sign away half his kingdom, rather than on any affection for the French, who were prodigal in promises which they took few steps to redeem, was preparing a powerful army for a purpose which we could little affect to misunderstand, even if we were ignorant of the intrigues of France, whilst the Nizam of the Deccan, with a French force at Hyderabad, and troops disciplined by French officers at his command, was burning with indignation against us, because the Indian government had deserted him in his war with the Mahrattas. Lord Mornington had arrived in India as governor-general, soon after his brother, bringing with him experience of Indian affairs acquired at the Board of Control under Lord Melville, and qualities which, as the result proved, admirably suited to insure him success in the difficult part he had to play. Colonel Wesley (who was still and for a short time afterwards, known by this form of his name, although his brother had just adopted the spelling by which it is better known, and called his family Wellesley),[1] had already been engaged on an expedition which was intended to act against the Spanish settlement at Manilla, but which had not proceeded further than Pulo Penang ere it was recalled by the governor of Madras, now thoroughly alarmed by Tippoo's preparations.

Proceeds to India.

The young colonel had been scrutinizing with the eye of a statesman, clearly and closely, the aspect of affairs in the country wherein he was to develop his extraordinary capacity for command. No more remarkable proof of his ability and industry could be pointed to than the four volumes of supplementary despatches and papers which he wrote in India between 1797 and 1805. Let those who think it is easy work to command armies, and that fortune has at least as much influence as conduct in war, read those papers, and they must admit that the wonderful diligence, the extensive research, the laborious inquiry, the vast variety of knowledge, statistical, geographical, political, and military, displayed in Colonel Wellesley's letters, and the pains he took to insure success in all his operations, are of an extraordinary and unusual character. Let us see any young officer of twenty-eight years of age writing such papers at present, and we may confidently rely on it that in an hour of need we have a great commander at hand. We may indeed affirm, that there have been very few officers in the British army who ever exhibited in such a conspicuous manner their fitness for command and their love of their profession, or who set to work with such zeal to make themselves masters of the situation, as Colonel Wesley did on his arrival in India. He was not insensible to the value of dinners and dinner-giving; and it is curious to observe how he exhorts his brother to indulge in that practice at Calcutta, and how he prepares himself to take the field with "a soup-tureen and plates for twelve guests" at Madras; nor does he forget, with something of a national bias, to evince considerable solicitude about his supply of potatoes. "Send all my things," he writes to Henry Wellesley, "as soon as you can, particularly my potatoes."

Indian despatches.

Wellington

His advice on all matters referring to the extension of British and the depression of French influence in India, leaves the stamp of wonderful thought and reflection on the part of one so young. The fame of the victories of republican France had reached the ears of Indian monarchs, and they eagerly sought the assistance of men like Raymond and Peron to drill their battalions on the European model. It was above all things necessary for the British government to destroy or neutralize the power of the formidable armies which the native independent states were thus collecting together, and the system on which it acted led to the inevitable dreary misgovernment and final absorption of the states on which it was forced. By the pressure of treaties, of promising offers of alliance, and other influences, the princes were induced to accept into their service corps of troops under British officers, and to assign the revenues of certain territories for their pay, and the French officers were sent away, and the regiments they had trained were reduced or disbanded. Thus the army of the Nizam under M. Peron was dealt with, and one great danger removed from us; but as long as Tippoo Sultan, our bitter enemy, was at the head of an army which he was strengthening every day, and was in communication with Napoleon at Cairo, it was evident our position was exceedingly insecure. Scindia and the Peishwa indeed promised us they would not make common cause with Tippoo, but Napoleon had already conceived the idea of rousing them to attack us, and if the French proved successful, there could not be much reliance placed on the promises of the Mahrattas. Whilst Lord Mornington was seeking in vain to procure from Tippoo any explanation of his intentions or of his intrigues with France, the news of the battle of Aboukir arrived, and removed from the minds of the British government in India great cause of anxiety. In order to direct the operations which appeared to be inevitable with greater vigour, the governor-general had come down to Madras; and Wellesley, who had been for some time at Fort St George without any active employment, was placed in temporary command of the force which the government was making ready to take the field, and in the organization of which he displayed great ability and skill. Tippoo not only refused to comply with the governor-general's demand that he should explain why he had despatched emissaries to the French at Bourbon, but he repeated the offence, and positively declined to receive at his court any English ambassador, as a medium of communication between the two governments.

Tippoo, whatever his intentions might have been, had done that which no European power in India could brook and live. Our forces were prepared, and on 25th February

[1] The first letter in the Duke's *Supplementary Dispatches*, signed Wellesley, is dated 19th May 1798; and the present Duke, the editor, in a footnote observes, that Lord Mornington's family adopted the ancient spelling of their name at this time.

Wellington

1799, their march was directed on Mysore, and proceeded slowly and laboriously towards the position occupied by the sultan.

Tippoo routed.

With the promptitude which was characteristic of his family, as compared with the hesitation of other Asiatic princes, Tippoo, turning to the west, attacked the Bombay column under Stuart on 6th March, but received a severe check at Sedaseer, and was obliged to retrace his steps. Somewhat disheartened by the failure, but anxious to destroy the meshes of the net which was closing round him, he marched towards the east, and threw himself between Seringapatam and the army of General Harris, who on 27th March found himself in front of the enemy, who was posted in a favourable position at Mallavelly. Whilst the commander-in-chief with the right wing was engaged with the enemy, Colonel Wellesley was directed to execute a turning movement on Tippoo's right—that fatal flank movement which no Asiatics can understand or resist. By the admirable conduct of their leader, this wing, advancing by echelon, forced its way steadily through the cavalry of Mysore; till at length, by the aid of murderous volleys of musketry, Wellesley threw their right into such confusion, that Floyd, with the true *coup-d'œil* of a cavalry leader, saw the moment for a charge, hurled his squadrons on the disordered masses, and in a moment turned disorder into defeat, and quickly converted discomfiture into a headlong rout. The enemy, who left upwards of 2000 on the field, fell back on Seringapatam. Harris effected a junction with Stuart's column, and having thus increased his army to 35,000 men and 100 guns, on 5th April sat down before that famous fortress, which was defended by 22,000 men and 240 pieces of artillery. In order to clear his front, the general directed Baird to sweep a tope—a cultivated grove which lay between his lines and the walls of the place—which was done without opposition, but the Mysoreans occupied it next day, and Colonel Wellesley was ordered to repeat the operation, and to occupy the position. Night attacks are always hazardous, and British soldiers do not like them. Wellesley appears, according to the very words of the often quoted despatch to General Harris, to have reconnoitred the position, and to have had an explanation in front of the spot of what the general wished to do. He led on the 33d and a native regiment to the assault, whilst Shaw made a combined attack on the flank. The enemy received them with a severe fire. Our troops became disordered in the dark, and retired, leaving prisoners in the hands of the enemy, who were put to death with brutal cruelty by Tippoo next day, and Wellesley himself, who was hurt in the knee, had some difficulty in finding his way back to camp, when he went to the general, with "a good deal of agitation, to say he had not carried the tope," in which, however, Shaw had established himself. Next day the tope of Sultanpettah was occupied; but Wellesley came, he says, to "a determination never to suffer an attack to be made by night on an enemy who is prepared and strongly posted, and whose posts have not been reconnoitred by daylight." Established on the ground, our lines were rapidily traced, batteries erected, and fire opened, with such effect that Tippoo endeavoured to gain time, under pretence of opening negotiations; but we knew the man, and rejected them. Inevitable as fate, our trenches closed and zigzagged onwards, bastions and curtains crumbled away before the fire of our batteries, the enemy made no sorties to prolong their existence. On 2d May, one of the principal magazines of the place exploded, and destroyed much of the works, as well as of the moral power, of the defenders; and, on 4th May, Baird led 2500 British troops—more than were actually sent against the Redan—and 1800 natives, to the breaches. In spite of a desperate resistance, in which Tippoo fought like a common soldier, the breaches in the fausse-braie, and the wall, and the first line of defence, were carried, and the entrance to the town was effected. Tippoo, twice wounded, and fighting like a hero, was thrown down amid a heap of dead and dying men. One of our soldiers, seeing the glitter of precious stones on his sash, sought to pull it from his body, but Tippoo gathered up all his strength, and raising himself on one hand, cut the soldier across the knee. In an instant the European's musket was pressed to the brow of the Sultan, who fell dead, open-eyed and glaring defiance, amidst the corpses of his soldiers in front of his palace-gate. Seringapatam, with enormous treasure, estimated at the value of L.20,000,000 by one of the prize-agents, fell into the hands of the captors, never to leave them more. A scene of plunder and violence, in which our soldiery, native and European, revelled in the wildest license and excesses, was only terminated by the active measures of Wellesley, who was appointed commandant of the place, and who restored order, as he says himself, on the 5th May, "by the greatest exertions, by *hanging*, flogging, &c., in the course of the day." His share of the plunder was L.7000 in money, and 3000 pagodas in pearls; and he at once proposed to apply it to pay his brother the sum he had advanced for the purchase of his lieutenant-colonelcy, but Lord Mornington generously refused. His appointment, in its results, more than justified his brother's partiality, and his powers of administration, his diplomatic skill in dealing with the armed chiefs of Mysore who still held out, his moderation in victory, were not less conspicuous than the military qualities which had already fixed on the youthful colonel the eyes of India.

Wellington

Tippoo slain, and Seringapatam taken.

Nor was it less to his honour that he advocated a clement and generous policy in dealing with the vanquished, and that he advised a liberal pension to be given to the sons of Tippoo, and fair treatment to be extended to the leaders of his court and of his armies. In May 1800, Wellesley, as commander of the troops in the Mysore territory, found it necessary to march out against a leader of robber-hordes, named Dhoondiah Waugh, who exhibited considerable address and daring in his plundering operations, and who moved with such celerity, that Wellesley was obliged to march at the rate of 30 miles a day in order to get near him. At last, after months of most arduous pursuit, in which Dhoondiah doubled through the three or four columns of troops which were after him, very much as Tantia Tope passed by his pursuers in the latter part of the Indian rebellion, Wellesley, on 10th September, fairly ran him down. Putting himself at the head of his dragoons, who probably did not muster 1200 sabres, he led a charge in single line against 5000 cavalry under Dhoondiah in person, overthrew them utterly, and directed the pursuit, in which many hundreds of the enemy were cut down, Dhoondiah being among the slain. Soon after that gallant action, the Indian government gave him the command of a column of troops destined to proceed from Bombay to Egypt. Subsequently they appointed Sir David Baird, and offered him the post of second in command, which his sense of public duty led him to accept, notwithstanding the annoyance he must have experienced; but he was seized with fever ere the expedition sailed, and did not participate in the scanty honours in Egypt. That which might have appeared to him a considerable misfortune, in reality afforded him the opportunity of placing his Indian reputation on an elevated and solid basis.

Represses a robber-horde.

The first of the Mahratta wars broke out. Scindia, the restless and enterprising chief, animated by French intrigues, and confident in a splendid army disciplined by Frenchmen, obstinately refused to come to terms with the Company's government, and was known to be aiming at their destruction. Hostilities were actively proceeded with, and Lake destroyed the Mahratta power in one direction, as Welles-

Mahratta wars.

Wellington

ley assailed their hosts in another. On 9th August he reduced the strong fort of Ahmednuggur, which gave him an excellent base of operations; and, on 23d September, after a long day's march, he suddenly found himself in front of Scindia's army, drawn up along the river Kartna, with the left on Assaye, and the right at Bakerdoun. Wellesley had not only miscalculated his distance from the enemy, but he was in error as to the force with which he was about to engage, and the position they occupied. Somewhat surprised, but not in the least disconcerted, when he discovered that 50,000 men, with 128 guns, were before him, after a rapid reconnaisance he resolved on attacking Assaye, although he had only 1500 Europeans, and about 7000 native troops, with 17 or 18 guns. The English infantry, undeterred by the storm of shot from the enemy's artillery, which soon drove our guns off the field, advanced in perfect order, threw themselves on the enemy with the bayonet, broke them instantly, and moved down on the guns, which were taken possession of by the Sepoy battalions. But the Mahrattas, as our troops rushed past to consummate their victory, got from under the guns, or rose from the ground, where they had feigned to be dead: at the same moment that the artillery attacked the rear, the Mahratta cavalry, for the first time, menaced the disordered line of our battalions with a charge on the flank. On that occasion, Wellesley, who lost two horses under him in the field, undoubtedly won Assaye twice over, displaying the same brilliant personal courage that he had exhibited in the cavalry charge on Dhoondiah Waugh's forces. He got together the 78th regiment of infantry, placed the 7th regiment of Indian cavalry on their flank, and led them straight at the mass of the enemy, who were rallying around the guns, and under cover of the cavalry, and routed them utterly. The Mahrattas lost 98 guns, and about 6000 men killed and wounded. Our own loss, in proportion to the numbers engaged, was very great,—44 officers and 365 men killed, 126 officers and 1841 men wounded, attested the power of the terrible cannonade to which the British were exposed; and Wellesley might well call it "the most obstinate" he had ever seen, and believe that no fiercer fight had ever been fought in India. Scindia soon afterwards proposed a suspension of arms, which was granted; but with that extraordinary disregard of even the outward forms of treaties and armistices which marks the conduct of Asiatics, he suddenly carried his troops over to the Rajah of Berar, with whom we were actually engaged in hostilities. Wellesley fell upon the enemy, who were drawn up in front of the village of Argaum, on the evening of 29th November 1803. The armies of Scindia and the Rajah amounted to 40,000 foot and horse; the former being upon the right, and the infantry of the latter, with the guns, being on the left. Wellesley's army consisted of 14 battalions, about 20 squadrons of regular cavalry, and 4000 irregulars. He threw the first line of his right upon the enemy's left, which resisted strenuously; his sepoy regiments fell into disorder, and the day was nearly lost, when Wellesley in person rallied his men. The cavalry of Scindia, repulsed in a charge, were forced back on their infantry, and seized by a panic, and unable to resist the advance of the British infantry, the enemy abandoned the field, leaving their camp, 38 guns, and all their equipage and transport, in the hands of the victors, whose cavalry pursued them throughout the night. The rapidity and certainty of these successes appalled the fickle and timorous minds of Scindia and of the Rajah. The latter indeed entered into a treaty with Wellesley, and Scindia followed his example at the close of the month; the result being, that Delhi, Agra, Gwaliör, Ahmednuggur, and the surrounding districts, yielding revenues of three crores of rupees, were delivered over to the Company. In order effectually to prevent any organization of troops by foreign adventurers, it was stipulated at the same time that no European should be permitted to enter the service of the native princes unless he was allowed to do so by the Company. Wellington

Scarcely had Wellesley concluded his labours in that direction ere he was obliged to take the field again, in order to put down a horde of horsemen, who were moving about the country of the Nizam in such strength, that they wasted and plundered it in spite of the efforts of the native troops. After very fatiguing marches, such as no British troops had ever known in India, Wellesley was able to overtake and disperse their flying column, and to draw their teeth very effectually; and though he did not inflict on them any severe loss, they gave no further trouble in the Deccan.

Wellesley's health gives way.

But his health now began to give way, and his complaint was probably aggravated by the annoyances which were created by the Peishwah's reluctance to assist him in the organization of the Mahratta army, which Wellesley was determined to conduct in such a way as to render it very little to be feared by the Company. He obtained leave of absence, and, quitting the Deccan, arrived at Calcutta in August; but ere he took his passage homewards, the Nizam gave the Indian Government reason to believe that it required a vigilant eye and a firm hand in his territory, and Wellesley proceeded to Seringapatam by the orders of the governor-general. There he was prostrated by fever; but in February 1805, having restored the district to comparative tranquillity, and having regained his health sufficiently, he was enabled to gratify his longing for a larger field of service and his natural ambition, as well as to get away from the endless disputes which were raised by the native courts as to the true meaning of his treaties. It must be observed also, that he was by no means satisfied with the conduct of the Company, and that the feud which seemed inevitable whenever officers of the royal army were obliged to deal with the Court of Directors had broken out in his case with considerable bitterness. Wellesley sought to be made general of division; the Court refused; nay more, they actually would not ratify his appointment to Fort St George made by General Stewart. Nor was Lord Mornington more happy in his relations with the Company, who laid to his door the cost and anxiety of these incessant wars, and he was as anxious as his brother to leave the scene in which he had played such a distinguished part. As a reward for his services, the king nominated him a supernumerary Knight of the Bath ere he left India; and on 10th March Major-General Sir Arthur Wellesley left the continent where, as executor of his brother's policy, and as a soldier who carried out in the field the plans in which he was part adviser in the cabinet, he had increased threefold the territories to which, in no equal period since their first marvellous spring from the seat of the trader to the throne of the monarch, had the East India Company made such vast increment. With more than Clive's success, although the results were not so great when judged by the comparative status of the British power at the two epochs, Wellesley had acquired a reputation to which no stain of duplicity or foul play could be attached. It would indeed be well for England if, on the great day when her conduct may be arraigned by history at the bar of posterity, she could point to the career of Arthur Wellesley in India and say, "By his words and deeds shall I be judged, for all those who governed and fought for me were as he was." In the first year of his residence he formed a harsh opinion of the natives of India, which, as he never repeated it, we may imagine his better knowledge led him to doubt; and it was at the close of his Indian experiences we find him uttering these noble sentiments:—"I would willingly give Gwalior and all the fortresses in India ten times over, rather than risk our reputation for scrupulous good faith and the honourable advantages we have ac-

Major-General Sir Arthur Wellesley sails for England.

Wellington

quired in war." When the envoy of the Nizam, desiring to ascertain what would be the share of the plunder assigned to his master, offered him L.70,000 for his assistance in obtaining the information, Colonel Wellesley asked him quietly, "Can you keep a secret?" "My lord, certainly." "Then so can I," replied the British general.

Whilst he was engaged in consolidating the vicarious rule of England, even in encounters much more serious than those by which so much had been gained in earlier days, and in negotiations which were equally conspicuous for the ability and honesty with which they were conducted, the most formidable enemy of the mother country was revolving in his vast mind schemes which, if successful in Europe or in the East, would have blighted the fruit of Wellesley's labours, and have deprived him of his last and greatest triumph. Napoleon was, in fact, debating whether he would hurl his Grand Army upon the shores of England, or tempt fortune in the regions where Alexander conquered, at the time that Wellesley was destroying the Mahratta confederation. But the meeting was reserved for other years. When Wellesley arrived in England in September 1805 the French were marching once more to meet Europe in arms; and in November he sailed as brigadier-general to Holland with Lord Cathcart's ill-advised expedition, only to hear the echoes of the guns of Austerlitz, which announced that the effort to make a diversion was too late. The safety of our shores had once more to be consulted, and Sir Arthur Wellesley was appointed to command the brigade at Hastings, which he raised to a considerable degree of efficiency. In April 1806 he married Lady Catherine Pakenham, his old love when he was a gay young aid-de-camp in the Irish court. She had been attacked by small-pox immediately after his departure for India, and she wrote to tell him that her beauty was gone, and that he was a free man; but Sir Arthur Wellesley, the famous Indian soldier, had returned to his country to claim the hand of his betrothed, and her hand was freely given. After a short interval of comparative obscurity, and, we doubt not, happiness, Sir Arthur was returned to parliament, just in time to contribute materially by his simple, straightforward answers, and by his knowledge of the facts, to the successful defence of Lord Mornington against the charges brought by Mr Paul and Lord Folkestone of extravagance and corruption. Paul died by his own hand after a debauch in a gaming-house, and Lord Folkestone's inculpatory motion was defeated by a considerable majority. When the Portland administration was formed after the death of Mr Fox in 1806, Sir Arthur Wellesley was selected to fill the office of chief secretary in Ireland under the Duke of Richmond, and he was at once plunged into the stormy politics which were the result of the agitation for Catholic emancipation; but he had not been more than a few months engaged in the struggles in which his political ties and his personal convictions made him a decided partisan, ere he was called upon to act once more in a military capacity, as general of a division of infantry under Lord Cathcart, in the expedition against Copenhagen.

Marries his old love.

We shall not now re-open the question, which jurists have vainly agitated, in reference to the abstract right of the expedition, particularly as historical justification can be found for the operation in a more specific and substantial shape than that of mere success. It is strange, however, that some writers and publicists, who have survived the influences of the hour, should pretend that the Danes themselves, as opposed to the Crown Prince, were in favour of our razzia on Copenhagen. Arthur Wellesley, in his despatch to Lord Hawkesbury, dated 21st August (1807), published in the exceedingly valuable supplementary despatches edited by the present Duke of Wellington, says distinctly, "We are very unpopular in the country, and derive but little resource or assistance from it, and that little is procured with difficulty." (P. 5.) "The troops," he adds, "have behaved very well in all the little affairs which they have had, and tolerably well in other respects." That testimony is repeated again and again; and it is some satisfaction to us to find that the general who commanded the British troops was exceedingly glad when the capitulation, which was, in a considerable measure, the result of his own active operations in the field, put an end to the contest, which can scarcely be called a war, and which assuredly added no glory to our arms, although it may have somewhat tarnished the fading lustre of our diplomatic reputation. When he got home, in a spirit of something very like irony, he wrote to Lord Cathcart that the English ministry had become less anxious to occupy Zealand, as soon as they found out it could be retained with greater facility, and that "the country is delighted with your conquests." In fact, the tenor of his correspondence and of his acts enables one to judge what was the Duke's opinion of the whole affair, and to coincide in the judgment of M. Brialmont, that the horrors of the bombardment of Copenhagen, and the subsequent excesses in the place, affected him to such an extent, that the predilection he evinced in his sieges for very desperate assaults instead of bombardments was due to his experience of 7th and 8th August 1807. The fruits of the long years of military toil and experience which had been planted at Angers had nigh been nipped by the unkindly Dutch frost, but had survived to receive the full rays of the Indian sun, were at last to be gathered by a bold and cautious hand, as the first offerings of Fortune to England and her arms since Marlborough had departed. Scarcely had we commenced the development of our scheme of aggression against Denmark, than Napoleon met us by a "*contre-coup*" in the Peninsula. In September 1807 he prepared to take a signal vengeance for the secret treaty in which the Portuguese ambassador had joined the representative of Russia and the Prince of Peace, with the design of making war on France the moment that she could be attacked with impunity. He called on the Prince Regent to join the confederation against England, and to place the Portuguese fleet under the French flag, in the endeavour to close the Mediterranean to the fleet of the regicide republic. The Regent was willing to yield that point; but he resisted the demand to confiscate the merchandise and seize the persons of all British subjects in Portugal. The Emperor was in no mood for delay. The convention signed at Fontainebleau, says M. Brialmont, bears date the 27th October. But ten days before, Junot was ordered to use all the rights the convention would have bestowed, and the French troops were on the march for Portugal, through Spain, long ere its provisions were ratified.

Junot had already crossed the Bidassoa, and the Prince Regent of Portugal endeavoured to obtain, by immediate concession of all the points demanded of him, the forbearance of Napoleon; but the latter had settled his plans, and was not to be propitiated. He pursued his great designs, and persevered till the glorious storm of the Spanish insurrection scattered his policy to the winds. On November 12, Junot marched from Salamanca, and eighteen days afterwards entered Lisbon, which the house of Braganza, faithful to its sordid instincts, quitted without a blow, and with full coffers. But although Napoleon might have been right in the axiom, that a nation brutalized by the monks and the Inquisition could not be formidable, he was wrong in supposing that Spain, after many years of the worst form of government, and the most degrading formulas of religion had utterly lost the sacred fire of national life, and the animating principle of the chivalry which had roused her people to shake off the yoke of invading races in times gone by. Inspired by the great successes in Spain, which had over-

Wellington

Wellington

whelmed the French in a series of disasters, which, if temporary, were not the less astonishing, the Portuguese established a junta at Oporto, the first acts of which were to solicit the aid of England, and to make common cause with the Spanish national leaders. Our government was at the time busy in organizing those miserable little expeditions which have brought on our arms the only shame and discredit ever attached to them,—such as those to Quiberon, to Walcheren, and to Carthagena. Moore had been wasting his energies with a paltry contingent in Sweden. Spencer was busy doing nothing, according to orders, at Gibraltar; but on 12th July there was actually a force of 12,000 men despatched from Cork, under the command of Sir Arthur Wellesley, for the occupation of Cadiz, or the seizure of Lisbon, or for any other object the caprice of the ministry might dictate. Ere Wellesley had fairly landed in Portugal, Sir Hew Dalrymple, however, received orders to follow and supersede him, and at the same time Moore, whose military reputation was undoubted, was placed under the command of Sir H. Burrard.

Wellesley enters Spain.

On 9th August, Wellesley, having effected his landing without opposition, at the head of less than 14,000 men, began his march towards Lisbon, between which and his army Laborde had thrown himself with about 5000 men, whilst Loison, with 7000, made a flanking movement on the left flank of our force, but at too great a distance to give us serious uneasiness. In fact, Loison seems to have been desirous of preventing our march towards the interior. The advance-guard and reconnoitering parties of the British came in sight of the French outposts on 15th at Ovios, and attacked and drove them back on their main body, which was strongly posted at Roliça. The next day was spent in obtaining information, and in a careful advance, and on 17th Sir Arthur fell on Laborde's corps with impetuosity, but met with a very gallant resistance, from far inferior numbers, which was only overcome after some loss on our side. Meanwhile Junot, alarmed for his position in Lisbon, had taken up ground with all his available troops on the heights at Torres Vedras, and presented a force of 16,000 good troops and 21 guns to his enemy. Wellesley had meanwhile been reinforced by a small corps of English, which raised his force rather in excess of the French corps, and he resolved to force his way between Junot and the sea with one portion of his army, whilst he occupied the attention of the enemy on the heights by a demonstration in their front with the remainder. But unluckily the operations of the cabinet at home had now time to make themselves felt in the field: an ill-wind, which blew good to the French, brought Sir Harry Burrard to the coast, and he at once gave orders to suspend all offensive preparations, and to halt till the reinforcements arrived which were expected under Sir John Moore. Wellesley, superseded and annoyed, sought to change the resolution of the general, and warned him that, if he did not attack the French, they would be very certain to attack him. In effect, Junot at once came down from his position, and on 21st August engaged the British at Vimiera with great vigour.

Repulses Junot at Vimiera.

Our troops behaved admirably, and, notwithstanding the determined gallantry of the enemy, repulsed them with loss in their repeated onslaughts. If Wellesley had been allowed to throw the battalions which were still fresh on the flank of the enemy, as he proposed, Junot would have been cut off from Torres Vedras, and would have lost Lisbon; but Sir Harry Burrard absolutely forbade any attempt of the kind. That feeble general was not, however, to have the monopoly of mismanagement, for the third commander of the government choice had by this time made his appearance, and Sir Hew Dalrymple, who had been previously raised to the command, superseded Sir Harry Burrard. Junot, much alarmed by the intelligence which reached him of the defeats and distress of the French in Spain, humiliated by his severe check at Vimiera, and apprehensive of the appearance of the British fleet before Lisbon, sent in proposals for a suspension of arms, which led to the unfortunate Convention of Cintra, in the negotiations previous to which, Wellesley, backed by the British admiral, in vain sought to open the eyes of his chief to the real state of the French army. Wellesley, who as signitary of the treaty, incurred public odium, which has been rarely more unjustly bestowed, left Portugal, better known and more unpopular than when he landed there, and returned to his duties in Ireland, and to his seat in parliament; but he was filled with forebodings, founded on his knowledge of the incapacity of the generals he left behind him, and the formidable nature of the difficulties with which they would have to contend in the obstinacy of their open foes, and the inefficiency of their native allies. It was determined by the British government that our generals should be directed to advance from Portugal with the British troops stationed there in occupation, and to commence a series of joint operations against the French, to complete their expulsion from the Peninsula, and 7000 men were sent to land at Corunna under Sir David Baird, whilst Sir John Moore was ordered to march with 21,000 men to pick up this corps, and with the whole force of 28,000 British troops to make an effective demonstration on the right and centre of the French line. But whilst we were deliberating, Napoleon was acting. No sooner had he heard the news of the reverses of his arms, than battalion after battalion, squadron after squadron, and battery upon battery, was hurried into Spain, and, in November, 150,000 French soldiers were assembled along the Ebro. When all was ready, Napoleon put himself at their head, fell upon and destroyed every Spanish force which stood in his way, and, on 4th December, stood as conqueror in the palace of the Bourbons at Madrid. Moore had only just reached Salamanca when those events occurred; but as Napoleon lost no time in sending masses of troops against that isolated corps, as soon as he made an onward movement towards Saldanha, the English general was forced to conduct his memorable retreat to Corunna, and Spain was left apparently in the hands of the French, from whom it seemed to have been so entirely emancipated only a few weeks before. The Spaniards, indeed, still held Saragossa in glorious defence; Andalusia was unconquered; and Cradock, with some 10,000 British, was still in Portugal; but Napoleon, having nearly done his work, drew a plan of operations for finishing the details of it, which seemed perfect. Soult was to march down from Galicia on Portugal, whilst Victor, with a strong corps marching from Elvas, and Lapisse with another from Almeida, should advance so as to surround the scanty battalions of the English, and force them to flee to their shipping, or to lay down their arms. Nothing impeded the march of Soult, and he occupied Oporto with ease; but M. Thiers seems to have good reason when he attributes to that general some of the gravest of military sins; and his reputation has always appeared to us greater than his deeds. He hesitated to cross the Douro; he wanted to hear from his generals; and he was apparently so secure of his prey, that he did not hasten to close upon it. Whilst he hesitated and waited, the wind was wafting to the shores of Portugal once more the Sepoy general, who was destined, ere he left the Peninsula, to carve the British name indelibly on the annals of its history, and to open the Spanish cancer which ate away the military reputation of France, the lives of her best soldiers, and the very heart of the empire itself. The British nation, violently capricious as any Athenian democracy, had been so elated by the easy successes of the troops in Portugal, and by the early successes of the Spanish patriots, that they were inclined to consider any treaty by which a trace of the French in the Peninsula was permitted to exist

Wellington returns home.

Wellington

something like a national dishonour, and they were loud in complaint against the Government, when suddenly the armies of France swept through Leon and Castile, and the news of the retreat of Moore came to appal the timid. The *popularis aura* changed at once, and it was with difficulty the government could obtain support in the courageous resolve to form a treaty with the Spanish provisional government, and to embark such a force to participate in the struggle on the soil where we had already won honour without profit, as would give substantial aid to the Spanish people. The part played by Sir Arthur Wellesley was by this time well understood, and his firm convictions, his military capacity, the clearness of his judgment, and his energy and sagacity, had secured him a consideration in the councils of the ministry, and a weight with its individual members, to which his years, or even his services, great as they were, scarcely would have obtained. He confidently asserted that the state of affairs was not hopeless, although a quarter of a million of French troops flooded the Peninsula, and overthrew every symptom of resistance and every landmark of national life. His Indian experiences possibly suggested the recommendation to government to send British officers to drill and organize the Portuguese levies. But he was not so foolhardy as to despise his enemy, and he accordingly stipulated that an army of not less that 30,000 British soldiers should be sent to Portugal to co-operate with the native forces, which Beresford was appointed to command. He at once resigned the Irish secretaryship and his seat in Parliament; he hastened the flagging movements of the government, superintended every detail, watched over every department of the expedition as soon as he was named to lead it; and on his arrival in Lisbon, on 22d April 1809, he lost not a moment's time in taking measures to avert the blow which was impending over Portugal. Inspired by his arrival, remembering his previous successes, his vigour and military qualities, the patriots at Lisbon took heart, and seconded all his efforts to put his troops in a state of efficiency. Soult heard of the arrival of the British under their young general, at the very moment that he was in perplexity respecting the movements of the columns intended to co-operate with him; but he was strongly posted at Oporto, and his communications were open with Ney. Having after a little delay satisfied himself of the exact position of the enemy, Wellesley adopted the extraordinary resolution of attacking Soult by leading his troops across the Douro in face of the enemy. But, in order to shake Soult's confidence, he despatched Beresford with a strong column to manœuvre against the enemy's left, whilst he advanced upon Oporto with 24,000 men. Soult was prepared, as he conceived, against any attempt of the kind; but in order to ensure the safety of his corps, he detached Loison, with 6000 men, to cover his retreat in case of accidents. Then removing the floating bridge, sweeping all the boats over to his own side of the river, he awaited the advance of the British with the huge wet-ditch of the Douro, nearly a thousand feet broad, in his front. It is a strange observation, but it is one, nevertheless, the truth of which will be admitted by students of military history, that the passage of a river has rarely been successfully resisted: apparently it is a most formidable defence; in reality it is readily bridged over by daring, skill, and resolution. All these qualities were possessed by Arthur Wellesley. Whilst Soult was, it is said, enjoying from his quarters the discomfiture of the English, very much as Bainié Madhoo might have laughed at Lord Clyde when he came to the banks of the Gogra, Sir Arthur, with his keen *coup d'œil*, on 12th May was surveying the shores of the rapid river. He perceived a stone building on the other bank, at a point which a bend in the course of the stream in some measure screened from the observation of Soult. Could he occupy that building, it would cover the passage of his men till they were sufficient in strength to hold their own! How to do that was the difficulty. But fortune was not unkind to one who knew how to take advantage of her favours. Among the reeds by the bank of the river a little boat lay hid. Colonel Waters, one of those men who are sometimes found whenever a gallant action of enormous importance is to be done, was at hand, and he at once crossed over in the boat to the other side, "cut out" some large barks drawn up under the north shore, and returning with them, afforded means of transport for seventy or eighty men across the Douro, for the immediate occupation of the coveted building. Once established, Wellesley hurried over men as fast as he could, and brought up his artillery to cover their landing. Soult, discovering the success of this movement on his flank, despatched battalion after battalion to drive the intruders into the river; but our men were in occupation; boats were found all along the bank; the British threw themselves over in masses, and were enabled to make an offensive movement against Oporto, which the French barely attempted to defend, and in the evening we were masters of the place; and Sir Arthur was, it is affirmed, entertaining his staff at the very excellent dinner provided by Soult's famous *chef de cuisine*, for his master. Soult, who suffered greatly in his retreat, joined Ney with little more than half his original force; whilst Wellesley was obliged to halt at Oporto in order to get his army in order for the next stroke, which he intended to deal with a heavy hand. Although we were in a friendly country, and England was rich enough to subsidize half Europe, so miserable was our commissariat, and so chronic our home mismanagement, that the British soldiers were destitute at times of wholesome food, of shoes, of clothing, and of pay. Sickness broke out among them, and in a short time more than a fifth of the army was in hospital. The want of discipline among the men and their scandalous excesses had much to do with the sufferings of the troops. "The army," writes their chief, "behaves terribly ill, and they are a rabble who cannot bear success any more than Sir John Moore's army could bear failure." There were no less than 250,000 French in the Peninsula, but they were split up into detachments and garrisons, and the largest force in the field consisted of about 28,000 men, under Marshal Victor, whom the obstinacy of Cuesta saved from the blow Wellesley had prepared for him by turning his position at Torre Mocha, and thus cutting him off from Madrid. Soult, however, had received the command of three corps d'armee, and he prepared to threaten Wellesley's communication with Lisbon with one portion of his force, whilst he held Beresford and the Spaniards and Portuguese in check, and vigorously besieged Ciudad Rodrigo and Almeida with the remainder. Under these circumstances, Wellesley would have to decide on passing the Tagus, and, having effected his junction with Cuesta, to attack Victor. If that course were undesirable, he could open the road by Ciudad Rodrigo and Almeida, with the aid of the Portuguese and Spaniards, securing his flank and rear, or, finally, he could direct his course upon Madrid at once. Although he had much difficulty in providing mules and transport, and considerable anxiety to contend with on other accounts, Wellesley, who was scarcely aware of the enormous concentration of the French on the left of the Tagus, where Ney and Soult had effected a junction, resolved on the bold step of invading Spain; and with that object steps were taken in time for the assemblage of the army at Placencia.

Sails again for Spain.

Wellington

Crosses the Douro under the eyes of Soult.

Early in July, Wellesley, with 22,000 British, began his march in the direction of Madrid; on the 8th he stood fast at Placencia, and soon afterwards joined the Spaniards, 56,000 strong, under the old, obstinate, and incompetent Cuesta at Oropesa. Victor, meantime, had been rein-

Wellington forced by all the troops which Joseph Bonaparte could collect, and covered the capital; whilst large columns of French troops were hastening down the valley of the Tagus on our flank. On the 28th July, after a severe encounter on the preceding evening, Joseph Bonaparte attacked the allies at Talavera. He showed considerable judgment in marching to meet the enemy, though the result might have been very different had he acceded to Soult's request not to fight till the principal corps under the Marshal's command should have arrived near Placencia. He had further reason to believe, when he resolved to fight, that Soult would certainly be close in rear of the English. Jomini is good enough to admit that the battle "established the fact that the English infantry was fit to contend on equal terms with the best in Europe;" but that the terms were by no means equal must be admitted when it can be proved that 16,000 hungry English soldiers, of whom many were recruits and militiamen, withstood and finally beat back the attacks of nearly 30,000 of the best soldiers in the French service. It is true there was no flight on the part of the enemy, but their onslaughts were repulsed with great slaughter, and they left 17 guns on the field, as well as upwards of 7000 killed and wounded.

Defeats the French at Talavera.

The miserable infatuation of Cuesta, the imbecility or criminal inactivity of Venegas, the loss of the pass of Banos, and the approach of Soult, decided Sir Arthur, as the only means of extricating his army from the difficulty out of which the victory of Talavera had not taken it, to retreat again into Portugal, and by some rapid, fortunate, and well arranged combinations and marches, he fell back on Merida, Badajoz, and Lisbon, leaving the Spaniards to their fate, and regarding them with a disgust and indignation which determined him never to trust British soldiers in line with them again. He had been taught, indeed, that with such allies active offensive operations against the powerful armies of France were, if glorious in individual action, singularly destitute of political success. The Spanish army made an attempt to liberate Madrid, but they were speedily taught to feel the value of their allies, and their own inefficiency, for on 5th November, Mortier, with a force not one-half their strength, attacked them at Ocana, and at one blow fairly annihilated them, and swept them off the face of the country; and on the 28th, del Parques' corps shared the same fate at the hands of Kellermann. Wellesley thus permitted the Spaniards to form an opinion of their own value when unassisted, and was soon exposed to their importunity and to the clamour of the press at home, in consequence of his attitude.

Sir Arthur Wellesley was, nevertheless, created Baron Douro of Wellesley, and Viscount Wellington of Talavera, and of Wellington in the county of Somerset; but the government lent him but lukewarm support in his earnest proposals for the effective prosecution of the war, which was now assuming gigantic proportions. Furious with anger on the receipt of the intelligence that Joseph had been defeated at Talavera, Napoleon directed that nine corps under the most famous marshals and generals of France should be assembled in Spain, and at one time had all but put himself at their head, but he was prevented by the preparations for his marriage, and for the more stringent enforcement of the great continental blockade. He fondly believed that Massena would drive the English into the sea, and the opening successes of the war, which gave the French Ciudad Rodrigo and Almeida as good bases of operations, seemed to promise that fortune would at last flee from other fields to light on her once favoured but long neglected eagles, which in Spain had uniformly quailed before the despised leopard. The campaign of 1810 opened, indeed, under circumstances which seemed to promise no good result. Wellington beheld with unquailing eye the storm which was gathering. With all disposable reinforcements, and with the aid of Beresford's Portuguese, Wellington his whole force consisted of about 120,000 men; of whom 40,000 were in reserve and in garrison. The flower of the French army, under their world-famed marshals, was before and around him in more than twice his greatest strength. His plans were soon taken, and speedily acted upon. Whilst the French were slowly advancing from the north, Wellington having moved towards the Mondego, was with extraordinary energy directing the construction of the famous lines at Torres Vedras, to which Massena's corps was pursuing him. In vain Lord Wellington besought the Portuguese government to stop the march of the enemy by laying waste the country and devastating the crops,—acts of which either great patriots or servile populations are capable could not be imitated by the Portuguese, and the sacrifices which Sidney Smith considered beyond the comprehension of English farmers, and which history tells us were offered by Russian peasants on the altar of their country at the behest of the Cossack, could not be expected from a race of effete constitutionalists. It was evident that the French could depend on the resources of the country whilst they were in pursuit, and that if anything were to be done in the way of depriving them of natural magazines, the British army could alone be relied on for the work. In order to show the enemy that it was not from disorganization, fear, or incapacity to cope with him in the open field, Wellington resolved to make one stand in the face of his foes, and give them a knock down blow ere he retired to his stronghold. Ere his arrangements were quite complete for the defence of the position he had selected on the Sierra de Busaco, he was confronted by Ney with 40,000 men on 25th September; but Massena, who seemed to suffer from a sort of paralysis that smote all the great marshals of France when they found themselves in front of the Anglo-Irish general of Sepoys, was afraid to attack till the 27th, and the delay gave the "Hindoo captain" the invaluable opportunity of concentrating the whole of his troops, and filling up the gaping blanks in the line of his defence. The attack of the French, Defeats them again gallantly delivered on a position so strong that even Ney on the and Junot declared it ought not to be assailed, and so far Sierra de testified to the skill with which it was chosen, was utterly Busaco. defeated with great and disproportionate loss. Massena next day made a masterly flank march by the sea, believing that the English would find no tenable position, and that if once Wellington was compelled to move at all, he could only find refuge in his ships. No proof of the value of popular sympathies in war can be more striking than the fact, that Massena was utterly ignorant of the great works which had been going on for nearly a year at Torres Vedras. He was unacquainted with the tactics Occupies of his enemy, nor was it until he began to advance in the Torres footsteps of the British general, and found the country de- Vedras. solated, and the population departed, that he began to appreciate the sagacity and determined resolve by which that masterly retrograde movement was governed. Besides, Wellington hanged his disorderly soldiers, and thus checked plunder, whilst the French permitted it to pass unpunished, and thus saw their resources wasted under their eyes, and prepared with their own hands the cup of bitterness and want which they were obliged to drink.

One regrets that among the numerous publications of self-memoirs which is characteristic of French literature, there is no autobiography of Massena, which records his feelings when he found himself in front of the frowning lines of Torres Vedras.

In one month Massena gave up the game. Scarcely had his rear-guard removed off the ground, than Wellington issued from his lines and hung upon him, perhaps with more caution than enterprise, for every mile of his masterly retreat. Massena has been blamed for not attempt-

Wellington

ing to dislodge or turn his enemy, but all the proposals suggested with that view are susceptible of easy confutation. In fact, the lines were inexpugnable, and the position in itself was admirable. On 14th November, the French quietly fell back upon Santarem, where they showed such a strong front that Wellington, whose policy was now thoroughly Fabian, in spite of the vindictive opposition he encountered at home and abroad, did not consider it expedient to force them to fight a battle. Massena was reduced to great straits for the want of provisions, and, toward the end of February, was so destitute of everything of which an army is in need, that he was obliged once more to continue to retreat, and to fall behind the Mondego, just as Soult might reasonably have been expected to have relieved him. On 5th March the Prince of Essling recommenced his retrograde movement, and with Ney in command of his rear-guard, which was frequently engaged with the British, exhibited abilities worthy of his best days, but not superior to that of his great antagonist, till, on 9th April, he passed the Portuguese frontier. In his anxiety to reorganize his army, and to save Ciudad Rodrigo, the French general took up his position at Salamanca; and thus gave Wellington an opportunity of making a demonstration against Almeida, of which he was not slow to avail himself, for he at once invested it with part of his troops, and, with the remainder as a covering army, took up his ground in front of the Coa, with his left on the Almeida road. Massena, to relieve the place, wheeled round and, on 5th, made an impetuous attack upon the British at Fuentes d'Onoro, which was unsuccessful, though it cost much life on both sides. Almeida at once fell into our hands, and Wellesley thus closed up one of the passes into Portugal. Massena, the victor of Zurich, the spoiled child of victory, the idol of the army, was superseded in disgrace by the Duke of Ragusa. These operations were attended with an enormous accession of reputation to the British army, and of lustre to the general who led them, but not with any increase of either personal comfort, confidence, or popularity to him who was restoring in the remote Peninsula the balance of European power. The Opposition, headed by the prince, who was afterwards George IV., were incessant in their attacks, and in ignorant, if not offensive, depreciation; and the heart of Wellington was doubtless steeling itself more and more against the flabby edge of what was calling itself public opinion, till it assumed the condition in which it presented its surface to what would have been sometimes a wholesome incision. Not that he was quite indifferent to those assaults: he felt them however, only when he saw that the ministry from whom he expected and claimed support had not the moral courage to stand up for the man who was winning immortal honour for his country.

Massena is disgraced.

Before Wellington could venture to proceed with offensive operations against the French in Spain, it was necessary for him to open his communications, and to free his rear and flanks of the fortified places which afforded to his enemy cover and support. Chief among these was Badajoz, which Soult had taken early in his proceedings, and had strongly garrisoned. Beresford was directed to invest, and retake the fortress; but Soult, on 10th May, made a tremendous effort to defeat the attempt, and it was only by the most extraordinary gallantry, by the most dogged courage, that at a great loss of life Beresford was enabled to win a glorious but very sanguinary victory at Albuera. Wellington arrived soon after to take command of the besieging army, but not even his genius could fit it for a work to which, in all respects, except readiness to fight and to die, it was utterly unsuited. As it was in the early Crimea, so was it then. The trenching-tools would not trench, the cutting tools would not cut, the spades would not dig, the shovels would not shovel; there was no transport, the guns were of small calibre, old fashioned, weak, and averse to battering; the engineers were without experience. The French defended the place with brilliant courage. Wellington, twice repulsed from the breaches of Badajoz, was compelled to raise the siege on 10th June, and to turn his arms against Ciudad Rodrigo on the northern frontier, where, taking up post in a strong position at Guinaldo, he established a blockade of the ill provisioned garrison. It would seem as if Fortune, indeed, were at this time almost inclined to fly from her favourite. True, he could be in no great straits as long as Torres Vedras was open to him, and the sea connected his position with England; but Soult, reinforced, was watching his old enemy on the south of Portugal; Marmont, with 30,000 men in line, lay between Toledo and Madrid; Castile and Leon were strongly occupied; and, in face of all this, Wellington had been beaten at Badajoz. The moment Marmont heard of the danger of Rodrigo, he collected 60,000 men, and after some affairs at El Bodon Aldeadaponte, in the month of September, threw a reinforcement and abundance of provisions into the place in face of Wellington, whose blockade was raised without the possibility of his preventing it. Indeed, he was in a most hazardous position; for, whilst Marmont, with a magnificent army of 60,000 men, lay within a few miles of him on one occasion, the British general had less than 16,000 men collected together, and might have been destroyed at Fuente Guinaldo. But it was one of the great advantages which we possessed in this struggle, and on which sufficient weight has not always been laid by our writers, whilst it has been a little exaggerated by French military historians, that the sympathies of the people were so far in our favour, the French could never obtain any trustworthy information in reference to our strength or position. Marmont imagined the whole British army was before him, and contented himself with the success of his attempt to victual and strengthen Ciudad Rodrigo, and Wellington, with activity and secrecy, assembled the scattered portions of his force, till he was restored to security in his position; and having put his army into cantonments for the winter on the line of the Coa, terminated the campaign, the close of which was marked by Hill's surprise, and defeat of the French at Arroyo de Molino. The failure of his attempt on Badajoz had attracted attention, and had been traced to its real cause. Steps were taken at home to obviate the recurrence, as far as possible, of such discreditable reverses. A first class siege train was sent to Lisbon, money was sent out, and equipment and material of all kinds; and while the French, supposing that Wellington could attempt nothing further for the year, were retired to their winter quarters, their indefatigable adversary was labouring night and day to accomplish the reduction of the fortress they believed to be quite secure. With the utmost secrecy he prepared a bridge to throw accross the Agueda, on the opposite bank of which stands Ciudad Rodrigo, and brought up the deepened channel of the Douro the siege-train which had been shipped at Lisbon, so as to induce the enemy to think it was meant for Cadiz. His transport was all in readiness. In the second week in January 1812, he crossed the Agueda, and sat down before the astonished garrison of Rodrigo; and on 19th the place was stormed, in spite of a very fierce resistance, which cost us many valuable lives. Having secured his prize by this brilliant feat, Wellington turned his attention once more to the capture of Badajoz.

Wellington repulsed at Badajoz.

Storms Ciudad Rodrigo.

Wellington's popularity again rose with fine weather. He was created earl, and was voted L.2000 a year in England; a grandee of the first-class and Duke of Ciudad Rodrigo in Spain; and Marquis of Torres Vedras in Portugal, where he was already marshal, general, and Count of Vimiero. The interference of Napoleon, now thoroughly alarmed, became more mischievous, in proportion as it relieved his officers of responsibility, and coerced their independent action. Marmont was ordered, in spite of his strong

Wellington opposition, to assume the offensive in Beria, and to occupy the Asturias. Wellington, relieved by the withdrawal of the French from the valley of the Tagus, marched through the Alentejo, and arrived at Elvas on 11th March, and on 17th with 18,000 men, exclusive of Hill's corps, invested Badajoz, which was garrisoned by only 5000, under the famous Philippon. The resistance was stern and desperate, but the place fell after one of the most bloody assaults ever delivered, in proportion to the men engaged, on the morning of 7th April, the glory of the victors being tarnished by the excesses of the troops, who for three days revelled in every species of license, notwithstanding the efforts of their chief and of their officers.

The bloody success at Badajoz.

Having obtained these extraordinary successes, the development of Wellington's military policy now became more obvious, and his first steps showed whither he was tending in pursuance of the plan long laid down for his guidance by his own sagacity and long-sightedness. Portugal was free, —and its gates were in his hands; his communications were open,—Spain lay before him, and already Andalusia had echoed back the shouts of Hill's victorious soldiery, and the alarmed footsteps of the French. With equal confidence and audacity, Wellington conducted his army into Spain, and, as he advanced, Marmont, who had a mania for field-days and manœuvres, and camp-work, made curious retrograde and sidelong marches, picking up, however, detachments and scattered corps on every side, till he had collected nearly 50,000 men, with whom he advanced to preserve Salamanca. The antagonists eyed each other keenly, and neither seemed disposed to enter hastily on a contest of which the results would be so important. But Marmont prided himself on the skill with which he handled troops, and probably despised the capacity of his opponent in that respect, although in other qualities he had now made himself respected by the best generals in Europe.

At the very moment that the wise persistency of Wellington was bearing such signal fruits, and that their vigorous growth was daily overshadowing and blighting French influence, power, and prestige in the peninsula, the emperor, intent on the invasion and humiliation of Russia, was withdrawing some of the best of his troops for that magnificent but disastrous project. Wellington had nevertheless no ordinary difficulties to encounter; and the heart-breaking indifference of the people for whom he was fighting was aggravated by the deficient organization of his own army, the opposition of most powerful parties at home, and the want of adequate funds.

On 17th June Wellington crossed the Tormes and entered Salamanca, which Marmont evacuated the previous evening, leaving adequate garrisons in the forts, who made a vigorous defence against the English, and thereby enenabled Marmont to collect about 25,000 men, with whom he attacked Wellington on the 20th. On the 22d he was reinforced by about 11,000 men, and repeated his demonstrations; but neither his efforts to dislodge Wellington or to relieve the forts were successful, although the resistance of the latter delayed the allies for ten days, and enabled the French to concentrate their various corps, which, at the outset, had been scattered far apart. At last, on 22d July, after much manœuvring and marching, sometimes within musket-shot of each other, the two armies met at Arapiles, near Salamanca—Marmont with 42,000 men and 74 guns, Wellington with 43,000 English, 3500 Spaniards, and 60 guns; and after a contest which is described by M. Brialmont as "brief and murderous," the French were beaten at all points, and fairly driven off the field, with the loss of 6000 men, 11 guns, 2 eagles, and 6 standards; whilst the English lost 5444 men, and were so far exhausted that they could not enter on the pursuit of the routed enemy with the vigour which might have been desired.

Defeats Marmont at Salamanca.

The battle of Salamanca put an end to all doubts that envy, jealousy, or ignorance, could affect to entertain in reference to the strategical ability of Lord Wellington. The hand of France was palsied by the stroke, and Spain half slipped from her grasp. The French marshals were stricken with astonishment, mingled with something like fear; and their councils, never very cordial or unanimous, were now more distracted than they had ever been, at the very moment when they required the most sincere co-operation in the wisest plans they could devise. Whilst they were disputing, Wellington was acting. The road to Madrid was open before him; and he entered the capital with his victorious army, as Joseph was fleeing from the irritated population whom he affected to consider as his subjects. The king betook himself to Suchet, who was preparing to effect a junction with the remains of Soult's corps d'armée in Valencia; whilst Clausel had rallied Marmont's army, and had thus collected an army which was at least equal to the English in Old Castile. Having secured Madrid, and made all his preparations with his usual foresight, Wellington took the field again and marched upon Valladolid; but Clausel was not disposed to risk another battle, and retired cautiously as his redoubtable antagonist advanced, exhibiting in his retreat proofs of the most signal capacity. With the prescience which distinguished the emperor's view of the contingencies of war, he had given orders early in the Spanish campaign to strengthen the fortress of Burgos, which commanded the road to Bayonne, and was used as one of the principal depôts of the French armies. Wellington found the place in his path; and although he would gladly have avoided it, the necessity of his position forced him to undertake a siege, for which his army was little qualified. In effect, the defence was exceedingly vigorous; the attack was not of the highest order. Five weeks were lost in operations which are not thought by foreign critics to have redounded to the credit of our engineers; and still the besieged held out, with the bravery which, it must in fairness be admitted, the French garrisons exhibited on all occasions. The news came meanwhile, that Soult was marching with 70,000 men on his old prey, now left almost defenceless; for Hill had only 20,000 men to defend Madrid, whilst Souham threatened the rear of the British with a corps which far exceeded all Wellington's disposable forces. There seemed no mode of escaping these difficulties but the unwelcome surrender of Madrid for a time, and the withdrawal of the British from their unsound military position to the lines of the Agueda. Hill effected his junction with his chief without molestation; and the army, which had suffered severely in moral as well as in physical strength, in consequence of the check at Burgos, and the result of the subsequent retreat, took up its quarters for the winter, in no very amicable mood towards its chief, who had rebuked their excesses, and the want of discipline of their officers, in no measured terms. Wellington took the opportunity now afforded to him of visiting the Cortes, then sitting at Cadiz, where they were blockaded on the land-side by a French corps, which was rather of observation than of attack. He was received with every mark of honour, was decorated with the order of the Toison d'Or, and was invested with powers, which were practically uncontrolled, over the Spanish troops. The Portuguese created him Duke of Vittoria. The king of England elevated him to the rank of marquis; and the parliament gave him a grant of L.100,000, with part of which he purchased the estate of Wellington, which was supposed to have belonged to the Colleys in times gone by; and he received permission to wear the crosses of St George, St Andrew, and St Patrick, in augmentation of his arms. Reinforcements also were poured in from England, notwithstanding a bitter and illiberal opposition from a few men like Sir F. Burdett; and the tremendous disaster which had befallen the arms of France

Wellington

Suffers a check at Burgos.

Wellington

in the snows of Russia animated the country with the hope that the contest in Spain could not long be protracted by a chief whose position would impose on him the necessity of withdrawing every soldier he could rally to his standard to defend his own frontiers.

The campaign of 1813 was opened by Wellington at the end of May with 200,000 men of all nations and arms, and he knew how much was expected at his hands by the magnitude of the favours conferred on him, for he was now a Knight of the Garter and Colonel of the Blues.

The French had made the greatest preparations to resist any attempt of the British to cross the Douro, and to oppose them at every step, if they succeeded in doing so, as well as to harass them by means of constant assaults, in case they moved towards Salamanca. But Wellington rendered all their precautions and plans abortive by turning their right with his left wing, whilst his right moved round and effected its junction with the rest of the army in rear of the French positions. It was hazardous to have divided his force, but fortune was favourable, and the French, as if conscious that the evil genius which had hovered over their eagles in the retreat from Moscow was now about to visit them in Spain, exhibited little of their usual energy and activity, and prepared for the great struggle which they knew must come without much spirit or confidence. It approached at last, and at the battle of Vittoria, on 21st June, Wellington gave a death-blow to the French in Spain. The enemy lost 7000 killed, wounded, and prisoners; 151 guns, their military chests, their plunder and baggage, and a spoil which for some days disorganized the victorious army. The Prince-Regent sent to the conqueror the baton of an English marshal, in return for the staff of Jourdain, which was found on the field. The British loss amounted to 5000. Not indeed that Napoleon, in the advent of his supreme hour, thought of giving up so splendid an appanage without an effort. On the contrary, whilst Wellington, with that rarest quality in generals who in other things are greatest, was profiting of his victory by the pursuit and pressure which forced the French army to retreat so rapidly that at times they might almost be said to be in full flight, Napoleon selected Soult once more to try the strength of his arm against his invincible antagonist, and handing over to him the choicest of the troops which remained to him, prepared with extraordinary resolution to give to the world the most convincing and astounding proofs of his own marvellous genius in the hopeless contest which he was about to maintain with the coalesced hosts of Europe. Soult's first attack was vigorous. The mountain-passes of the Pyrenees became the scenes of fierce encounters, and the silence and solitude of river-pierced glens were disturbed by the roar of cannon and the rattle of musketry.

He defeats the French at Vittoria.

St Sebastian, most gallantly defended by the French, who repulsed more than one assault with great loss to Graham's corps, was now covered by the allies, who occupied all the gorges of the mountains in scattered divisions, when Soult, on 16th July, in obedience to the emperor's orders, made an offensive movement, and, on the 28th, fought the sanguinary but unprofitable battle of Sauroren, which was followed by a series of many able dispositions on the part of the English general, the result of which was to force Soult to retreat from his commanding position. In nine days serious encounters, almost worthy of the name of battles, took place between the two armies, which cost the allies 7000 and the French 13,000 men. St Sebastian, after a defence of extraordinary gallantry, fell, after nine assaults, on 31st August, and, on 7th October, Wellington executed one of the most brilliant strategic operations ever performed by any general, by crossing the Bidassoa with seven different columns in the face of Soult and of his army, posted in a most admirable position. But his successes were imbittered by the ingratitude and lying malignity of his enemies, and of the anti-English party in Spain and in England, even at the moment when the Prince-Regent, elated by his successes, proposed that he should move his whole army by sea to Belgium, in order to invade France with the allies from the northward. Never, perhaps, was the *robur et æs triplex* of his iron character more severely tested; never was the patience of any general more severely tried by popular clamour and national ingratitude. It was not till 10th November that Wellington, with 100,000 men and 95 guns, was in a position to commence an offensive movement against Soult's lines, which were held by upwards of 65,000 veteran troops. The result of the action on the Nivelle was, that the French were driven from their position with the loss of 4300 men, 51 guns, and their principal magazines, and that after some subsequent affairs they were obliged to take up new ground, resting on their intrenched camp at Bayonne.

Wellington

The campaign in the Pyrenees must have been one of the most exciting episodes of Wellington's life, for this *chasse à Français* into their own country could scarcely have been anticipated so speedily. At one time we see the English chief on a mountain top, where his presence is greeted by the thundering shouts of his soldiery. Soult, whose features Wellington can distinguish as he rides along the hill-side nearly opposite, hesitates in the attack he is about to make with every chance of success, till he learns the cause of the cheering, and the English reinforcements come up meantime, and the danger is averted. Again, we behold Wellington peering down on the masses of his unsuspecting enemies, embayed, as it were, in a deep valley, the outlet of which the allies are rapidly closing up. Soult and his army seem to be almost in his grasp. Suddenly three red-coated soldiers appear in the gorge of the valley, and are at once pounced upon by the French cavalry, and carried before their chief; in a few moments the French are streaming out of the trap, and the deep-laid plan is destroyed by the indiscipline of three miserable plunderers. Once again, Wellington is to be seen, seated on the ground in a little glen, poring over his maps, and, *totus in illis*, a group of French horsemen dash at him, and the English general has just time to get into his saddle and ride for liberty and life, pursued by their bullets. These passes were indeed the gates by which he could keep watch and ward over the Peninsula he had saved by his genius; but he resolved not to leave a hostile fortress in his rear before he entered France, in spite of the powerful representations addressed to him to induce him to depart from his resolution. The fall of St Sebastian, and the conclusion of the armistice between the allies and France, promised him greater liberty of action, but Suchet was still holding his own with great skill and courage in Catalonia, and Pampeluna was in the hands of the enemy, though blockaded closely by the Spaniards, so that the garrison were all but starving. Wellington, who must have witnessed with concealed, but much and well justified satisfaction, how far his victories in Spain were regulating the whole course of political action between Europe and France, was at last induced, as we have seen, to throw into the scale the moral weight which would be gained in an actual invasion of the French territory. There never was an army with such long-standing animosities to gratify kept in such order,—though it was composed, he declared, of "the greatest blackguards on the face of the earth." He hanged some of his men for acts of plunder; officers were tried and cashiered by his orders for misconduct; and his general orders fulminated threats which it was well known would not be empty words, against soldiers and officers who should be guilty of oppressing the inhabitants of France. It is to be regretted that there were never wanting deserters from our army, who kept Soult well informed of all Wellington's movements; but when he was attacked and forced back on Bayonne, he

The campaign in the Pyrenees.

Wellington seems to have been surprised, to a certain extent, by the vigour of the attack. In order to save France as far as possible from the misery her troops had inflicted on nearly every country in Europe, Wellington, ere he advanced, sent back most of the Spanish troops to the other side of their own frontiers. Active operations were suspended by the inclemency of the weather, but, on 14th February 1814, Wellington crossed the Adour below Bayonne, and, on 27th, drove back Soult from Orthez, and would probably have routed him utterly, but that he was struck from his horse by a spent ball as he was directing the pursuit. The battle of Toulouse. It was the 27th March ere the allied army found itself before Toulouse; but the floods and rains, which swelled the Garonne and its tributaries, prevented military operations till the close of the first week in April, and on 10th was fought the very desperate battle, which some foreign writers would contend to have been indecisive, although Soult, on the next night, abandoned the city, his position, the wounded, his heavy artillery, and his stores, and never halted till next night, when he drew up at Carcasonne, 22 miles from Toulouse. There is no need here to refute the calumny urged against the two generals, that each was aware of the abdication of Napoleon, or might have inferred it from the intelligence they had received ere the battle began, and that they sacrificed so much life to their evil passions. History has disposed of the falsehood. The war was at an end!

And Wellington stood at the head of a conquering army on the soil of France. That army had been formed in the furnace of battle, under the eye and by the hands of one who may be said to have been its creator. The materials were the undisciplined militia and recruits of England, Ireland, and Scotland, and the courage and soldierly qualities of the races from which they sprung. By its efforts it had secured for Great Britain a position which all her naval successes could never have won in the councils of Europe. It was Wellington and his army which gave dignity and force to Castlereagh at the congress of sovereigns, and which caused his voice to be heard in their tents with attention and respect. It was that army and its chief which employed for years the best soldiers and the best generals in France, and finally overwhelmed them with defeat. It was that army and its leader which for five years deepened and widened the Spanish ulcer which ate into the heart of France, and which, as it were, like a consuming rust, destroyed the vast machinery of conquest which had been contrived and put together by the subtlest brain and most cunning hand for war the world has ever seen.

Bonaparte in Elba. The mission, as it is called, of that wonderful force, which had been so hardened and tempered in warfare that it could go anywhere and do anything, was now over. The allies were in Paris; Napoleon was on his way to Elba. The Peninsular army was broken up, never to be reconstituted. Some battalions were sent to be shot down ingloriously by hidden foes from the shelter of cotton bags at New Orleans; others to garrison pestiferous settlements, and to languish in remote colonies, to the arid plains of India, or to the frontier-posts of Canadian waste and lake. The man to whose genius, capacity for command, and consummate military character, they had by a vast expenditure of blood, and by unsurpassed exhibitions of courage and endurance, given the fame and the success due to such rare qualifications, had now become almost the moderator of the councils of Europe, senates, and emperors; kings and nations turned their eyes on him with respect and admiration; and statesmen hung upon his words. Far into the remotest corners of distant lands his name had penetrated, and victories which sounded uncouthly in the ears of Cossack and Tyrolese, were familiar on the lips of the soldiers of Russia and of Austria, who found some little consolation for their own disasters in the thought that the French were not invincible. Great, however, as was Wellington's success, and large as were his honours, the crowning glory of his life was yet to come, whilst the army which had done so much, with a strange perversity on his own part, and on that of the country, sought for years in vain any mark of the nation's recognition of its service. The sagacity, political knowledge, and discrimination of Wellington had been so remarkably displayed in his management of Spanish affairs, and in his correspondence, that the ministry requested him, the instant he arrived in England, from the head of his army to proceed as the ambassador of England to the court of France; indeed, as early as May 4, 1814, he had gone up from Toulouse to Paris, and had made the acquaintance of some of the most remarkable men in the capital; scarcely had he repaired to his post ere the state of affairs required his presence at Madrid, where the influence of his personal character, and the soundness of his judgment, were amply tested in composing the disputes at that unhappy court, and interposing between the follies and imbecility of the monarch, and the angry turbulence of his subjects. But the Bourbons have had great opportunities and great servants only to neglect both, and the Duke of Wellington left Madrid with no confidence in the results of his good counsel to the king of the realm, in which he was not only a peer, a proprietor, but an actual *restitutor rei*. Having, on his way back from Spain through France, broken up his army at Toulouse in a simple order of the day, the Duke returned to England, where, if his stern nature, rather contemptuous of popularity, and the breath which more poetical temperaments consider the best filling stuff for heaven-soaring balloons, could have been satisfied with the most enthusiastic reception, he must have enjoyed complete contentment. On 28th June, however, he received those constitutional marks of favour, to which he was not and could not be indifferent. At one sitting he became developed in the House of Lords through all the stages of the peerage, as baron, viscount, earl, and marquis, to the highest title of honour; and the Duke of Wellington claimed, as Lord Eldon said, on his first entrance to the House, all the dignities which the crown could confer,—"If his merit was not great," he said, "his gratitude was unbounded;" and on 1st July he attended the House of Commons on an occasion quite unexampled in our history, to return thanks for the honour done to him by the House, in having deputed a committee to congratulate him on his return home, which he did in a speech remarkable for simplicity and good taste, and not unworthy of the admirable and eloquent reply of the speaker, who, in conclusion said, "This country owes you the proud satisfaction, that amid the constellation of great and illustrious warriors who have recently visited our country, we could present to them a leader of our own, to whom all by common acclamation acceded the pre-eminence, and when the will of Heaven and the common destinies of our nature shall have swept away the present generation, you will have left your great name and example as an imperishable monument, inciting others to like deeds of glory, and serving at once to adorn, defend, and perpetuate the existence of this country among the ruling nations of the earth." And this ere Waterloo was won! It is one of the most crucial proofs of the fineness of temper of the man which never changed colour when tested by cold or tried by fire, that he was as little heated by the breath of flattery as he had been chilled by the blasts of indifference and neglect.

Wellington. The Duke visits Paris. His return to England. His reception.

In August, the Duke in proceeding towards Paris to execute the functions of ambassador at the court of France, to which he had been appointed, took occasion, in company with three engineer officers, to examine the frontier line of the Netherlands; and in the course of his survey, he certainly pointed out the position of Waterloo as one which

Wellington should be occupied to cover Brussels in case of a French invasion.

In Paris again.

For five months Wellington remained at Paris, every week of which was marked by some earnest work, by honest and disregarded counsels to France or Spain, and by unproductive attempts to inspire the Bourbons with notions of moderation and forbearanee. Of the people of France he formed an opinion, which, if not politically correct, was peculiar and forcible. He believed they never could go on without "the plunder of the world," and that they could not endure the prospect of a peaceable government. In order to restrain that indomitable spirit of homicide, Wellington always recommended the continued action of the grand alliance. The sagacity of man is microscopic. The grand alliance, indeed, performed its mission; but we now (1860) see France ruled by the representative of the family and of the traditions of the empire; and we have scarcely yet learned to decide whether an *entente cordiale*, an entangling alliance, or an open war with our great antagonist, would be most grateful to the prejudices, or hurtful to the interests of England, which has already aided France in giving a tremendous blow to Russia; and has supported her by her sympathies in a war which has deprived Austria of the fairest portion of her dominions.

His duty done, the Duke of Wellington was accredited to Vienna as the representative of England at the famous Congress, of the no less famous settlement of which little now remains, except the memory and the practical proofs of its unsoundness. But the progress of the work was on that occasion rudely interrupted. The eagle had broken loose from Elba, eager for prey and for vengeance, fanning with his pinions the air still heavy with the smoke of battle and tainted with human blood. The vultures and foxes quarrelling over their spoil broke up in dismay. But there was at their congress one who was not to be daunted by the terror of any foe, and who ardently longed for the opportunity of measuring himself against the most tremendous antagonist that ever marshalled a battle-field.

Napoleon escapes from Elba.

Austria was clamouring for Poland; Berlin was anxious to swallow all Saxony. England, France, and Austria, were actually driven into a secret alliance to resist the armed violence of those states who had never won an inch of ground or a particle of honour from France in a fair battle-field; and Murat, encouraged by Russia, had seized on a portion of the States of the Church, and seemed resolved to brave the anger of Austria as the Congress drew to its close. On the 8th March the startling news reached Vienna that Napoleon was marching upon Paris. On the 20th the Bourbon was a fugitive, and the Corsican sat once more on the throne of France. But the Alliance still lived. The name of Bonaparte was a talisman to shake every legitimist government to the foundation, and to reopen the fountains of fear and misery which had flowed over every country of Europe. If Napoleon desired peace, he would have desired it in vain. The Castlereaghs the Metternichs, the Nesselrodes of the day had vowed eternal hostility to the Empire—they could not recognise the fact, Europe has been forced to admit, that the principles on which the Empire was founded must exercise their influence as long as France is a nation. They were bent only on destroying the eagle that had fluttered their dovecots from the Rhine to the Neva. They determined to maintain the treaty of Paris at every cost; and Wellington deserves no great credit for predicting that Napoleon must fall under the cordial united efforts of the sovereigns of Europe. Under the impulse of the common terror, these sovereigns turned their eyes on one man as their only champion. The Duke of Wellington was entreated to take the command of the armies of England, the Netherlands, and Prussians in the Low Countries, which would be supported as speedily as possible by the legions of Austria and Russia. He arrived in Brussels on 5th April, and was for some time in doubt whether he should begin an offensive movement upon France, or await the development of the designs of his mighty antagonist. On both sides the preparations for the struggle were vigorous, though it must be admitted that labour, time, and money, were all thrown away on the defensive works undertaken by Wellington's orders, to delay the march of the French, inasmuch as Bonaparte selected a line of attack by which his opponent did not expect him. Never had Napoleon given such proof of indomitable resolution and self-reliance, as when he set out cheerfully and confidently to try his fortune against the world in arms. Schwartzenberg was to throw 200,000 Austrians across the Rhine, and move towards the old battle-ground between Chalons-sur-Marne and Paris. The Russians were to make for the same points, with every disposable man. The Prussians under Kleist were to operate against the line of the Meuse; the Austrians and Italians from Italy were to move northwards from Lyons, and then join the main body under Schwartzenberg. Blucher's Prussians and Wellington's army, consisting of English, Dutch, Belgians, Brunswickers, and Hanoverians, were intended to move down on the enemy from Liege and Courtrai towards Laon; whilst the Bavarians, the Wurtemburghers, and the Bade troops operated from the Black-forest, as circumstances might direct. Napoleon anticipated the invasion of France by marching at once upon the Anglo-Prussian army in Belgium by the line of the Sambre. Although Wellington thought such an offensive movement rather improbable, he had by no means excluded it from the category of possibilities; but it must be acknowledged he did not act as if he thought Napoleon would move in the direction he actually took. It was three o'clock on the 15th June when general Van Müffling informed the Duke, as he was seated at table with the Prince of Orange, that the French had attacked the Prussian outposts, and the whole army was immediately afterwards ordered to march to its left. The regret which Colonel Hamley expresses, that the Duke never stated his reasons for thinking that the allied right was the proper point for Napoleon to have attacked, must be shared by all who study the history of that brief and most momentous campaign.

Wellington

The two great generals meet at Waterloo.

As a strategical fight, Waterloo does not rank very highly. The Duke had no great opinion of it; and Napoleon's sole object seems to have been to overwhelm the British and the allies by brute force before the Prussians could come up. The Duke did not care for military criticism upon his manœuvres or his position; and as he declared subsequently, "historians and commentators were not necessary." Indeed they were not, if the results of the struggle are alone to be considered. And what were they? Let us hear them from the lips of the chief actor:—"The battle, possibly the most important single military event of modern times, was attended by advantages sufficient for many such armies as the two great allied armies engaged. The enemy never rallied; Bonaparte lost his empire for ever; and the peace of Europe and of the world was settled on the basis on which it rests at this moment." The immediate results, indeed, were those which Wellington claimed for this—"the first and last of fields!—king-making victory!" But recent events have greatly deranged its political sequences. The 18th June 1815 must, however, rank among the most important dates in the world; it is the mark which stands highest above the flood of time which rolls over the events of the last century, and the first half of that in which we live.

For the second time in two years France submitted to the forces of coalesced Europe, and to the effects of self-exhaustion. The conquerors were vindictive. Paris had capitulated; its garrison had been sent to the south of the

Wellington

Loire; Napoleon had no longer even an Elba. But the sovereigns were implacable, the diplomatists were bitter, and the policy of dismembering the tremendous body which had dealt such fearful blows at every vested interest, at every sacred notion, at every divine right; which had, with a stroke of its hand, annihilated military reputations, systems, thrones, principalities, and powers, was openly favoured by those whose political vision was blinded by the glare of success. Wellington opposed their views, though it can scarcely be urged as a proof of either his sagacity or his high moral sense, that he took Fouché into his favour, and forced him on the reluctant ministry of Louis XVIII. as a state necessity, for which there was no real necessity whatever. Of all the allied generals, indeed, Frenchmen had and have less reason to complain of Wellington than of others, for not only did he respect the principles of national life, but he tempered the severities and miseries of a hostile occupation by the most rigid discipline, though he was not able to induce the Austrians, Russians, or Prussians, to imitate the example set to them by the English soldiery. A stanch no Popery and Protestant ascendency man in Ireland, the Duke was in France, at that period, the actual enemy of the Protestants, whom he regarded as the friends of Bonaparte and the enemies of royalism; thus exhibiting another phase in the practical side of his character, which indeed abounded in appearances which were rather to be viewed by the rays of expediency than by the lights of fixed principle. In reference to the two grave charges which have been preferred by many foreign writers, and some English enemies, against the Duke, the execution of Marshal Ney, and the so-called spoliation of the museums of the Louvre, there is little necessity to reopen the pleadings. Whilst the fate of Ney must be regretted, his offence must be admitted. Whether the Duke could have saved him or not, we may be permitted to utter a sentiment of something like a desire that he had used his influence in favour of a man who, with all his great faults, had been worthy of such intercession.

Wellington subject to two grave charges.

Although the Duke of Wellington now seemed to have reached the culminating point in his career, the anxiety and annoyance to which he was exposed whilst he commanded in Paris and at Cambrai were almost insupportable. The affair of Lavallette, the conspiracies in Belgium, Cautillon's attempt at assassination, the endeavour to set his house on fire, repeated attacks from the press, and considerable difficulties in preserving the relations between the army of occupation and the people,—were proofs of ill-will and sources of trouble, which must have rendered his visits to England very agreeable relaxations, and have caused him to hail with satisfaction the evacuation by the allied armies of the soil of France.

When, in September 1818, the Emperors of Austria and Russia, and the King of Prussia, met at Aix-la-Chapelle, the Duke of Wellington was appointed to proceed, in conjunction with Lord Castlereagh, to represent the wishes of England in reference to the French question. It cannot be said that Great Britain exhibited any hostility to the French nation on that occasion, still less that the great captain was actuated by any unfriendly feelings towards the country whose soldiers he had so often met in battle. It had been originally arranged that the armed occupation of Paris was to last for five years, and the Duke of Wellington, as far as his own individual interests were concerned, must have been inclined to urge that the agreement should be carried out, inasmuch as his position, whilst he was commander of the foreign troops in France, was little less than regal, whilst his pecuniary emoluments were enormous; but he acted with perfect independence of any personal considerations, and he threw his weight into the argument in favour of the immediate evacuation of France. For nearly four years the duke enjoyed such repose as his active mind and nature could bear; but in 1822 he was deputed to appear at Verona, where a European Congress was sitting to consider the affairs of Spain. The liberal party, incensed by the bigoted refusal of Ferdinand VII. to grant constitutional privileges to his subjects, and by his disregard of vows and promises, were rapidly organizing a formidable agitation, which the monarchy could not withstand without extraneous aid. It was from republican France that those ideas of liberty and equality and personal rights had been imported, and it appeared therefore a proper task for monarchical France to use her arms to suppress the liberal struggle in Spain. In vain the duke opposed the violent reactionary policy on which the Congress determined to act, and sought to convince the absolutists of the fatal tendency of their projects, and of the madness of reviving French influence, no matter on what side, in the Peninsula. He was doomed not only to find his arguments disregarded at the Congress, but to find his conduct assailed in parliament in violent debates, wherein the Opposition maintained that the duke had either disregarded Mr Canning's instructions when he consented to the intervention of France, or that Mr Canning had committed a gross breach of duty, and had disgraced England by his acquiescence in the plan of pacifying Spain by French bayonets.

Wellington

The school in which the Duke had been trained was not one in which the masters were mere *doctrinnaire* professors, or in which the text-books were abstract theses on the rights of man or on the theories of government in its relations to the governed. Although he had been associated with what was called the liberal party in Spain and in Portugal, he had no real sympathy with any movement which disturbed the divine calm of the *status quo*. To revolutionary France, to her leaders as to the revolution, its results, its consequences, and its master, he had an intense aversion; and it was an accident in the nature of things not at all sympathetic to him which placed his battalions by the side of the Spanish bands who were fighting for a doubtful constitutionalism. His active and energetic correspondence with the members of his own party in England, and with the chief of the Holy Alliance abroad, affords abundant indications that he received with very great apprehension the spread of what might be regarded as French principles in Great Britain, whilst his early associations rendered such a development still more obnoxious to him in his native country. The Irish Roman Catholic element was, perhaps, in his mind the most dangerous and unconstitutional ingredient in the caldron of reform, which was beginning to boil over, when it seemed as if the successes of the arm with which he had crushed the last exposition of the French sentiment of 1793, had created and raised an effectual barrier to its extension. To the support, thorough and honest, which the bent of his mind induced him to give to the established order of things, he added the stronger agency of personal feeling and strong antipathies.

His conservatism.

His honours accumulated year by year. Waterloo Bridge was opened by the Prince Regent, with a salute of 202 guns. Apsley House was built for him at the cost of the nation by Wyatt. For twenty years the Duke had no statue; but up to the present time there is not one of Marlborough. The Hyde Park Achilles was the result of a subscription made by the ladies of England in 1819–21; and it was erected in 1822, the same year in which the famous shield was presented to him by the city of London. In 1818 he was made master-general of the ordnance; in 1819 he became governor of Plymouth; in 1820 colonel of the Rifle Brigade; and when he died, the Duke of Wellington was field-marshal in the armies of England, Austria, Russia, and Prussia. But with his honours his popularity by no means increased. There had

His honours increase.

Wellington

been a riotous and disaffected spirit generated among the people; conspiracies were discovered; *Habeas corpus* was suspended; open insurrections actually broke out; Peterloo was a hapless parody of civil war; and the Six Acts and Cato House conspiracy were ominous signs of the temper of the times. The French revolution had strengthened the hands of the so-called Tories so much, that the early struggles for Catholic emancipation and reform seemed Quixotic and hopeless; but the people were gaining strength, and the consciousness of their power gave an intemperance to their language and their acts which, after the struggle was over, would have shocked them. For ten years Lord Liverpool's cabinet and principles had governed without change, and there was no sign of relaxation of the old policy till Mr Canning became colonial secretary in 1822. The king was not liked; he was believed to have been treacherous to his old liberal associations and friends, and to put his trust in a policy of mere repression. The prosecution of the queen raised the outcry against the ministry to a storm, and the Duke of Wellington, who as a cabinet minister had agreed to the measure, came in for a full share of the public indignation. A cordial feeling and mutual appreciation existed between him and Sir Robert Peel, who became home secretary in 1822; but there was certainly no cordiality on the Duke's part towards George Canning, and when he was appointed premier the Duke resigned his offices of master-general of the ordnance and commander-in-chief. Nay more, he moved the amendment in the Lords to the bill sent up by Canning and Huskisson as the first instalment of the settlement of the corn-law question. In four months Mr Canning, tortured by candid friends, open enemies, lukewarm support, and vindictive opposition, had died. Goderich's short ministry was called into existence only to expire, and the Duke on its dissolution was sent for by the king, and requested to undertake the task of forming a government. He had only eight months before, in answer to some hints that he was agitating for the honour, declared his conviction to the Lords that he was quite unfit to be premier, and he now laid himself open to some ill-natured remarks in consequence of his accepting the post notwithstanding his declaration. He fell on troubled days.

His political career.

He was by no means what is called a statesman in advance of his time. On the contrary, he was essentially a politician who looked at the immediate effect of measures, and at the questions of the day as they appeared to him at the moment. Though it could not be said that the Whig principles of his ancestors had left no trace of their existence, seeing that his hostility to the Catholic claims was shared by many of the most forward of that party, the Duke was eminently a conservative statesman, to whom movement was in itself an evil; and his feelings were those of the great bulk of Englishmen, in spite of the activity of the reform party, and their aid to the agitators for Catholic Emancipation in Ireland. But notwithstanding the firmness of his character, and the obstinacy of his political opinions, the Duke was so completely aware of the necessities of his position as a British minister, that he did not hesitate to meet fate, and avert its blow, by running in the highway alongside it. He felt the force of necessity without any attempt either to dissimulate his fears or his convictions, or to sacrifice the machinery of the government of the day in opposing an idle resistance.

When Lord John Russell carried the repeal of the Test and Corporation Acts in the House of Commons by a majority of forty-four, the Duke, to the astonishment of some of his friends, the indignation of others, and the joy of his enemies, accepted the situation, and calmly made himself master of it by carrying these very bills through the Upper House, in spite of the opposition of some of his own colleagues, with whom, on the representation of Mr Canning, the Duke could not entertain any cordial or sympathetic relations.

Wellington

For two years the Duke maintained his position. To detail the events of his administration would be to write an abstract of the history of England for one of the most important epochs in its history. At home and abroad great questions presented themselves. Surrounded by difficulties, and aggravated by the fierce personal spirit which pervaded politics, the influence of which led the Duke once more into the field, and induced him to fight a duel with Lord Winchilsea. Times not less stormy followed. The Duke was an opponent of reform, when the heart of the active majority of the nation was set upon it. He proposed to recognise Don Miguel, whilst he resisted the Catholic claims, and the admission of the Jews into parliament and of dissenters into the universities; and his support gave firmness and resolution to the party with which he acted. Although he found himself unable to form a ministry, when requested to do so in 1832, on the defeat of the government by Lord Lyndhurst, he felt less hesitation in monopolizing for the time nearly all the offices of state, in November 1834, on the resignation of Lord Melbourne, till Sir Robert Peel could return from Italy to constitute a short-lived administration. It is needless to criticize the acts of his political life. On such questions as Catholic emancipation, the reform bill, the corn-laws, if the Duke was the oracle of expediency, he, like oracles of old, suffered violence, and spoke on compulsion the "logic of facts." The iron mouth could be coerced by one "open sesame;" and when the Duke "felt it to be his duty" to do a thing, all arguments and considerations were as an idle breath. By the advice of the Duke, whom the Queen consulted in any emergency, Sir Robert Peel, formerly routed by the ladies of the bedchamber, was called in, with greater success, to occupy the position of prime-minister in 1841. Her Majesty requested the Duke to take the command of the army, of which Lord Hill's ill health rendered him incapable, and in that office he continued till his death. His active political life ceased. His speeches were always listened to with respect; his presence gave dignity to the highest assembly in the world; his nation learned to be proud of him with a pride in which there was reverence; he was the friend and councillor of his sovereign. In his later days he had some alarming illnesses; but after a time he was seen as usual riding down from the Horse Guards to the House, and his speeches appeared in the papers at longer intervals, when some great public question connected with his own grave problem was under discussion. In August 1852 he went down to Walmer Castle, where he expected some guests, and on the 13th September he was engaged in preparing for their reception with unusual activity and energy. Next day he complained of difficulty of breathing, which did not yield to the medical means employed. His illness increased; he became speechless and insensible; and ere the evening he had passed peacefully away.

Retires from political life.

Death.

And so, looking out, as it were, from one of the ancient watch-towers of the English coast, died Arthur Wellesley, who had been so long "the living oracle of a just and patriotic expediency," as he had been the breathing statue of English victory. He was gone at last; and the historic period, so often vaguely indicated in the phrase, "while the duke lives," had received its definite boundaries. He had fought the great fight, after which it might be said indeed, "The land had rest for forty years;" and had lived so long before the people—though not of them—that even whilst they recognised the perishability of flesh and blood, they scarcely thought of the Iron Duke as of a mortal. He had become, as it were, statuesque, monumental, mediæval. He lived to be a being of an age gone by. He was a mammoth of the old battle world; one who had fought

Conclusion.

Wellington || Wells.

with the Titans; who had stood face to face with the terror-bearing legions of the last of the ancient scourges of God, whose race and name were never more to be permitted on the earth. He had ceased to become a man; his apotheosis was indeed not either declared or accepted. But he, undoubtedly, was no longer an individual. He was an incarnate embodiment of tradition, of authority, of revered experience. To the throne he was not merely the bearer of the sword of state, but its *decus et tutamen;* he was not merely the most honoured servant of the sovereign, but the most valued friend and the most loved councillor. His failures as a politician had only proved to the people at last, that the fixed principles which decide the fate of the nations and of the world are too great to be applied to the contests of party. The Lords listened as though Chatham spoke once more, whenever the white-haired old man blurted out his few pregnant sentences, and the Commons heard the echoes ere the words had died away. The people, in their wildest excitement, and their most violent political agitations, would stand, as it were, palsied and aghast at the presence of some new danger to home and country, when the homely difficulty of their cause was put before them in some such plain sentence as, "How is the king's government to be carried on?"—Or the nation, for a moment, would be startled by some such wonderful exposition of its real condition as the letter of the Duke to Sir John Burgoyne. With the news of his death came the conviction, that Israel had lost the greatest of her chiefs,—that one great bulwark had been removed from the towers of our strength, for which no substitute could be found. The toast and tea of the good apothecary failed to cure the malady under which the Duke sank, in silence and in darkness, so quietly that those around him doubted if his spirit had indeed parted. His death was, in a few hours, made known to the whole nation, and the tokens of national mourning were spontaneously universal and sincere. First among those who gazed upon the lineaments of that honoured face was the queen herself; and, at the lying in state at Chelsea Hospital, the people, as far as it could be, ratified the homage of their sovereign to the great subject. Ministers, and statesmen in the senate, orators at the bar, ecclesiastics in the pulpit, eloquent writers in the press, historians and essayists,—all strove to excel each other in the fitness of their eulogy, and in the warmth of their praise. But the country mourned in truth and in heart. And it needed not speeches in Lords or Commons,—nor the decree of a public funeral,—nor the stately sepulchre in St Paul's, to attest their sorrow, although it was indeed but right that such ratification of the grief of our empire, and of the gratitude of the sovereign and of the people for services beyond price, should be freely given. Although his victories belonged to a past generation, the present had enjoyed the fruits of them; and he had lived to receive their homage whilst living, and to be mourned by them when dead. History has, no doubt, greater names on its rolls than that of Arthur Wellesley, but England cannot show one more illustrious for services, or more brilliant in success; and in those later times there have been few who to simplicity, truthfulness, sincerity, and honesty of purpose, added such masculine grandeur of character, and such rigid devotion to duty as a subject and a statesman and a soldier, as the Great Duke.

Wells.

The Duke's remains, after "lying in state" at Chelsea, were conveyed to St Paul's on the 18th November, and interred in the vaults with the solemn dignity and pomp of a state funeral decreed by Parliament. (W. H. R.)

WELLINGTON, a market-town of England, Shropshire, near the foot of the Wrekin, 11 miles E. by S. of Shrewsbury, and 142 N.W. by W. of London. It consists of narrow streets; but most of the houses are neat and well built. There are two good modern churches and places of worship for Wesleyan and Primitive Methodists, Independents, Baptists, and Roman Catholics; National and free schools; a market-house; dispensary; alms-houses; and a prison. Most of the inhabitants are employed in coal and iron mines, quarries, smelting furnaces, iron and glass works. Wellington has also malt-houses, corn-mills, and a considerable trade in timber. In the vicinity are mineral springs, much resorted to by visitors. Population (1851) 4601.

WELLINGTON, a market-town of England, Somersetshire, near the right bank of the Tone, 7 miles W.S.W. of Taunton. It consists of two principal streets, crossing at right angles; and has recently been much improved by paving, and the removal of old houses. The parish church is a fine Gothic building, containing among other monuments the magnificent tomb of Sir John Popham, who was chief justice under Queen Elizabeth. Wellington has also a chapel of ease, and places of worship for Baptists, Independents, Methodists, and Quakers; National schools, and alms houses. The manufacture of woollen stuffs is carried on to some extent here; and the coal-mines and limestone-quarries in the vicinity give employment to many of the inhabitants. The Duke of Wellington derived his title from this place; and on a hill to the south is an obelisk commemorating the battle of Waterloo. Population (1851) 3926.

WELLS, a parliamentary and municipal borough of England, in the county of Somerset, 120 miles W. by S. of London, and 18 S.W. of Bath. It is situated in a rich valley at the foot of the Mendip Hills, and is tolerably well built. Many of the old houses are of an antique fashion, whilst others of more modern erection are very handsome. The streets are well paved, and remarkably clean. In conjunction with Bath, it is the seat of a bishop, whose palace in the city is one of the best episcopal residences in the kingdom. The cathedral is a spacious Gothic structure in the form of a cross, 415 feet long and 155 feet wide at the transept. The most remarkable part of the building is the west front, which is most elaborately ornamented with statues and carved work in stone. One of the windows contains some beautiful paintings on glass. The chapter-house is remarkable for its structure in the form of a rotunda, having its roof supported by a single pillar in the centre. The deanery is a handsome residence, and the houses of the vicars within the close are very commodious. Besides those belonging to the church, there are several other charitable establishments. Near the city is St Andrew's Well, whose water is conveyed by pipes to an elegant conduit near the market-cross, whence the city is well supplied with water. The civil government is vested in the corporation, consisting of a mayor, four aldermen, and twelve councillors; and the city returns two members to the House of Commons. Besides the cathedral, are the parish church of St Cuthbert, with a lofty square tower, and a fine set of six bells; places of worship for Independents, Methodists, and Baptists; a grammar school, blue-coat school, National and British schools. There are good markets on Wednesday and Saturday, and four annual fairs. Horse-races are held yearly near the city. The population of the city liberty amounted in 1851 to 7050, that of the borough to 4734.

WELLS, a seaport town of England, in the county of Norfolk, on an inlet of the German Ocean, 33 miles N.W. by N. of Norwich. It consists of two principal streets; and has a large church in the later English style with a lofty tower; places of worship for Wesleyan and Primitive

Wels ‖ Wener.

Methodists, Independents, and Quakers; several schools, a custom-house, and a theatre. Ship-building, rope-making, brewing and malting, are the chief manufactures; and there are oyster-fisheries along the coast. The harbour was at one time much choked up with sand; but has been recently improved, and a quay built accessible to vessels of 150 tons. Pop. of the parish (1851), 3633.

WELS, a town of the Austrian Empire, capital of a circle in Upper Austria, on the Traun, 16 miles S.W. of Linz. It is an ancient town, walled and entered by four gates, with two suburbs; and it has two ancient castles, Roman Catholic and Lutheran churches, a large hospital, and a military and various other schools. It is the seat of government offices and courts of law; and has cotton factories, paper and powder mills, copper-works, and a considerable trade in corn, timber, and vegetables. Pop. 5670.

WELSHPOOL, or POOL, a parliamentary and municipal borough of N. Wales, in the county and 10 miles N. of Montgomery, near the left bank of the Severn, 171 miles N.W. by W. of London. It derives its name from a lake called Llyn Du, in the vicinity; and is called Welsh to distinguish it from Poole in Dorsetshire. It stands partly on the slope and partly at the foot of a declivity leading to Powis Castle a little to the S. of the town; and it is traversed by two rivulets flowing into the Severn. There is one main street running E. and W., with others diverging from it; and the houses are for the most part regularly built of brick. About the middle of the principal street stands the town and county hall, a modern building with a corn market beneath. The parish church is a large but no way remarkable edifice, in the pointed style, with a lofty square tower. Another church has recently been erected in an elevated position, and the town has also places of worship for Independents, Methodists, Baptists, and other sects. Education is provided for by National and free schools; and there are several charitable establishments. The chief manufacture here is that of flannel, for which Welshpool was once the chief seat in N. Wales; and there are also malt-houses and tanneries. Weekly markets and annual fairs are held; and traffic is facilitated by the Severn, which is navigable for barges nearly as far as Welshpool. The borough is governed by four aldermen, and twelve councillors, of whom one is mayor; and along with Montgomery, Llanfyllin, Llanidloes, Machynlleth, and Newtown, it returns one member to the House of Commons. Pop. (1851) of the parliamentary borough, 4434; of the municipal borough, 6564.

WEM, a market-town of England, Shropshire, near the Roden an affluent of the Severn, 11 miles N. by E. of Shrewsbury. It consists chiefly of one broad street; and has a handsome parish church, Independent, Methodist, Baptist, and Irvingite places of worship, a free school, National, British, and infant schools. There are here corn-mills, tanneries, malt-houses, and ropeworks. Wem gave the title of Baron to the infamous Judge Jeffries. Pop. (1851) of the parish, 3747.

WENDOVER, a market-town of England, in the county, and 23 miles S.E. by S. of Buckingham, at the foot of the Chiltern Hills. It is ill built; and has a parish church, Independent and Baptist chapels, National, British, and infant schools. Lace making was once the principal employment of the inhabitants; but it has declined considerably. There are ropeworks, flour-mills, and malt-houses in the town. Wendover was, till 1831, a parliamentary borough, and had the honour of being represented by Hampden and Burke. Pop. of the parish (1851) 1937.

WENER, the largest lake in Sweden, and, next to those of Ladoga and Onega in Russia, the largest in Europe, lies between N. Lat. 58. 22. and 59. 25., E. Long. 12. 28. and 14. 12., encircled by the laens of Wenersborg and Mariestadt on the S. and Carlstadt on the N. Its form is very irregular, being broad towards the N.E. and coming to a narrow point at the town of Wenersborg in the S.W.; and about the middle two promontories extend from the N. and S. shores and approach within 15 miles of each other. Length from N.E. to S.W. 94 miles; greatest breadth, 50 miles, average 30; area estimated at 2020 square miles; average height above the sea, 147 feet. It receives a great number of rivers, the largest of which is the Flar from the N.; and it discharges its waters by the Goeta into the Cattegat. It is connected by the Gotha Canal with Lake Wetter.

Wenlock ‖ Went-worth.

WENLOCK, a market-town, parliamentary and municipal borough of England, Shropshire, at the E. end of the Wenlock Edge Hills, 12 miles S.E. of Shrewsbury. The parliamentary and municipal borough comprises a much greater area than that of the town (which is called Much Wenlock to distinguish it from Little Wenlock in the vicinity); the former including eighteen, and the latter, which does not even contain the town, twelve parishes. The borough is governed by six aldermen and eighteen councillors, of whom one is mayor, and is represented in parliament by two members. Much Wenlock consists of two streets; and has a parish church, two chapels of ease, national schools, and several charities. The principal object of interest here is the ancient abbey in the vicinity, which was founded in the seventh century, and of which extensive and interesting ruins still remain. Pop. of the parish of Much Wenlock, 2398; of the municipal borough, 18,728; of the parliamentary borough, 20,588.

WENTWORTH, THOMAS, Lord Strafford, was the eldest son of Sir William Wentworth, the representative of an ancient Yorkshire family. He was born in London in 1593, and in due time removed to Cambridge, where he entered St John's College. His university career was followed up by the usual tour on the continent; and on his return from his travels he was knighted. In 1614 he succeeded to the patrimonial estates, and in 1621 he entered parliament as member for the county of York. It was the eventful year in which the court and the country parties were first openly arrayed against each other. James had most injudiciously provoked the resentment of the country party by claiming, in the strongest language, rights which he had neither the resolution nor the power to vindicate; and Wentworth was among the most resolute in maintaining the memorable assertion that "the liberties, franchises, privileges, and jurisdictions of parliament are the ancient and undoubted birthright and inheritance of the subjects of England." Another champion of the popular cause had entered parliament the same year, not superior in talent, though he adhered more resolutely to the cause which he had adopted. "Hampden," Macaulay thinks, "had more judgment and sagacity than Wentworth; but no orator of that time equalled Wentworth in force and brilliancy of expression." Macaulay's estimate is perhaps too favourable to Hampden; at least there can be no comparison of the inferior position which Hampden at that time occupied with the recognised merits of Wentworth as a great leader on the popular side.

The accession of Charles seemed to the leaders of the opposition to offer a favourable opportunity for carrying out their views; and they accordingly resolved to employ the power which the constitution conferred upon them of withholding supplies till the monarch made satisfactory concessions. The appearance of the political horizon foreboded a storm. Charles was determined to maintain in their integrity all the prerogatives which his predecessors had for one hundred and forty years enjoyed or usurped; and though he was far from being inflexible in his purposes, he yet possessed a sufficient amount of resolution to render a contest with him a very different affair from an undignified

Wentworth.

squabble with his infirm and vacillating father. The country party, on the other hand, was as resolutely bent upon vindicating for themselves and their descendants all the privileges which the laws secured them; and were resolved, moreover, to curb the royal power, which was ever threatening to overwhelm the rights of the people, so as to prevent any danger from its encroachments in future. Foremost among this party was Wentworth, and so well did the court party understand the value of his services to the opposition, that to prevent his sitting in parliament they nominated him sheriff of his county. An attempt was made at the same time by Buckingham to gain him over from his principles, but without success; he adhered resolutely to the cause of liberty, and in 1626 refused to pay his contribution to the forced general loan, and was in consequence for a short time committed to prison. In the third parliament of Charles, Wentworth was again one of the most conspicuous members, one of the loudest in condemning the arbitrary exactions of Charles, and his violent infringement of the liberties of the people. It was to his eloquent and energetic advocacy that the unanimity with which the Commons agreed in voting the "Petition of Right," the great modern charter of liberty, must be in part ascribed. Everything in fact marked him out as the man whose enmity the court had most reason to dread, and whose friendship it was most desirable to conciliate.

On the assassination of Buckingham, Charles, left without a minister, resolved to weaken his opponents by gaining over some of their number, and Wentworth was among those who yielded to his solicitations. What were the inducements that overcame his patriotism cannot of course be certainly known. He seems to have possessed a great admiration of titles, such as we should hardly have expected in one of his talents, and to have been "susceptible of strong impressions from private interest and ambition." Perhaps his patriotism may have been all along merely assumed, as the most convenient means of obtaining power, At all events titles were accumulated on him. He was created in succession a baron, a viscount, and finally Earl of Strafford; he was elevated to the office of President of the North; and he manifested the sincerity of his change by using all his ability in suppressing the party which had formerly acknowledged him as leader. His presence infused into the king's counsels a vigour which had formerly been wanting. He knew the character of the party whom he now had to oppose, and he seems to have believed that, by a display of vigour and energy, they might be awed into submission. That any amount of vigour could for any length of time have suppressed the determination of the middle classes to have their influence in the state increased may well be doubted; so far, however, as anything could be done to check for the time the popular element, the measures of Strafford seem well adapted to accomplish that end. His grand object was to make the king independent of Parliament by furnishing him with a revenue sufficient for the ordinary expenditure of the country, without the necessity of receiving any subsidies from the Commons. To accomplish this, fines and other illegal exactions were levied with unsparing rigour, and all attempts at evasion or resistance were punished with the most arbitrary severity. In 1632 he was appointed deputy of Ireland. His new government was conducted with much ability. The Irish, a half civilized people, required the guidance of a strong hand, and under the firm though arbitrary rule of Strafford, the country enjoyed an interval of unwonted prosperity. Industry flourished; the linen manufacture was introduced; the shipping increased an hundred-fold; order and peace were established. Meantime, by his advice, England was exposed to all the rigour of arbitrary rule. Ship-money was levied not only from the maritime counties, which alone had hitherto been called upon to bear that impost, but from inland counties; and Hampden's resistance to the unconstitutional exaction, while it drew public attention to the violent proceedings of the government, showed by its unsuccessful termination the resolution of the king and his advisers to tolerate no evasion of their authority. Strafford and Hampden knew too well the nature of the struggle in which they were engaged; not power merely, but life depended on the issue, and on losing his case, Hampden, as is well known, prepared to leave the country.

Werdau || Werden.

So far Strafford's measures had been successful. To the complete development of his plans, however, it was essential that peace should be maintained both at home and abroad; and when in 1637 the disturbances arose in Scotland, it was evident that the crisis was come which was to test the wisdom of his procedure, and to exhibit the folly of attempting to support a government by force, in opposition to the wish of the people, and in violation of the law of the land. Hampden and his party hailed with delight the opportunity which thus presented itself of regaining their lost power; and indeed there can be little doubt that the rising in Scotland was fomented if not originated by their advice. Strafford advised the king to use the strongest measures in suppressing a rising which threatened to undo the labours of ten years, but it was too late. He hastened over from Ireland with troops and money, but his efforts were vain; the English looked on the Scots as deliverers, the king's troops would not fight, and after in vain trying to push off the evil day which had now arrived, Charles summoned the Long Parliament. Strafford well knew the danger which he had to apprehend, and wished to return to Ireland, but Charles assured him that "not a hair of his head should be touched by parliament." As he anticipated, the first step of the popular party was to impeach him of high treason. Pym carried up the impeachment to the Lords, and Strafford was immediately placed in custody. A committee was appointed to prepare a charge against him, and their proceedings were marked by an extreme rigour, which showed their sense of the necessity of proving his guilt, whatever means might have to be employed in doing so. Twenty-eight articles of impeachment were exhibited against him, but it was doubtful whether any or all of them, even if proved, amounted to high treason. Additional evidence was provided against him in a dishonourable manner by Sir Harry Vane, which, when interpreted in a particular way, seemed to amount to an advice to Charles to reduce England by force. This was construed to be an attempt to subvert the fundamental laws of the land, but the law did not clearly recognise this as treason. A bill of attainder was, however, passed by a very large majority, and Strafford was sentenced to death. Charles long refused to sign the warrant for his execution; at length influenced by a letter from Strafford himself, he consented, and the Earl fell by the hand of the executioner. The time has not yet come for arriving at an impartial estimate of Strafford's character. Writers still look with too lively a sympathy on the stirring events of Charles's reign, to allow of the formation of a dispassionate judgment on a personage who figures so prominently on that page of our national history from which more than from any other we hope to learn the lessons of political wisdom. (See Forster's *Life of Strafford*, and his *Statesmen of the Commonwealth*, 5 vols., 1840.)

WERDAU, a town of Saxony, in the circle and 5 miles W.N.W. of Zwickau, on the Pleisse. It has two churches, manufactories of woollen and cotton cloth and of nets, and some dyeworks. The trade of the town is facilitated by the Saxon and Bavarian Railway, on which it stands. Pop. 7327.

WERDEN, a town of the Prussian dominions, province of the Rhine, in the government and 16 miles N.E. of Düsseldorf, on the Ruhr. It has two churches, and a

Wergeland ‖ Werner.

former abbey, now used as a house of correction; manufactures of cloth, and some trade in coal. In the neighbourhood are copper-foundries and alum-works. Pop. 5702.

WERGELAND, HENDRIK ARNOLD, an eminent poet of Norway, was born at Christiansand, on the 17th of June, 1808. After passing through the university, he commenced his literary career by the publication of a dramatic satire, entitled *Ah*, which was so successful as to encourage the author to prosecute the farcical vein which he had just begun to work. Spiced with politics and personalities, these writings kept their author in hot water for 10 years of his life. His friends were accustomed to call him the "Byron of Norway," but he resembled much more our own "Corn-law Rhymer," Elliott, than the splendid young lord. Wergeland had entered the clerical profession in 1829, but, after officiating as a curate to his father, he, in 1834, resigned that office. The sentiments expressed in a recent poem which he had published, entitled *Creation, Man and the Messiah*, were deemed incompatible with his sacred calling. Curious to say, this hot young "radical," as he was called, accepted a pension from the king's privy purse in 1834, which brought down a shower of abuse on the head of the poet. He studied medicine, was appointed keeper of the university library; and lastly, in 1840, keeper of the Norwegian archives. By the influence of drink, this strong man of 6 feet 3 inches was compelled to lay down the load of life at the early age of 37, on the 12th of August 1845. A collected edition of the works of Wergeland was commenced in 1851, to be completed in 9 vols.

WERNER, ABRAHAM GOTTLOB, the first geologist and mineralogist of his day, was born at Weslau, in Upper Lausitz, on the 25th of September 1750. His father being superintendent of a foundry at his native place, had him placed, at an early age, at the celebrated mining school of Freiberg, in Saxony. To prepare himself for ultimately entering the mining establishment at that place, he took a licentiate's degree in law at the University of Leipzig, where he wrote a brief treatise, in 1774, on the external characters of minerals, in which he proposed a methodical terminology to describe the qualities of those substances. This, says Cuvier, was performing for mineralogy what Linnæus had done for the science of botany in his *Philosophia Botanica*. So original views, promulgated by a youth of four-and-twenty, were rather remarkable, and Werner rose immediately into notoriety. Next year he was chosen professor of mineralogy in the school of mines at Freiberg, and inspector of the mineralogical cabinet at that place. His fame as a lecturer was quite remarkable, pupils flocked to his class from all quarters. He was much greater as a practical teacher than he was as a writer. The distinguished names of such men as Alexander Humboldt, Von Buch, D'Aubuisson, Jameson, Brocchi, Napione, Freisleben, Raumer, Englehart, Karsten, Molis, Herder, Wiedemann, Emmerling, Reuss, Steffens, Breithaupt, Esmark, Wad, D'Andrada, and Elhyar, bear witness to his discrimination as a mineralogist, as well as to his friendliness as a teacher. In 1787, he published a small work on the classification of rocks, but he was too hasty in his generalizations regarding the origin of basalt. Perhaps Werner's greatest achievement in geological science is his *Theory of Formations*. He taught that the exterior crust of the earth consists of a series of concentric liths (or "formations," as he called them), laid over each other in a certain determinate order. Ideas of this magnitude, says Cuvier, are the true marks of genius. His *Formation of Veins*, which he had long taught, in which he advocated the theory that they were originally open fissures, he published in 1791. This was his last work. It has been translated both into French and English. Werner had a singular aversion to the mechanical act of writing, and henceforward he contented himself with the reputation of his lectures. He is author of a great many terms in his favourite sciences, and while he sometimes generalized too hastily, he on the whole must be regarded as one of the greatest geologists who have yet appeared. In 1792, he was chosen counsellor of the mines of Saxony. On his visit to Paris in 1802, he was received with much honour by the scientific men of that city. He was made a foreign associate of the French Academy of Sciences. Troubled with a severe disorder in the stomach, he went to Dresden in the hope of relieving it, where the malady put a period to his life on the 30th of June 1817, at the age of 66. The School of Mines at Freiberg received his collections and specimens at less than one-fourth of their original cost.

Werner ‖ Weser.

WERNER, *Friedrich Ludwig Zacharias*, a German dramatist of some note, was the son of a professor of history and rhetoric in Königsberg, where he was born on November 18, 1768. After preparing for the civil service, he obtained a situation at Warsaw, where he, in 1800, wrote his first dramatic work, *Die Söhne des Thals*. It was distinguished, as indeed the majority of his dramas are, by simplicity of plot, depth of feeling, and power of language. After writing his *Der Vierundzwanzigster Februar* and his *Das Kreuz an der Ostsee*, he removed to Berlin, where, after publishing his *Martin Luther, oder die Weihe der Kraft*, and divorcing his third wife, he wandered over Europe like a spirit who had perpetrated some great crime, halting now here, now there, but settling nowhere. At last he entered the Romish Church, and was made a priest. He attracted considerable crowds as a preacher, but the purity and simplicity of his genius had forsaken him. He disfigured his discourses by puerile witticisms and indelicate humour, which likewise affected all his after-writings. He died on the 18th of January 1823, in his 56th year. A complete edition of his collected works appeared, in 14 vols., in 1839–41.

WERNIGERODE, a town of the Prussian dominions, province of Saxony, government, and 43 miles S.W. of Magdeburg, at the N. foot of the Brocken. It has several churches, a gymnasium, and other schools, an orphan hospital; and on a hill near it an ancient castle, containing a library of 20,000 volumes and a museum. Various branches of industry are carried on here, especially distilling. Pop. 5595.

WESEL, a fortified town of the Prussian dominions, province of the Rhine, government, and 32 miles N.N.W. of Düsseldorf, at the confluence of the Lippe with the Rhine, which is here crossed by a bridge of boats. It is an antique town, and has an old town hall, a citadel, Roman Catholic, Lutheran, and Reformed churches, a gymnasium, poorhouse, and house of correction. Many manufactures are carried on here, especially those of sugar, tobacco, leather, woollen and cotton cloth, hosiery, and brandy. A considerable trade is carried on, by the Rhine, with Holland, and by the Lippe with Westphalia, both rivers being navigable. Corn, wood, coal, salt, wine, and brandy, are the chief articles of commerce. A monument has been erected to eleven Prussian officers shot here by the French for being engaged in Schill's revolt at Stralsund in 1809. Pop., including the garrison, 15,644.

WESER, a river of Germany, formed by the confluence of the Fulda and Werra, near Münden, on the borders of Hanover and Hesse Cassel. It flows in a very irregular course, generally towards the north, through small portions of Brunswick, Hesse Cassel, and Westphalia; then traverses Hanover and the territory of Bremen; and finally separates Hanover from Oldenburg. It falls into the German Ocean along with the Jahde, by a wide estuary, after a course of 250 miles; and it is navigable as far as Bremen. Its principal affluents are the Aller, with its tributary, the Leine, from the right, and the Hunte from the left.

Wesley. WESLEY, JOHN, founder of the sect of the Methodists, was the son of Samuel Wesley, rector of Epworth, in the isle of Axholme in Lincolnshire, and was born in that village in the year 1703. His very infancy was distinguished by an extraordinary incident; for when he was only six years old, the parsonage-house at Epworth was burnt to the ground, and the flames had spread with such rapidity that few things of value could be saved. His mother, in a letter to her son, Samuel Wesley, then on the foundation at Westminster school, thanks God that no lives were lost, although for some time they gave up "Poor Jacky," as she expresses herself; for his father had twice attempted to rescue the child, but was beaten back by the flames. Finding all his efforts ineffectual, he resigned him to divine providence. But parental tenderness prevailed over human fears, and Mr Wesley once more attempted to save his child. By some means equally unexpected and unaccountable, the boy got round to a window in the front of the house, and was taken out by one man's leaping on the shoulders of another, and thus getting within his reach. Immediately on his rescue from this very perilous situation, the roof fell in. This extraordinary escape explains a certain device, in a print of John Wesley, engraved by Vertue in the year 1745, from a painting by Williams. It represents a house in flames, with this motto from the prophet, "Is he not a brand plucked out of the burning?" Many have supposed this device to be merely emblematical of his spiritual deliverance; but, from this circumstance, it is apparent that it has a primary as well as a secondary meaning—it is real as well as allusive.

In the year 1713, he was entered a scholar at the Charter-house in London, where he continued seven years under the tuition of Dr Walker, and of the Rev. Andrew Tooke, author of the *Pantheon*. In his seventeenth year, he was sent to Christ Church at Oxford. In 1726, he was elected a fellow of Lincoln College, and took the degree of A.M. in 1727. He was afterwards appointed a tutor of his college. He discovered early a turn for poetry. Some of his gayer poetical effusions are proofs of a lively fancy and a fine classical taste; and some translations from the Latin poets, while at college, are allowed to have great merit. He had early a strong impression, like Count Zinzendorf, of his designation to some extraordinary work. This impression received additional force from some domestic incidents, all which his active fancy turned to his own account. His wonderful preservation, already noticed, naturally tended to cherish the idea of his being designed by Providence to accomplish some purpose or other that was out of the ordinary course of human events.

The reading of the writings of William Law, the celebrated author of *Christian Perfection*, and of a *Serious Address to the Christian World*, contributed to lead John Wesley and his brother Charles, with a few of their young fellow-students, into a more than common strictness of religious life. They received the sacrament of the Lord's Supper every week, observed all the fasts of the church, visited the prisons, rose at four in the morning, and refrained from all amusements. From the exact method in which they disposed of every hour, they acquired the appellation of *Methodists*; by which their followers have been ever since distinguished.

From Dr Potter, bishop of Oxford, he received deacon's orders in 1725, and priest's in 1728. For some time he officiated as his father's curate. But the boundaries of this island were soon deemed by Wesley too confined for a zeal which displayed the piety of an apostle, and of an intrepidity to which few missionaries had been superior. In 1735, he embarked for Georgia, one of our colonies, which was at that time in a state of political infancy; and the great object of this voyage was to preach the Gospel to the Indian nations in the vicinity of that province. He returned to England in 1737. Of his spiritual labours, both in this country and in America, he himself has given a very copious account in a series of journals printed at different periods. These publications drew upon the laborious preacher and his coadjutors some severe animadversions from two prelates, Dr Lavington, bishop of Exeter, and Dr Warburton, bishop of Gloucester. The former published, in three parts, the *Enthusiasm of the Methodists and Papists compared*; the third part of this performance containing a personal charge of immoral conduct. Wesley, in his vindication, published a letter to his lordship, which produced a reply from the latter. Bishop Warburton's attack is contained in his celebrated treatise, entitled *The Doctrine of Grace; or, the Office and Operations of the Holy Spirit vindicated from the Insults of Infidelity and the Abuses of Fanaticism*; concluding with some thoughts, humbly offered to the consideration of the Established Clergy, with regard to the right Method of defending Religion against the Attacks of either party: Lond. 1762, 2 vols. 8vo. There is much acute reasoning, and much poignant and sprightly wit, in his *Doctrine of Grace*; but there is too much levity in it for a grave bishop, and too much abuse for a candid Christian. On this occasion, Wesley published a letter to the bishop, in which, with great temper and moderation, as well as with great ingenuity and address, he endeavoured to shelter himself from his lordship's attacks, not only under the authority of the Holy Scriptures, but of the church itself as by law established.

On his return from Georgia, Wesley paid a visit to Count Zinzendorf, the celebrated founder of the sect of Moravians or Hernhutters, at Hernhut, in Upper Lusatia. In the following year, he appeared again in England, and, with his brother Charles, at the head of the Methodists. He preached his first field-sermon at Bristol, on the 2d of April 1738, from which time his disciples have continued to increase. In 1741, a serious altercation took place between him and Whitefield. In 1744, attempting to preach at Taunton, he was regularly silenced by the magistrates. Although he chiefly resided for the remainder of his life in the metropolis, he occasionally travelled through every part of Great Britain and Ireland, establishing congregations in each kingdom. In 1750, he married a lady, from whom he was afterwards separated. By this wife, who died in 1781, he had no children. He had been gradually declining for three years before his death, yet he still rose at four in the morning, and preached, and travelled, and wrote as usual. He preached at Leatherhead, in Surrey, on the Wednesday before that event. On the Friday following appeared the first symptoms of his approaching dissolution. The four succeeding days he spent in praising God. He died at a quarter before ten in the morning of the 2d of March 1791, in the 88th year of his age. His remains, after lying in a kind of state at his chapel in the City Road, dressed in the sacerdotal robes which he usually wore, and on his head the old clerical cap, a Bible in one hand and a white handkerchief in the other, were, agreeably to his own directions, and after the manner of the interment of Mr Whitefield, deposited in the cemetery behind his chapel, on the morning of the 9th March, amid an innumerable concourse of his friends and admirers, many of whom appeared in deep mourning on the occasion.

Wesley was a very various and voluminous writer. Divinity, both devotional and controversial, biography, history, philosophy, politics, and poetry, were all, at different times, the subjects of his pen. He possessed great abilities, and a fluency which was well accommodated to his hearers, and highly acceptable to them.

West. WEST, BENJAMIN, the greatest artist whom America has yet produced, was born in 1738, at Springfield in Pennsylvania. When a boy of seven, he began to exhibit his inclinations to art. According to the well known story, he was sitting by the cradle of the child of his elder sister,

West. watching its sleep, when the infant happened to smile in its dreams, and, struck with its beauty, young Benjamin got some paper, and drew its portrait. The career thus begun was prosecuted amid many difficulties. The simple Quakers of his native province knew nothing of art; neither instructors nor copies were to be had, and he had to pursue his inclinations with such materials as chance threw in his way. It was impossible, however, to repress his genius; his perseverance overcame every obstacle; even his parents were led to abandon their Quaker principles, so far as to allow him to follow the vocation for which nature had marked him out, and at the age of eighteen he settled in Philadelphia as a portrait-painter. After a short time he removed to New York, where he practised his profession with considerable success. In 1760, through the assistance of some friends, he was enabled to complete his artistic education by a visit to Italy, where he remained nearly three years. Here he acquired a distinguished reputation as an historical portrait-painter; and so highly was his merit appreciated, that he was elected a member of the principal academies of Italy. On the expiry of his Italian visit he went to London on his route to America. The metropolis, however, held out powerful inducements to a young artist conscious of genius and zealous for fame; and he resolved to settle there as an historical painter. His success was not long in doubt. George III. took him under his special patronage; and thus supported by royal favour, commissions flowed in upon him from all quarters. He devoted his attention mainly to the painting of large pictures on historical and religious subjects, conceived, as he believed, and as his contemporaries were willing to believe, in the style of the old masters, and executed with great care and much taste. So high did he stand in public favour, that on the death of Sir Joshua Reynolds he was elected his successor as president of the Royal Academy, an office which he held for twenty-eight years. The monotony of his life in London presents few incidents deserving of special record. In 1802 he took advantage of the opportunity afforded by the peace of Amiens to visit Paris, and inspect the magnificent collection of the masterpieces of art, pillaged from the gallery of almost every capital in Europe, which then adorned the walls of the Louvre; and on his visit he was treated with the courtesy and deference due to a court artist and a man of talent. On his return to London, he devoted himself anew to the labours of his profession, which were, however, somewhat broken in upon by quarrels with some of the members of the Royal Academy. At one time he went the length of resigning his office, but a unanimous request that he should return to the chair induced him to recall his resignation. Time did not at all weaken the energy with which he laboured at his easel. When sixty-five, he painted one of his largest and best works, "Christ Healing the Sick." This was originally designed to be presented to the Quakers in Philadelphia, to assist in erecting an hospital in the town where West had first earned distinction as a painter. On its completion it was exhibited in London to immense crowds, and was purchased by the British Institution for 3000 guineas, West being allowed to make a copy of it, which, according to his original intention, he sent to Philadelphia. His subsequent works were nearly all on the same grand scale with the picture which had been so successful, but for obvious reasons did not meet with a very ready sale. He died in 1820, in his eighty-second year, and was buried in St Paul's, beside the other great masters of the pencil. Since his death his reputation has seriously declined. His works, which fond criticism ranked during his life with the great productions of the old masters, are now considered as in general formal, tame, wanting the freedom of nature, and the life which genius alone can breathe into the canvass. From this condemnation a few, however, of his works must be excepted. His "Death on the Pale Horse" is allowed by all to deserve a large measure of the praise which it received on its first production; the "Death of Wolfe" possesses that dignity and nature which West so usually missed in his compositions; and his "Battle of La Hogue" is entitled to a very high place among British historical paintings. An account of West's life was published by Galt (*Life and Studies of Benjamin West*), and a biography of him occurs in Cunningham's *Lives of Eminent British Painters*.

West || Westbury.

West, *Gilbert*, was the son of Dr West, prebendary of Winchester, who published an edition of Pindar in 1697. He was born probably about 1700, and studied at Winchester, Eton, and subsequently at Christ Church, Oxford. His studious and serious turn inclined him to take orders; but Lord Cobham, his maternal uncle, diverted him from that pursuit, and gave him a cornetcy in his own regiment. This profession he soon quitted on account of an opening of another nature, which presented him with a flattering prospect of advancement in life. A number of young gentlemen were to be selected from the universities, and, at the expense of government, were to be taught foreign languages, and then sent to the secretary's office, to be initiated into business, and trained there for the public service, as envoys, ambassadors, &c. West was one of the few pitched upon; and, on his first introduction into that office, Lord Townshend, secretary of state, treated him with singular marks of regard, and the strongest inclinations to serve him were testified from all quarters. But Lord Cobham's strong opposition to the measures of the government rendered these advantages entirely fruitless; and the ministers honestly told West that he must not expect them to distinguish his merit, as any favours conferred upon him would be imputed as done to his uncle. He now left that office, and all his views of making his fortune, and, entering into the married state, retired to Wickham in Kent, where he lived in great domestic comfort and tranquil happiness. In 1752 he was appointed one of the clerks of the privy council; and Pitt, on becoming paymaster, nominated him under-treasurer of Chelsea Hospital. During his earlier years, he joined Lyttelton in his infidel principles, but towards the end of his life he wholly applied himself to the study of the Scriptures, being extremely anxious to try his utmost endeavours to reconcile the seeming inconsistencies which gave the enemies of revealed religion a handle to doubt and discredit their authenticity. The result of his inquiries was partly communicated to the public in his *Observations on the Resurrection*, Lond. 1747, 8vo. This work procured him from the University of Oxford the degree of LL.D., conferred by diploma. On the evidences of the truth of the New Testament he meditated another work, but did not live to execute his design. He lost his only son in 1755; and on the 26th of March, in the following year, a stroke of palsy terminated his own career. He left behind him the character of an amiable and pious man. His *Observations*, which, it has been said, were written to confirm the wavering faith of his great friends Pitt and Lyttelton, bear ample testimony to his reasoning powers and the sincerity of his religion, while his translations from Pindar show him to have been a respectable Greek scholar, and very considerable poet. His *Dissertation on the Olympic Games* is likewise a creditable specimen of his learning.

WESTBURY, a parliamentary borough and market-town of England, Wiltshire, on the N.W. side of Salisbury Plain, 21 miles N.W. of Salisbury, and 100 W. by S. of London. It is an insignificant and irregularly built place, covering a considerable extent of ground; and it consists of one main street, extending from north to south, from which others of smaller size diverge. The parish church is a fine old cruciform building, with a central tower and a beautiful west window. There are here also places of worship for Inde-

Westerham || West Indies.

pendents and Baptists, national and other schools, and a handsome town-hall, erected in 1815. The manufacture of woollen cloth was formerly carried on here to a large extent; and though it has somewhat fallen off, it still employs a considerable number of the inhabitants. There are also malt-houses; and an active trade is carried on in cattle, sheep, cheese, malt, &c. Westbury returns one member to Parliament. Pop. (1851) of the borough, 7588; of the township, 3631.

WESTERHAM, a market-town of England, in the county of Kent, 21 miles W. of Maidstone, and the same distance S. by E. of London. The parish church is a large and handsome building in the perpendicular style, with a spire; and it contains a monument to General Wolfe, who was a native of the town. There are here also two chapels of ease, an Independent chapel, national school, and almshouses. Limestone is quarried in the vicinity, and lime is made. Besides General Wolfe, Bishop Hoadley was born here. Pop. (1851) of the parish, 2162.

WEST INDIES, The, comprise five large and about forty smaller islands, besides numerous islets, lying in the Atlantic, and extending from the coast of Florida in North America to that of Venezuela in South America, between 10. and 28. N. Lat., and 59. and 85. W. Long. They are generally divided into three groups, named the Lucayos or Bahamas, the Greater Antilles, and the Lesser Antilles or Caribbean islands. The Bahama group comprehends fourteen principal islands, besides innumerable smaller islands and keys. They are chiefly of coral formation, low, flat, and scantily covered with soil. Most of them are uninhabited. The Greater Antilles are Cuba, Hayti or San Domingo sometimes called also Hispaniola, Porto Rico, and Jamaica. The Lesser Antilles consist of a long chain, extending in a curved line from Porto Rico to the Gulf of Paria, and called the Windward Islands; and of a smaller and more scattered group along the coast of Venezuela, called the Leeward Islands. These names, however, are more usually given to the islands of the former chain only, those to the north of Dominica being called Windward, those to the south, Leeward. Most of these islands contain isolated peaks or mountain-ranges, supposed, not improbably, to be the summits of a submarine range of mountains. Several of them are still active volcanoes.

The West Indies, with exception of the more northerly of the Bahamas, lie within the tropics, and are consequently subject to great heat, which, however, is modified by the length of the night, the sea-breezes, and, in some of them, by the elevation of the land. The interior high lands of Cuba, Hayti, Jamaica, and Porto Rico, enjoy throughout the year a mild temperature, as do also several of the smaller islands; but the lowlands, subject to the combined influence of heat and moisture, are generally considered unhealthy. It is this low region that falls under the influence of the frequent scourge of the West Indies, the yellow fever; but above the elevation of 1200 feet the climate is temperate and healthy. Ice sometimes forms in Cuba after a long continuance of north wind; but snow never falls. The year is naturally divided into two seasons, the wet and the dry.

The rich and varied productions of the West Indies give them an important place in the commercial world. To their valuable native plants, art and industry have added others not less valuable. The sugar-cane, coffee, pimento, plantain, banana, pine-apple, anana, yam, sweet potato, maize, cassara, manioc, cocoa, tobacco, cotton; various dyewoods and stuffs, as fustic, logwood, indigo, cochineal; medicinal plants, as liquorice, arrowroot, ginger, jalap, ipecacuanha, mahogany, and lignum-vitæ, are among the vegetable productions. The cattle are generally of a small size; and only a few of the islands contain sheep and goats. Few horses, asses, and mules are reared, and consequently great numbers of these animals are imported from the continent. Swine are more abundant than other domestic animals. There are few wild animals. Some wild boars are still found; otherwise the quadrupeds are represented by monkeys, rats, and other smaller vermin. The maniti is found at Trinidad and Tobago. The cayman and various other lizards and snakes are common. Fish and turtle are abundant. Parrots, flamingoes, and humming-birds are also common. Musquitoes, cockroaches, centipedes, scorpions, ants, and chigoess abound in the islands.

Westmacott.

The indigenous people of the islands have long been extinct, except a few still existing on the islands of St Vincent and Trinidad. At the time of their discovery the southern islands were inhabited by the fierce and warlike Caribs; the more northern by a gentler race, the Arrowauks. At present the population is European and African, partly pure and partly mixed. The negroes of pure race form nearly two-thirds of the whole; the whites about one-fifth, and the mixed races one-seventh. In the British and French islands slavery has been abolished, but it still prevails in the Spanish, Dutch, and Danish possessions. The following Table gives a list of the principal islands as politically grouped, with the area, population, and capital of each group. An account of the several islands will be found under their respective heads.

	Sq. Miles.	Population.	Capitals.
Dominican Republic ...	17,609	130,500	Santo Domingo.
Empire of Hayti	10,081	572,000	Cape Haytien.
Spanish Colonies—Cuba, Porto Rico	51,143	1,456,974	Havanna.
British—Bahamas, Turks and Caicos, Jamaica, Caymans, Trinidad, Grenada, Tobago, St Vincent, Barbadoes, Saint Lucia, Dominica, Montserrat, Antigua, St Kitts, Nevis, Barbuda, Anguilla, Virgin Islands.....	15,663	835,944	Spanish Town.
French — Martinique, Guadaloupe, Mariagalante, Desirade, Les Saintes, St Martin (N. part)	1,013	276,453	Port Royal.
Dutch—Curaçoa, Bonaire, Aruba, St Eustatius, Saba, St Martin (S. part)	369	28,497	Wilhelmstadt.
Danish — St Thomas, Santa Cruz, St John...	127	39,623	Christianstadt.
Swedish — St Bartholomew	25	9,000	Gustavia.
Total.....	96,030	3,354,991	

WESTMACOTT, Sir Richard, was born in London in 1775. His father, Richard Westmacott, was intended for one of the learned professions, and was educated at Brasennose College, Oxford; but circumstances led to his relinquishing this design, and he settled in London as a sculptor. His mother was a daughter of John Vardy, who held the office of Surveyor-general of Public Works.

The younger Westmacott early showed a taste for sculpture, and it was determined, after the usual education of a classical school, to give him the advantage of studying his art in Italy. With this object he proceeded to Rome, in the year 1793. He here became acquainted with Canova, who took great interest in the young student's progress, and whose kindness to him our sculptor always warmly acknowledged. While in Italy, Westmacott gained much honour, by carrying off the highest prizes in his art. At Florence he gained the Grand Duke's medal; and in 1795 he received at Rome, from the hand of one of the assembled cardinals, the gold medal given by the Pope in the grand

Westmeath

concorso of the Academy of St Luke. He was soon after elected a member of the Academy at Florence. In this year he went to Naples, and travelled much in southern Italy, visiting many parts of the Abruzzi and Calabria.

In 1797 he quitted Rome to return to England. On this journey his party was attacked by banditti, near La Storta. Westmacott narrowly escaped with life, and he lost all his baggage, with many of his drawings and sketches. He established himself in London, and soon after married the daughter of Dr Wilkinson, a physician of some repute. Westmacott soon took an honourable place as a sculptor. His first success in England was for a design for a public work, for which he was, by favour, allowed to compete with the established artists of the day. His merit was at once admitted, and he was thus introduced to the notice of the most discerning judges of art, and, consequently, to extensive public and private employment.

Only a cursory reference can here be made to some of his leading works; but even these few will show the variety and the character of the artist's genius. Among the more poetical and inventive of his productions, may especially be noticed a large relievo, at Petworth, of the "Dream of Horace" (lib. iii. od. 4); one, of "Hero and Leander," and another, of the "Progress of Civilisation;" the well known statue of "Psyche," and several *relievi*, at Woburn Abbey; "The Houseless Wanderer," at Bowood; and a playful group of a "Nymph and Cupid," in the Grosvenor collection. His statues of public characters are numerous, in bronze and marble. The colossal equestrian bronze statue of George III. at Windsor is a work of a very high quality; and in the horse the sculptor has shown his intimate knowledge of that animal. The statues of Lord Erskine, C. J. Fox, Francis, duke of Bedford, Joseph Addison, Lord Duncan, and many others, equally attest the ability and the diligence of the artist. In noticing his productions, it would be unjust to omit his admirable designs for monumental sculpture, both public and private. These compositions evince a fertile and graceful fancy, and often show very deep feeling. Among the most remarkable are those in memory of Warren Hastings, at Calcutta; the fine statue of the Duc de Montpensier, in Westminster Abbey, of Sir R. Abercromby, of Sp. Perceval, of W. Pitt, of the Duchess of Newcastle, of Lord Penrhyn, of the Countess of Rocksavage, &c. No sculptor, without even excepting Fiamingo, has shown greater ability and feeling than Westmacott in the treatment of infantine beauty. His illustrations, by means of groups of *putti* or children, are unequalled for grace and character.

Besides his accomplishment in his own art, Sir Richard Westmacott was a great authority on subjects of antiquity, and especially ancient Greek sculpture. His knowledge of architecture was also considerable; and his drawings, whether original designs or from nature and landscape, exhibit a refined taste, and great freedom of style.

Sir R. Westmacott was elected Associate of the Royal Academy in 1805, and Academician in 1816; and in 1827 he succeeded Flaxman as Professor of Sculpture. In 1835 the University of Oxford conferred upon him the degree of D.C.L. He received the honour of knighthood in 1837. He was also a Fellow of the Society of Antiquaries. Sir Richard Westmacott died, after a short illness, at his house, 14 South Audley Street, on the 1st of Sept. 1856, in his eighty-second year. (R. W—T.)

WESTMEATH, an inland county in the province of Leinster, in Ireland, bounded on the N. by Longford and Meath, on the E. by Meath and Kildare, on the S. by the King's county, and on the W. by Roscommon. It lies between 53. 20. and 53. 47. N. Lat., and 7. and 7. 55. W. Long., extending 40 miles in its greatest length from N. to S., and 45 in its greatest breadth from W. to E., and comprehending an area of 708 square miles, or 453,468 acres; of which 365,218 are arable; 56,392 uncultivated; 8803 in plantations; 628 in towns; and 22,427 are under water. Of the 56,000 acres of land which have never been tilled, about 18,000 acres, consisting chiefly of bog, with some rough pasture, might be advantageously improved for cultivation; 37,000 acres may be drained, and 1000 acres only are incapable of improvement.

Westmeath

The county originally formed part of the central kingdom of Meath, when it was distinguished by the name of Eircamhoin, or the western division. Nor was it till the reign of Henry VIII. that it was formed into a separate county, including within it the district of Longford, which continued to form part of it till the reign of Elizabeth. Before the English invasion the M'Geoghegans, chieftains of Moycashel, the Malones, and the Magardleys, were the principal families. When the palatinate of Meath was granted to Hugh de Lacy by Henry II., the former proprietors were supplanted by English settlers, the principal of whom were the families of Petit, Tuite, Hussey, Dalton, Delamaine, Nugent, Geneville, Nangle, Ledwich, and Constantine. The confiscations consequent on the wars of 1641 and 1688, in both of which the landed gentry took an active part, made very great alterations in the state of property. The landing of a French force in the west of Ireland in 1798 occasioned a partial insurrection in this county, in the course of which the armed peasantry seized and fortified Wilson's Hospital, but were quickly dispossessed of it by a detachment of the royal forces.

This district forms the most elevated portion of the great central limestone plain of Ireland, which is here 274 feet above the sea-level; but no part of it is mountainous. The highest elevations are Knocklayde in the north, 795 feet high, and the Hill of Ben, 710. All the hills are suited, even to their summit, for pasturage, and some for tillage; many are richly clothed with timber. Lakes are numerous; the largest lie in a direction nearly north and south along the middle of the county. Lough Sheelin, a beautiful lake about 5 miles in length, and on an average 2 miles in breadth, is the most northern; it is a border-lake on the side of Cavan, and near it is the smaller border-lake of Lough Kinale or Kinully. Lough Derevaragh is a winding expanse of water, 11 miles long and 3 broad, flat and uninteresting at its lower part, but bordered in some places by steep hills richly clothed with trees, and having at the head of the lake the Hill of Knockeyon, 707 feet above the level of the sea, the most striking and elevated conical hill in this part of the country. Lough Derevaragh covers about 2555 acres. Farther south is Lough Owell, a clear sheet of water forming the principal supply of the Royal Canal; and Lough Tron or Hiern, of smaller dimensions. The most southern, and also the largest lake of the southern chain, is the very beautiful Lough Ennell, or Belvedere Lake, as it is often called. A number of smaller lakes are scattered throughout the county. Loughs Lene, Bawn, Glyde, and Fore, are in the northern part; the small but romantic lake of Loughsewdy in the western. Lough Drin is remarkable only for its great depth; it covers but an acre of land. Lough Ree or Reagh, which is in reality a portion of the Shannon, forms part of the western boundary of the county, separating it from that of Roscommon. It is 20 miles in length, and contains several islands, two of which were the sites of religious foundations.

Though no large rivers traverse this portion of the island, it may be considered to be the source of several. The Inny, which rises in Lough Ramor in Cavan, and enters Westmeath through Lough Shillin, through the most part of its course forms the boundary line on the side of Longford, but in one part traverses the county, and after dividing two of its baronies, ultimately joins the Shannon. The Inny is a sluggish river; boats pass along the greater part of its course, and the whole might easily be made

Westmeath navigable from Lough Sheelin. Two small rivers, the Golden and Silver Arms, which issued from the northern and southern extremities of Lough Owell, have been closed up, so as to increase the quantity of water in the parent lake, which is the main feeder of the Royal Canal. The Brosna flows from Lough Ennell into the Shannon, which forms part of the western boundary of the county. Lough Lene also gives rise to two streams of some notoriety. The northern, after sinking into the ground near the village of Fore, and reappearing, empties itself, under the name of the Glōre, into the Inny, and the united stream passes through the Shannon into the Atlantic. The southern forms the Deel, which joins the Boyne, and falls into the Irish Sea. Hence this little lake, with its two perennial branches, may be said to divide Ireland into two islands.

The county forms part of the great limestone field that traverses the island across its centre. This substratum is interrupted in two places only, the one at Moat-a-Grenogue, and the other near Ballymahon, at each of which places the sandstone rises from under the limestone bed, and forms insulated protuberances of some elevation. In some places the limestone is wrought up for architectural and domestic purposes, but in others its quality is such as to render it nearly unfit for the farmer's use, in consequence of the quantity of fuel required for its calcination. Traces of lead and copper have been discovered, but not in quantities sufficient to hold out a fair prospect of pecuniary remuneration by exploring them farther. Coal is also said to have been raised in small quantities. A chalybeate spring rises at Grangemore, near Kinnegad, bursting forth with force, and forming a copious stream; but in consequence of the difficulty of access to it, few take advantage of its medicinal virtues. The soil is in general a deep rich loam resting on the limestone, but in the flat lands in the west it is light. The centre is intersected with numerous eschars formed of calcareous gravel. There is much bog: that of Allen covers a large portion of the western baronies. Many parts are well timbered, and traces of the old forests show themselves by the spontaneous growth of indigenous trees of various kinds in places where the young shoots are protected from the depredations of cattle.

The population of the county has been stated on the best authorities, at various periods, as follows:—

Year.	Authority.	Number of Inhabitants.
1760	De Burgo	50,340
1792	Beaufort	69,000
1812	Parliamentary census	112,000
1821	Ditto	128,819
1831	Ditto	136,872
1841	Ditto	141,300
1851	Ditto	111,409

The number of persons to the square mile in 1841 was 199; and in 1851, 157; being a decrease of 42 inhabitants per square mile, or 21 per cent. The return of the Commissioners of Public Instruction in 1834, taken according to dioceses, gives a population to the county of about 138,560 souls, of whom 10,175 were of the Established Church, 251 Protestant dissenters, and 128,133 Roman Catholics. The number of children receiving instruction in the public schools, at the periods stated beneath, was as follows, according to returns made to parliament:—

Date.	Boys.	Girls.	Sex not ascertained.	Total.
1821	4952	2374	...	7326
1824–6	5740	3820	359	9919
1838–9	2126	1925	...	4051

According to the return of 1824–6, the number of Catholic children educated in the public schools was 8249, of Protestants 1533, and of dissenters 6. The number of schools of each denomination, and of pupils attending them at the date when the census of 1851 was taken, was:— Westmeath

Description.	No. of Schools.	Number of Children.		
		Males.	Females.	Total.
National	62	2,287	2,119	4,406
Church Education	13	215	234	449
Endowed	3	170	23	193
Boarding	1	...	8	8
Agricultural Boarding	1	19	...	19
Private	65	845	709	1,554
Parochial	15	226	228	454
Free	3	29	56	85
Mission	2	46	44	90
Military	1	11	3	14
Workhouse	2	606	692	1,298
Total	168	4,454	4,116	8,570

The county is divided into twelve baronies, the acreable contents and valuation of which are as follows:—

Baronies.	Area.	Annual Valuation.
	Acres.	L.
Brawny	11,456	10,301
Clonlonan	32,118	21,649
Corkaree	26,960	18,076
Delvin	39,165	29,775
Farbill	35,458	23,538
Fartullagh	39,340	22,922
Fore	52,479	32,970
Kilkenny, West	37,627	20,047
Moyashel and Magheradernan	42,845	35,751
Moycashel	47,333	30,390
Moygoish	40,277	26,907
Rathconrath	48,415	34,477
Total	453,473	306,803

These are subdivided into sixty-two parishes, of which fifty-nine are in the diocese of Meath, and three in that of Ardagh. Westmeath was represented in the Irish Parliament by ten members, two for the county, and two for each of the boroughs of Athlone, Fore, Kilbeggan, and Mullingar. By the arrangements under the union act, all the boroughs were disfranchised, except Athlone, which belongs only partially to this county, one half of it being in Roscommon; it now returns one member.

The county is in the home circuit. The assizes are held at Mullingar. General sessions of the peace are held four times in the year at Mullingar, Delvin, and Moate. The county infirmary is in Mullingar, a fever hospital at Castlepollard, and fifteen dispensaries in various places. Lunatics are sent to the district asylum at Maryborough, where forty patients from the county are received. The poor-law unions of Athlone, Delvin, and Mullingar are seated in Westmeath, but part of the county is comprised in the neighbouring unions of Granard and Tullamore. The County Infirmary and the District Lunatic Asylum for the counties of Meath, Westmeath, and Longford are in Mullingar.

All kinds of grain thrive well in this productive soil, but the cultivation of wheat and barley has of late years much diminished. Limestone gravel, which is to be had in abundance in most parts, is the usual manure. The fences are bad, except in the demesnes of the gentry. The low lands and valleys produce abundance of rich grass; from which cause, and as the management of cattle has been found more profitable and less laborious than tillage, most of the land in the county is assigned to the former department of rural economy.

Westmeath

The extent of land under each description of crop in 1849 and 1859 was:—

Crops.	1849. Acres.	1859. Acres.
Wheat	10,271	3,107
Oats	59,424	47,947
Barley, bere, rye, beans, and pease	6,478	829
Potatoes	9,053	20,457
Turnips	7,562	5,589
Other green crops	2,685	2,942
Flax	81	278
Meadow and clover	35,359	41,535
Total	130,913	122,684

Great attention is paid to the breeds of cattle, which, both great and small, are purchased chiefly at the fairs of Ballinasloe. The long-horned cows are preferred, as being large and good milkers. The breed of horses is excellent. Many are brought young from Connaught, and reared here till fit for the market. Dairies are frequent, and butter is made in large quantities.

The quantity of live stock in the county in 1859 was:—

Horses	14,771	Sheep	135,904
Cattle	83,699	Pigs	18,044

Like most other parts of the island, timber was abundant until destroyed by a lavish and improvident use of it, which made no provision for a fresh supply. The deficiency is severely felt; but here, as elsewhere, great exertions are making to remedy it by young plantations, which are now rising in many parts.

The manufactures are not, nor were they ever, of any magnitude; the making of woollen and linen cloths being almost wholly confined to the domestic demand, and the operations carried on in the farmers' houses. Fish is abundant in the lakes and rivers. Bream, trout, pike, and eels are taken in the Inny; salmon in the same river and in the Brosna. The goaske, a fish about the size of the herring, is found in Lough Dereveragh; a thin-shelled mussel in some of the bogs. The Royal Canal passes through the central part of the county from east to west; a branch of the Grand Canal proceeds from near Philipstown, in King's county, to Kilbeggan. There are branches of the National Bank in Athlone, Moate, and Mullingar, a branch of the Provincial Bank in Athlone, and one of the Hibernian Bank in Mullingar. In 1858 there remained three loan societies which circulated L.17,018 in 4625 loans. Under the direction of the late Commissioners for Railroads in Ireland, a survey was made of a line from Dublin, to enter the county near Killucan, and to proceed to Mullingar, whence it was to diverge in two branches, the one north-west through Longford to Sligo, the other westward through Athlone to Galway. Under the name of the Midland Great Western, the line from Dublin to Galway, 126½ miles, was finally completed in 1851, and branches have since been opened from Mullingar to Longford and Cavan.

A considerable number of the landed proprietors reside on their own property; hence the county contains many elegant mansions and villas, surrounded by well-planted demesnes, which add very much to the natural beauties of the landscape. In the demesne of Mount d'Alton is an obelisk 50 feet high, erected in honour of the Empress Maria Theresa, the Emperor Joseph, and King George III., by a late member of the d'Alton family, who formerly resided here. An obelisk of similar dimensions stands on the estate of Lowville, near Kilkenny-west. The character of the middle and lower classes is generally represented as superior in intelligence to that of the inhabitants of the adjoining county of Meath. The peasantry are described as being lively, intelligent, and quick-witted; hasty in their tempers, and prone to litigation; unwilling to deviate from the habits and customs of their forefathers; lax in their ideas of morality towards their superiors, but rigidly observant of the engagements voluntarily entered into with one another, and of the religious observances imposed on them by their clergy. A disinclination to improvement in their farms, and to domestic neatness, is also observable. The cottages are ill constructed and badly furnished, the roofs being made of boughs of trees with the leaves on, covered with sods of turf or peat called scraws, and thatched with straw. Many are without chimneys, the place of which is supplied by a hole in the roof. The furniture consists of a deal table, a few stools, an iron pot, and a dresser, with a few plates and dairy utensils. Yet their clothing is comfortable, usually of home-made gray or drab frieze. The favourite garment of the men is a large, loose coat, wrapped up in which they go to the fairs and markets even during the heat of summer, followed by their wives, who transact most of the business there. The women spin the wool and flax for their clothing, perform the household work, and take a large share in the labours of the field. The use of the Irish language is almost discontinued; in 1851 but one person was returned as speaking Irish only, and the entire Irish-speaking population amounted to no more than 920.

Westmeath

Many remains of antiquity still exist. The parish of Rathconrath takes its name from a rath or moat 470 feet in height and of peculiar construction; besides which, nine of smaller size have been discovered within its boundaries. A still more remarkable pile of the same kind exists at Ballymore. It had originally been a Danish fort, and its position was so well chosen for military purposes, that it was strongly fortified by the Irish in the wars of 1641 and 1688. After its capture by the English in the latter period, it was made the head-quarters of General Ginckell when preparing to besiege Athlone. A third, called the Fort of Turgesius, as being the reputed place of residence of the Danish monarch of that name during his reign in Ireland, is to be seen near Lough Lene, one of the most picturesque of the many lakes of Westmeath. The ruins of ancient castles are also visible in many places. The origin of several of them can be traced back to Hugh de Lacy, the first lord palatine of the county. His chief place of residence was at Kilbixy, where he had a large and well-fortified castle, and where also stood a town of such importance as to be governed by a mayor or sovereign, and burgesses, with their usual appendages of inferior officers. The site of the former is now merely matter of conjecture; and the privileges, and consequently the importance, of the latter were transferred to Mullingar. The castle of Ardnurcher, or Horseleap, as it is called in allusion to a popular legend, is noted in history as being the place where the same De Lacy was treacherously killed by one of his own menials. The castles of Sonnagh, Rathwire, and Killare, were built by the same nobleman. In the barony of Moycashel are the remains of several castles formerly possessed by the M'Geoghegans, the ancient proprietors of the soil. Some of the old monastic buildings have been converted into parochial places of worship, both Protestant and Roman Catholic. The ruins of a few are still in existence, but the locality of many others is now matter of conjecture. The ruins of Tristernagh Abbey, called also the Priory of Kilbixy, and founded by one of Hugh de Lacy's immediate successors, were visible till the year 1783, when they were totally destroyed. Near them are the remains of the chapel of Templecross, which, though of inferior note as a structure of monastic celebrity, is memorable from being the place where the corp-naomh, or blessed body, a relic of extraordinary sanctity, was found. The relic consists of a wooden box about the size of a small Bible, clasped with bands of brass, studded with valuable stones, and

Westmeath

marked with a crucifix. Its contents, if any, are unknown. It was used as a test of evidence. An oath on the corp-naomh was considered an act of peculiar solemnity; a pledge which, if given in support of a falsehood, was supposed to bring down on the guilty person some visitation of dreadful consequence. Such is the respect paid even to its name, that if any one asserts what he wishes to be received with implicit credit, he avers its truth "by the corp-naomh that arose at Templecross." The site of the Abbey of Multifernan can still be traced by its ruins. It lies about four miles north of Tristernagh, and is singularly remarkable as being in possession of the Franciscan friars till the commencement of the year 1641, notwithstanding the total suppression of the monasteries by Henry VIII. upwards of a century before. For some years previous to the breaking out of the civil wars at the above-mentioned period, it had been much frequented by visitors of every description, who went thither, as was said, to arrange the plans of the ensuing insurrection. The unusual assemblage of strangers is also said to have excited such apprehensions in the mind of the then Bishop of Ardagh, that he removed with all his property to England, and thus escaped the calamities with which so many who continued to reside in the country were visited. There were three religious houses at Mullingar, belonging respectively to the Dominicans, Franciscans, and Augustinians. At Kilkenny-west are the reliques of a preceptory of the Knights of St John.

The population of Westmeath is so exclusively rural, that Mullingar, with a population in 1851 of 5026, is the only town containing more than 2000 inhabitants. It is situate nearly in the centre of the county and of Ireland, at the junction of the barony of Fertullagh with that of Moyashel and Magheradernan, on the stream of the Golden Arm, about midway between Loughs Owell and Ennell. It was one of the ancient palatinate towns of the county, and suffered much by the ravages committed during the petty wars with the Irish. In the war of 1688 it was fortified by General Ginckell, and was for some time the head-quarters of the English army. Though it obtained a charter, it enjoyed none of the usual corporate rights, except that of returning two members to parliament, a privilege of which its proprietor or patron availed himself till the Union. It is the assize town, a large military station, and one of the most important stations on the Midland Great Western Railway. Four general sessions of the peace are held here. It is the site of the county court-house, prison, lunatic asylum, and infirmary, and has a large church, and a Roman Catholic chapel capable of holding 6000 persons, which is considered to be the cathedral of the diocese; the parish, with two others and a part of a third, being the mensal of the bishop, who resides in the town. The Union Workhouse and extensive infantry barrack are a short distance from the town. The vicinity of the Royal Canal, which passes close to the northern side of the town, and on which boats ply regularly to Shannon harbour and the station of the Midland Great Western Railway, has made the place the centre of an increasing inland trade. It holds a weekly market and four fairs during the year. Large quantities of butter are brought to the former, and the latter are great marts for wool, horned cattle, and pigs; the November fair is for horses. One half of the town of Athlone is in this county, and was formerly connected with the other half, lying on the Roscommon side, by a long bridge over the Shannon, so narrow that two carriages could with difficulty pass each other; but this check upon the communication between the two provinces of Leinster and Connaught has been obviated by the erection of a magnificent stone bridge, which was opened for traffic in 1844. The property of the extinct corporation is vested in town commissioners. Athlone returned two members to the Irish parliament, and since the union one to the imperial parliament. The number of electors in 1832 was 243; in 1859, 225. It is a place of great antiquity, being known as such before the settlement of the English; and after their arrival a castle was erected here by King John, to secure the main pass of the Shannon, which was deemed of such importance, that in a grant of the whole of Ireland by Henry III. to his son Edward, Athlone was specially excepted. It afterwards was the seat of government for the lord president of Connaught. In the war of 1642 it was taken by the Irish after a stubborn and protracted resistance, but subsequently retaken by the parliamentary army. In the war of 1688 it was invested by King William's forces under General Douglas, who was forced to raise the siege by means of the gallant defence of Colonel Grace; but it was soon after taken by storm by General Ginckell, in the face of the Irish army commanded by St Ruth. In 1697, the magazine was struck by lightning, and the castle and town nearly destroyed. It is still considered of such importance in a military point of view, that it has been secured by strong works on the Roscommon side, covering 15 acres and containing two magazines, an ordnance store, an armoury for 15,000 stand of arms, and barracks for 1500 men. The population of that part of Athlone which is situated in Westmeath is 3513. The only other town whose number of inhabitants exceeds 1000 is Moate, which had in 1851 a population of 1979 souls. (H. S—R.)

Westminster || Westmorland.

WESTMINSTER. See LONDON.

WESTMORLAND, or WESTMORELAND, one of the lake-counties of England, is bounded by Cumberland on the north-west and north, by Durham and Yorkshire on the east, and by Lancashire on the south and west. It has one sea-inlet, about five miles of its boundary line being washed by the waters of Morecambe Bay. Its form is very irregular; its greatest length is 40 miles, and its greatest breadth 25 miles. The superficial area is 758 square miles, or 485,432 acres, of which 180,000 are arable and pasture. It extends from 54.10. to 54.42. N. lat., and from 2.9. to 3.10. W. long.

Boundaries and extent.

This county is wholly mountainous, and its various strata are found in a very disturbed state. The appearance of the lake-district generally, as seen from the mountain summits, has been compared to that of an ocean in a storm. "On the outskirts," says Professor Sedgwick, "the mountains have a dull outline, and a continual tendency to a tabular form; but those of the interior have a much more varied figure, and sometimes present outlines which are peaked, jagged, or serrated." The whole series of slate rocks of the district may be subdivided thus:—1. Skiddaw slate (which does not extend into Westmorland); 2. Green roofing slate and porphyry; 3. Dark-coloured slate and flagstone, alternating with bands, and sometimes with thick beds, of siliceous gritstone. The second of these divisions, and therefore the oldest of the stratified rocks of Westmorland, is described by Professor Sedgwick as rising into the highest and most rugged mountains of the whole region. It contains two distinct classes of rock —aqueous and igneous; but they are piled one upon another in tabular masses of such regularity, and are so interlaced and blended, that we are compelled to regard them as the effects of two distinct causes, acting simultaneously during a long geological period. The igneous portions present almost every variety of felstone and felstone porphyry; sometimes passing into greenstone, and rarely into masses with a structure like that of basalt. All the aqueous rocks have more or less a slaty structure, and pass in their most perfect form into the finest roofing slates. The third and latest division, which alone is fossiliferous, is made up of four well defined groups—Coniston limestone, Coniston flags, Coniston grit, and Ireleth slates. Above these in several places appears the old red sand-

Geological aspect.

Westmorland. stone; then the carboniferous series, which yields in Westmorland but little coal; and lastly the magnesian limestone and conglomerate, and new red sandstone. Immediately on the last-mentioned rests the boulder clay and drift, leaving a wide gap in the geological features of this district, as compared with other parts of England. An immense mass of granite, known as Wasdale Crag, protrudes on Shap Fells, boulders from which have been carried far to the south, and even over the Pennine chain into Yorkshire, and to the shores of the German Ocean. Several clefts or "faults" traverse these mountains, the principal of which is known as the Pennine fault. On the east of this the carboniferous beds are lifted to the height of 3000 feet, and on the other side are deeply buried beneath the new red sandstone and alluvion of the Eden. Igneous dykes of porphyry abound in this region.

Mountains, lakes, and rivers. The eastern side of Westmorland is traversed by the Pennine chain. On the west enters a ridge of the Cumbrian group, commencing with Helvellyn, and crossing towards the Pennine, from which it is separated only by a narrow valley. Numerous branches extend through the county, a remarkable one being that which includes Shap Fells. The principal mountains are Helvellyn, on the border, which is claimed for Westmorland, 3055 feet in height; Fairfield, 2950; Bow Fell, 2914; Rydal Head, 2910; High Street, 2700; Hill Bell, 2500; Harrison Stickle, 2400; Pike o' Stickle, 2300.

The lakes are picturesque and beautiful. Windermere (anciently Wynandermere), on the border of Lancashire, is considered a Westmorland lake. It is the largest in England, being 12 miles long, and in some parts 1 mile broad, and is beautifully margined with woods, shrubberies, and cultivated grounds, interspersed with villas. Next in size is Ulleswater, 9 miles long, and nearly 1 mile in breadth, on the Cumberland border. The head of this lake is surrounded by majestic mountains. Hawes Water, 3 miles in length, differs from the other lakes in being situate entirely amidst uncultivated scenery. Rydal Water, Grasmere, and Brother's Water are also in this county. Windermere and Ulleswater have several small, flat islands; and during the summer months steam-boats ply on both lakes the entire length. There are numerous tarns, or small lakes, among the mountains.

The rivers are not important or navigable. In the Pennine chain rises the Eden, which, passing north, enters Cumberland after a course of 30 miles. The Eamont flows from Ulleswater, and, separating Cumberland and Westmorland, joins the Eden. The Lowther, a tributary of the Eamont, rises in the neighbourhood of Hawes Water, and has a most picturesque course through Lowther Park and woods. The Kent takes its rise at the foot of High Street, and passing through Kendal, after a course of 23 miles, flows into Morecambe Bay. The Lune rises in Ravenstonedale, passes through Kirkby Lonsdale, and enters Lancashire after a course of 27 miles. The Belo and the Winster or Pool may also be mentioned. The mountains abound with rivulets. Several waterfalls, called "forces" in the district, form objects of attraction to the tourist; the principal are Colwith Force, which has a fall of 150 feet; Stockgill Force, 152; Dungeon Gill, 90; and Rydal Fall, 70.

Canal and railroads. There is one canal, which commences near Kendal, at a height of 144 feet above the level of the sea, and passes southward as far as Preston. It has a course of 12 miles in Westmorland, with a few locks, and a short tunnel. The Lancaster and Carlisle Railway, which passes through this county, was opened in December 1846, having been completed for L.22,000 per mile. It passes through Shap Fells with a deep, open cutting, a mile in length, and attains an elevation of 1000 feet above the level of the sea, and 888 feet above its own level near Morecambe Bay. Docker Gill and Lowther viaducts are fine stone structures on this line, the latter being nearly 100 feet in height. Its construction was a matter of vast importance to the district, and on the whole it has continued to be one of the best managed lines in the kingdom. The Kendal and Windermere forms a junction with the above at Oxenholme, and proceeds from thence through Kendal to Birthwaite, about a mile from the lake. The South Durham and Lancashire, a new line, joins the Stockton and Darlington at one end, and, passing through Kirkby Stephen, forms a junction with the Lancaster and Carlisle at Tebay in Westmorland. Near Kirkby Stephen the Eden Valley, also a new line, unites with the Durham and Lancashire, and, passing through Appleby, joins the Lancaster and Carlisle at Clifton in Westmorland. The two last-mentioned lines, when opened for traffic, will almost complete the system of railway communication in this county. The turnpike roads also are excellent, considering the surface of country they traverse. Westmorland.

Much more than an average quantity of rain falls in this county. In the winter snow accumulates on the fells to a great depth, and inundations of the low grounds are only too frequent. Notwithstanding this superabundance of wet, the district is healthy, and the inhabitants are long-lived. There are, however, some localities in which fevers often prevail, rheumatism and dropsy being also very general ailments. Numerous cases of goître occur, in great part, if not altogether, among females. Climate.

Considerably more than one-half the area of Westmorland is mountain and waste. Yet the valleys are fertile, and much has been done of late years in the draining and reclaiming of marshes, and the enclosing of commons. Upwards of a thousand acres have thus been brought into cultivation in the dreary district of Shap within a short time. Dry stone fences, straggling up the mountain side, are a remarkable feature in this region. Guano and artificial manures are now much used. Sheep-feeding is extensively carried on, and turnips are in consequence much grown. The principal breeds of sheep are the black-faced and white-faced, with a mixed breed between these two—Herdwicks, Cheviots, Leicesters, and some Southdowns have also been introduced. Silverdale, near Milnthorpe, gave its name to a breed of sheep once much spoken of in this county. The fattening of cattle is better understood than formerly, and shorthorns have almost entirely replaced the older breeds. Barley and oats are much grown, and enter largely into the food of the people, a peculiar kind of oaten bread, named "clap-cake," being made here, and highly relished. The class of small proprietors, called statesmen, was once numerous in this county. On this subject, Miss Martineau observes:—"The decline of the domestic fortunes is regular and inevitable when it has once set in. The land is mortgaged; the 'statesmen' ('estatesmen' originally) haunt the fairs and markets, losing more and more, and too commonly resorting to the old solace on such occasions, and coming home drunk. The amount of intemperance among that class, both in the villages and the dales, is something incredible to strangers, and by far the most painful feature of the transition stage. As the mortgages grow more oppressive, the heirs sell the land; estates which have belonged to the same names for centuries have changed hands, and the old names are found everywhere among the shop-boys, domestic servants, and labourers of the towns and villages. The old yeomanry of the district have nearly passed away, and strangers have come into their place." At Brough Hill is held the principal fair of the county, on the last day of September and 1st of October, and great numbers of horses, sheep, and cattle are brought there for sale. Agriculture.

The rivers and lakes still abound with trout and char.

Westmorland.

During the last century, it is said, it was usual to provide in indentures that apprentices should not be fed on salmon oftener than twice a week. This is now changed, and owing to the destruction of smolts, the discharging of poisonous matter into the rivers, &c., salmon has almost disappeared from the county. Westmorland is justly famed for its butter, of which large quantities are sent to London and other parts of England. The fattening of hogs and curing of bacon are carried on here successfully, and the hams are much in request. The quarries are an inexhaustible source of wealth, producing some of the best slates in England. The lead mines at Greenside employ upwards of 300 men. Lime is abundant, but coal is little worked. There are many mills for the manufacture of bobbins, and the coppice woods are consequently more prized than formerly, being largely drawn on for this purpose. Paper-making is carried on near Milnthorpe, and there are some powder-mills in the south of the county. The seat of the principal manufactures is at Kendal.

Products and manufactures.

Divisions and population.

Westmorland is included in the northern Circuit, and belongs to the diocese of Carlisle, and province of York. It is divided into the barony of Kendal, in the south, and the barony of Westmorland, in the north, called also the "bottom of Westmorland." There is some diversity in the customs of inheritance in the baronies. The latter of these divisions is subdivided into East Ward and West Ward, and the former into the Kendal and Lonsdale Wards. The principal town of the county is Kendal. (See KENDAL.) The assizes are held at Appleby, the county town, on the river Eden, 270 miles from London; population in 1851, 1294. The other market towns are Kirkby Lonsdale, population 1675; and Kirkby Stephen, population 1339. Besides these, there are the nominal market towns—Ambleside, Brough, Burton-in-Kendal, Milnthorpe, Orton, Ravenstonedale, and Shap; but at all these places the markets are now unimportant, or wholly discontinued.

The county returns two members to parliament. The population in 1851 was 58,287 (females in excess of males 129), showing an increase of 43 per cent. in the last fifty years; inhabited houses, 10,849; uninhabited, 875; and 39 in process of erection.

History.

Westmorland, in its Latinized form, Westmeria, the *west* moor county, was probably so called to distinguish it from the moorlands on the other side of the Pennine. Its earliest inhabitants, as far as any traces remain, were principally, though not exclusively, Celts of the Cambrian division. Early in the second century this part of England was overrun by the Romans, who established their power by means of numerous forts and well constructed roads. From Yorkshire a branch of the great Roman way, known to antiquaries as Watling Street, entered this county, and, passing through Brough and Kirkby Thore, turned northward in the direction of "Old Penrith" and Carlisle. Traces of a main road have also been discovered leading from Ambleside towards "Old Penrith," and passing over one of the highest hills of Westmorland, thence called High Street. Principal forts were erected at Ambleside and Brough, small forts at Milburn, Kirkby Thore, Yanwath, Brougham, Orton, and Water Crook, near Kendal. Hincaster, Muncaster, and Casterton, by their names indicate that they too were Roman stations. The Itineraries of Antoninus and the *Notitia Imperii* (410) afford little certain information, except that the names given to the forts by the natives were invariably adopted by the conquerors. From the withdrawal of the Romans to the coming in of the Angles and Danes, the history of Westmorland is a complete blank. The invasion of the former people, who appear to have penetrated along the lines of the Roman roads, probably commenced about the close of the seventh century, and soon after the Northmen, when driven from the other parts of England, took refuge in these mountains, and extensively occupied the parts capable of cultivation. Westmorland, with other northern counties, was either held or claimed during some centuries by Scotland, and thus continued for a long time a cause of contention between the two countries. At the Conquest this county was divided by William between two of his vassals, Ranulph de Meschines receiving the barony of Westmorland, together with Cumberland, and Ivo de Tailbois the barony of Kendal. Finally, in the year 1237, the King of Scotland was induced to give up his claim to the northern counties, in consideration of a grant of lands in Cumberland and Northumberland. From this time to the period of the civil war of the reign of Charles I., Westmorland enjoyed comparative tranquillity. In the year 1648, Sir Marmaduke Langdale raised a force of upwards of 4000 men, chiefly in Cumberland and Westmorland. They were joined by the Scots, who remained in the latter county until they were compelled to remove out of it for want of provisions; and during their stay, and until the final retreat of the royalists, this district was reduced to extreme distress. In 1715, the adherents of the Stuart family passed through Westmorland on their way to Preston. And again in 1745, Prince Charlie, with his Highland followers, marched through the county in his invasion of England. During the retreat of this ill-fated expedition, in December of the same year, the rear of the Highlanders was overtaken by the Duke of Cumberland's horse on Clifton Moor, when a sharp skirmish ensued. The clansmen took post behind some hedges, and, awaiting the attack of the dismounted English dragoons, repulsed them with loss. The effect of the engagement at this point was to check the advance of the English for the moment, and to hasten the retreat of the rebels. The Duke passed the night in Clifton, at the house of one Savage, a quaker, but in the morning continued the pursuit.

Westmorland.

Primitive manners linger in the remote districts of this county, and various old customs still survive. Rushbearing is annually observed at Ambleside and Warcop, "Pace-egging" at Easter is very general, and the curfew is still rung at Kirkby Stephen.

Customs.

At Kentmere Hall, in this county, was born in 1517 Bernard Gilpin the reformer, well known as the "Apostle of the North." The wild district of Stainmore gave birth to Sir Cuthbert Buckle, a vintner in London, who became lord mayor in 1593. Christopher Bainbridge, a native of Warcop, became archbishop of York in the reign of Henry VIII. Near Kendal was born Barnaby Potter, bishop of Carlisle, 1578. Milnthorpe has given to the church Richard Watson, bishop of Llandaff, and William Preston, bishop of Ferns, both in the eighteenth century. Hogarth, the greatest of dramatic English painters, belongs by descent to this county, Troutbeck being the birthplace of his father. Near Heversham was born Ephraim Chambers, the compiler and publisher of the first Encyclopædia. John Gough, celebrated as a naturalist, was born at Kendal, 1757. The last, and not the least of the "lake poets," Wordsworth, the late poet-laureate, died at Rydal Mount in 1850, having resided here for the last thirty-seven years of his life. His grave in Grasmere churchyard forms a centre of attraction to all lake tourists. Elleray, near Windermere, is pointed out as once the residence of Professor Wilson (Christopher North), and Dove Nest, near Ambleside, as for a short time the residence of Mrs Hemans.

Worthies.

Numerous Roman remains, consisting of altars with inscriptions, urns, coins, &c., besides the forts and roads, have been discovered in this county. Several objects of interest to the antiquary still remain. Near the Eamont stands King Arthur's Round Table, a moated platform of considerable extent. Not far from this, in the direction of Yanwath, is Maybrough—the "May Castle," an enclosure

Antiquities and memorable places.

Weston-super-Mare ‖ Westphalia.

formed with an embankment of pebbles taken from the beds of the rivers. Carl Lofts, near Shap, consisted of two lines of stones of unhewn granite, enclosing an area of half a mile in length and from twenty to thirty yards broad. Very little of this monument now remains. Some stone circles, popularly called Druidical temples, are still in existence, more or less perfect. Barrows, or tumuli, are also found. Near Kirkby Stephen, on the border of the county, is a monument of nine large blocks of stone set upright, called Nine Standards. In the secluded vale of the Lowther, about the year 1150, was founded Shap Abbey, for the maintenance of canons of the Præmonstratensian order. A part of the church tower is all that now remains. The most considerable ruin in the county is that of Brougham Castle, at the confluence of the Eamont and Lowther, near Penrith. Not far from this stands the Countess's Pillar, erected by the Countess of Pembroke in memorial of her parting with her mother. Brougham Chapel, at Brougham Hall, is also an attractive object. In the neighbourhood of Shap is a saline spa, of some note, called Shap Wells.

Honours.

Westmorland gives the title of earl to a descendant of the Nevilles of Raby, Lonsdale confers an earldom, and Brougham the title of baron on the Baron of Brougham and Vaux.

Principal seats.

Lowther Castle, the seat of the Earl of Lonsdale, a new Gothic building standing in a noble park of 600 acres, is one of the finest mansions in the north of England. About two miles distant stands Brougham Hall, the seat of Lord Brougham, a castellated mansion, partly old and partly restored in ancient style. The Castle of Appleby, the occasional residence of Sir Richard Tufton, Bart., is yet in excellent preservation. The greater part was rebuilt in 1686. The keep, called Cæsar's Tower, is still surrounded by a moat. In the south of the county are—Sizergh Hall, the seat of W. Strickland, Esq.; and Leven's Hall, with its gardens in the old French style, the seat of the Hon. Mrs. Howard. Dallam Tower, G. E. Wilson, Esq.; Rydal Hall, Lady le Fleming; Underley Park, Mrs Thompson; and Augill Castle, J. B. Pearson, Esq., must also be mentioned.

Camden's *Britannia;* Nicholson and Burn's *History of Westmorland and Cumberland;* Parson and White's *History of Cumberland and Westmorland;* Lyson's *Magna Britannia;* Sayer's *History of Westmorland;* Wordsworth's *Scenery of the Lakes;* Prof. Sedgwick's *Geology of the Lake District;* Ferguson's *Northmen in Cumberland and Westmorland;* Sullivan's *Cumberland and Westmorland, Ancient and Modern:* Whellan's *History of Cumberland and Westmorland.* (J. S.)

WESTON-SUPER-MARE, a town of England, Somersetshire, on the Bristol Channel, 19 miles S.W. of Bristol. It has recently risen from an insignificant village to a favourite watering-place, and has several well built streets, two of which are in the form of crescents. There are here two established churches, one of which is a neat building on the slope of a hill, an Independent chapel, national and infant schools. Many of the inhabitants are engaged in fishing. Pop. (1851) 2103.

WESTPHALIA, a province of the Prussian monarchy, lying between N. Lat., 50. 43. and 52. 30.; E. Long. 5. 55. and 9. 25.; bounded on the N. by the kingdom of Hanover, E. by the principalities of Waldeck and Lippe, the electorate of Hesse Cassel, the grand duchy of Hesse Darmstadt, and the duchy of Nassau; S.W. by the Prussian province of the Rhine; and N.W. by Holland. Its outline is very irregular, and its area is 7675 square miles. The Lippe, an affluent of the Rhine, flowing from E. to W., divides the province into two parts, which are very dissimilar in their character and productions. The northern portion is entirely flat, with the exception of some low hills in the E. It belongs to the great plain, which stretches out into the flat regions of Holland and of Northern Germany. South of the Lippe, on the other hand, the country is traversed by numerous small chains of hills, between which there are many beautiful valleys. The Sauerland mountains occupy with their various chains, the whole S. of the province, as far N. as the Ruhr. These hills vary from 1000 to 2000 feet in height, and many of the summits exceed 2000. Between the Ruhr and the Lippe, a low chain called the Haar or Haarstrang extends from E. to W.; and in the extreme N.W. there are two chains — the Teutoburger Wald and the Süntelgebirge — both extending in a curve from S.E. to N.W. The latter has a narrow pass called *Porta Westphalica*, or the Westphalian Gate, through which the Weser flows into the flat country beyond. The principal rivers have been mentioned already. The Wapper, the Ruhr, and the Lippe, flow westwards into the Rhine; the Vechta rises in the N.W. of the province, and flows N. and W. into the Zuyder Zee in Holland; the Ems enters the province from the duchy of Lippe, and flows in a N.W. direction into Hanover; and the Weser crosses the extreme N.E. of the province for a short distance. All these, except the Vechta, are navigable for some part of their course. Westphalia contains no lakes, but has many swamps and morasses—some of considerable size. The mineral riches of the country are very considerable; there is abundance of iron, as well as copper, lead, coal, and rock-salt. Mineral springs occur in several places. The climate is, on the whole, healthy and temperate. The air is purer and colder in the S. than in the N., where the marshes give rise to fogs and exhalations. The soil is far from being fertile, especially in the N. It is somewhat better in the S., and there are here extensive forests. All sorts of corn are raised, as well as potatoes, pulse, hemp, flax, hops, and tobacco. The rearing of live stock is much attended to, especially that of cattle and swine, the latter of which furnish the well known Westphalia hams. Manufactures are extensively carried on; the most important being those of linen, woollen, and cotton fabrics, silk, leather, hosiery, paper, iron, steel, and all kinds of hardware. An active trade is carried on, consisting chiefly in the exportation of the natural productions and manufactured goods of the country. The province is divided into three governments, as follows:—

	Area.	Pop. (1855).
Munster	2966 sq. m.	433,837
Minden	2013 „	462,503
Arnsberg	2796 „	630,912
Total	7675 „	1,527,252

Westphalia was the name of an ancient circle of the German empire, much more extensive than the present province; for it comprised an area of 27,000 square miles. The kingdom of Westphalia, erected by Napoleon I. in 1807, comprised parts of Hanover and Prussian Saxony, with the intervening small states. It had an area of 14,000 square miles, and existed till the battle of Leipzig in 1813, after which the former governments were restored.

Westport ‖ Wetstein.

WESTPORT, a market-town of Ireland, in the county of Mayo, at the mouth of a small rivulet in Clew Bay, 10 miles S.W. of Castlebar and 170 W. by N. of Dublin. It is regularly and well built, and is one of the neatest towns in Ireland, having been much improved by the first Marquis of Sligo, who is the proprietor. The principal streets diverge from the Mall, an open space in the centre lined with large and handsome houses, and having at one end the entrance to Westport House, the seat of the Marquis of Sligo. Besides the parish church, there are here places of worship for Presbyterians, Methodists, and Roman Catholics. Westport has also a court-house, with a jail attached to it, a market-house, linen-hall, free school, dispensary, workhouse, and nunnery. Many of the inhabitants are employed in fishing, and in the manufacture of linen, beer, and brandy; and there is some trade in corn, flour, butter, pork, and whisky. Pop. (1851) 4815.

WETSTEIN, JOHN JAMES, a learned biblical critic,

Wetter ‖ Wexford.

was born at Basel in 1693. On his admission to the ministry, he maintained a thesis, "De variis Novi Testamenti Lectionibus;" in which he showed that the great variety of readings of the New Testament affords no argument against the authenticity of the text. He had made these various readings the object of his attention, and travelled into foreign countries to examine all the manuscripts he could find. In 1730, he published *Prolegomena ad Novi Testamenti Græci Editionem, accuratissimam*, &c. Some divines, dreading his unsettling the present text, procured a decree of the senate of Basel against his undertaking, and even got him prohibited from officiating in the ministry; on which he went to Amsterdam, where the Remonstrants named him to succeed the famous Le Clerc, then superannuated, as professor of philosophy and history. His edition of the New Testament he published in 1752, in 2 vols. folio. He left the text as he found it, placing the various readings, with a critical commentary, underneath; subjoining two supposed epistles of Clemens Romanus, discovered by him in a Syriac manuscript of the New Testament, but which have since been proved to be spurious. He died at Amsterdam in 1754.

WETTER, a lake of Sweden, lying between N. Lat. 57. 30. and 58. 40; E. Long. 14. and 15.; having the laen of Lönköping on the E., and that of Mariestadt on the W., Orebrö on the N., and Jönköping on the S. Its length is 80 miles, and its average breadth 10; its height above the sea 295 feet, and its depth in some places 70 fathoms. It is connected by the Gotha Canal with Lake Wener, and by the Motala Canal with the Baltic.

WEXFORD, a maritime county in the province of Leinster, in Ireland, is bounded on the N. by Wicklow, on the E. by St George's Channel, on the S. by the Atlantic, and on the W. by Waterford, Kilkenny, and Carlow. It lies between 52. 4. and 52. 48. N. Lat. and 6. 5. and 7. 1. W. Long.; extending 55 miles in its greatest length from N. to S., and 34 in its greatest breadth from W. to E., and comprehending an area of 900 square miles, or 576,616 acres, of which 510,702 are arable, 45,501 uncultivated, 14,325 in plantations, 2392 in towns, and 3668 under water. The 45,000 acres of uncultivated rough pasture land are situate chiefly on the eastern declivities of the mountains adjoining the county of Wicklow; of the whole, about 16,000 acres are capable of being drained and cultivated advantageously; 18,000 acres may be drained for mountain pasture; and 11,000 acres, consisting chiefly of the rocky and heathy tops of mountains, may be considered as incapable of improvement.

The county was first known as the settlement of the Brigantes and of the Menapii, whose chief town, Menapia, is supposed to have been either Ferns or Wexford; the latter holding the northern parts, with part of Wicklow, the former the southern and western, with a portion of Waterford. It was afterwards known by the name of Laighion or South Leinster. It suffered severely by the predatory incursions of the Danes, who, after ravaging the open country, and burning Ferns, then the capital, made a permanent settlement, of which the town of Weisfiord or Wexford was the principal position. They retained possession of the district until the arrival of the English, who, in 1169, landed at Bagenbon, near Bannow, under the command of Robert Fitzstephen, Maurice Fitzgerald, and Hugh de Montmorency, and took the town of Wexford, which M'Murrough, king of Leinster, to whose aid these adventurers had come into the country, granted to Fitzstephen, together with the adjoining district of Forth, at the same time bestowing on Montmorency the neighbouring district of Bargie. The latter grant was confirmed by Henry II. on his arrival; but that conferred on Fitzstephen was taken from him and made part of the palatinate of Leinster, which the same king granted to Strongbow, the first undertaker of the adventure, and chief leader of the forces. The district descended, through the female line, to William Earl Marshal, on whose demise, without male issue, it was portioned out among his five daughters, the second of whom, wife of Warren de Mountchenoy, obtained Wexford. In consequence of the frequent changes of seigniory, the district fell into a state of great distraction, and was partly seized on by the Kavenaghs, the descendants of M'Murrough, who assumed the title of Kings of Leinster. It was reduced to shire-ground by King John in 1210, and the lordship having ultimately descended to the Earl of Shrewsbury, the county was separated into two parts, the Liberty and the Cross, the former being governed by authorities appointed by the earl, the latter by officers of the crown. Each sent two members to the Irish parliament, until the property of the earl became vested in the crown, under the statute of absentees, passed in 1537. During the civil wars of 1641, it was held for the royal party, until reduced by Cromwell, whose operations were signalised by much cruelty. Since that event, the county remained in a tranquil state until the year 1798, when it became the principal seat of the insurrection in the southern counties; the town of Wexford forming the headquarters of the insurgents, and several severe conflicts taking place at Enniscorthy, New-Ross, and other positions, with the royal forces.

Wexford.

The surface consists chiefly of a collection of very low hills, except on the northern and western sides, on the former of which it rises into an elevated ridge, forming the southern termination of the great Wicklow group. Its loftiest points are Slieveboy, 1384 feet high; Kilkevan, 1063; Connar Hill, 1491; and Croghan-Kinshela, 1985. On the latter or western side it is bounded by the rugged granitic chain of Mount Leinster, extending from the valley of the Slaney at Newtownbarry to the confluence of the Barrow with the Nore, near New-Ross—a distance of 20 miles, comprehending the summits locally known as Mount Leinster, 2610 feet high, and Blackstairs, 2409 feet in height. The county boundary on this side is continued southwards by the Barrow and the estuary of Waterford harbour. Within the county are the Cameross Hills and Carrickburne, respectively 598 and 766 feet; Lackan, near New-Ross, 628; Tara Hill, between Arklow and Courtown harbour, a striking landmark on the eastern coast, 825; and Forth Mountain, 774 feet. The south-eastern extremity, containing the baronies of Forth and Bargie, forms a peninsula of low land, nearly shut out from the rest of the county by the last-mentioned range of mountains and by Wexford harbour. The principal river is the Slaney, which rises in the county of Wicklow, and, after passing through the county of Carlow, enters this county at its north-western extremity, and traverses it in a south-eastern direction, till it falls into Wexford harbour at Carrigg, noted for the remains of an ancient Norman fortress, erected by Fitzstephen immediately after his landing. The whole course of this river is marked by a succession of picturesque scenery; and it receives in its progress a number of tributary streams, of which the Bann is the most remarkable. The Slaney is navigable for barges of considerable tonnage to Enniscorthy. The Bannow, which discharges itself into a bay of the same name, claims notice solely from its historic reminiscences. The Barrow forms the western boundary, from the foot of the Blackstairs range of mountains, to its confluence with the Suir, in Waterford harbour. There are no lakes inland, but on the southern coast, near Carnsore Point, are two loughs, Pacumshin, open to the sea, and Lady Lough, which, being supplied by the ingress of several small streams, and having no natural outlet, increases rapidly in extent, covering the surrounding low land, until, in every second or third year, its accumulated waters are drawn off by an artificial cut,

Wexford. which discharges them into the sea. The coast on the eastern side, from Arklow southwards to Wexford, is very dangerous, having no place of refuge in case of foul weather, except in the small artificial harbour of Courtown, fit only for small craft. The dangers of navigation are increased by a succession of sand-banks from that of Arklow, the south point of which is marked by a floating light. These are called Kilgorman, the Rusk and Ram, and Blackwater Bank. Wexford harbour forms a large and safe land-locked basin; but the entrance to it is obstructed by a bar, on which at neap tides there is not more than eleven feet of water; and in the passage up to the quay there are several shifting banks, that render the navigation hazardous even to those acquainted with it. Within the harbour are the two small islands of Beg-Eri and Great Island, on each of which are the remains of monastic buildings. The Tuskar Rock, about five miles from shore, between Greensore and Carnsore Point, has on it a revolving light of various colours, consisting of twenty-one argand lamps, and is seen far along the line of coast. South of the coast, and west of Carnsore Point, are the two Saltee islands. South of them is a floating light; and between them and the mainland is a narrow ridge, called St Patrick's Bridge, with but from seven to ten feet of water on it at ebb tide. Farther west are the fishing harbours of Crosfarnogue and Fethard. The latter is a creek, dry at low water. Still farther, the projecting point of Hookhead, having on it a lighthouse 110 feet high, forms the southern extremity of the coast, which thence trends northwards to the mouth of the Barrow, forming the eastern side of Waterford harbour. On this coast, commanding the entrance to the harbour, is Duncannon Fort, which has been regularly garrisoned since the threatened invasion of the Spaniards in 1588. The fort occupies the point of a rocky headland, about a quarter of a mile from the line of the shore, and rising 130 feet above the level of high water.

The basis of nearly the whole county is a stratum of clay-slate, interrupted by several small patches of quartz rock near Gorey, one of larger size south of Wexford, and another south of Enniscorthy. A small protrusion of greenstone trap, with whin-dykes, appears to the north of Gorey. The carboniferous or mountain limestone shows itself to the south of Wexford, along the shore of the harbour. It forms also the extremity of Hookhead Point. Mount Leinster and Blackstairs are a continuation of the great granite formation of Wicklow, constituting its southern termination, which is here broken through by the valley of the Barrow or New-Ross river. On its eastern verge it is bordered by clay-slate, passing into greenstone-slate. Granite also shows itself in two patches south of Carnsore Point. The Saltees are of clay-slate, supporting beds of sandstone. Slates are raised in several places. A lead-mine at Cairn, after having been worked for some time, and abandoned, has been reopened. Silver was formerly raised at Clonmines, where it is said that the Danes established a mint for its coinage. Copper ore has been discovered near Wexford, and remains of ancient mines are visible in several places. A perfect skeleton of the great moose-deer of Ireland was found in a bog, and preserved in a private collection in the county. The soil in the south-eastern parts is a rich alluvial mould, mixed with coralline sand and limestone. The peninsula of Hookhead, which rests on a limestone bed, is peculiarly fertile, both throwing up a rich herbage and yielding heavy crops of grain. The quality of the soil deteriorates on proceeding westward; but the farmer finds a valuable equivalent in these districts in the large tracts of turf or peat-moss with which its surface is overspread.

The numbers of the population, according to the calculations most deserving of credit, have been as follows:—

Year.	Authority.	Total Inhabitants.
1760	De Burgo	66,804
1792	Beaufort	115,000
1812	Parliamentary census	160,000
1821	Ditto	170,806
1831	Ditto	182,713
1841	Ditto	202,033
1851	Ditto	180,159

Wexford.

The latest of these returns shows a decrease of 24 persons per square mile in the density of the population, which in 1841 was 224, and in 1851 had declined to 200 inhabitants. The return of the Commissioners of Public Instruction, made in 1834, gives a total of 187,497 souls, of which 21,602 were members of the Established Church, 317 Protestant dissenters, and 165,578 Roman Catholics. The number of children receiving instruction in public schools, as stated in various parliamentary returns, is as follows:—

Year.	Boys.	Girls.	Sex not ascertained.	Total.
1821	7,924	3930	...	11,854
1824–26	10,951	7233	585	18,769
1838–39	2,825	1748	...	4,573

According to the return of 1824–26, in which alone notice is taken of the religious persuasion of the pupils, the numbers were as follows:—Established Church, 2298; Protestant dissenters, 30; Roman Catholics, 15,641. The number of schools, and of pupils attending them, was found by the Census Commissioners, in April 1851, to be:—

Description.	No. of Schools.	No. of Children.		
		Males.	Females.	Total.
National	80	2521	2616	5,137
Church Education	21	369	344	713
Diocesan	2	131	...	131
Endowed	8	177	196	373
Boarding	3	36	11	47
Private	53	643	488	1,131
Parochial	28	416	326	742
Free	11	169	203	372
Industrial	1	...	38	38
Mission	2	508	...	508
Workhouse	5	951	993	1,944
Gaol	1	152	...	152
Total	215	6073	5215	11,288

There is an endowed school at Ferns, on the foundation of Erasmus Smith, in which the master receives an annual salary of L.30, in addition to the pupils' fees. At New-Ross there is a school, founded by Sir John Ivory, with an additional endowment from the corporation.

The county is divided into ten baronies—

Divisions.		Acreable contents.	Annual Valuation.
		Acres.	L.
Ballaghkeen, North	Baronies.	45,384	29,362
Ballaghkeen, South		40,975	30,130
Bantry		101,232	51,543
Bargy		40,002	27,467
Forth		38,366	32,404
Gorey		81,926	49,999
Scarawalsh		106,429	56,319
Shelburne		51,103	33,177
Shelmaliere, East		16,364	12,412
Shelmaliere, West		50,300	30,098
Borough of New-Ross (part of)		366	8,627
Borough of Wexford		472	15,078
Reclaimed Land		4,071	1,049
Water and Ocean Fisheries		3,668	170
Total		580,658	377,835

Wexford. These are subdivided into 143 parishes, all, except two in the diocese of Dublin, being within that of Ferns, which is nearly conterminous with the county. The diocese was united with that of Leighlin until after the passing of the act for reducing the number of sees in Ireland, under the provisions of which the united dioceses were, in 1835, joined to that of Ossory, and the three are now held by one bishop, who is a suffragan to the archbishop of Dublin. Previously to the Union, the county was represented in the Irish parliament by eighteen members, two for the county, and two for each of the boroughs of Bannow, Clonmines, Enniscorthy, Fethard, Newborough, New-Ross, Taghmon, and Wexford. By the Act of Union the number was reduced to four; two for the county, and one each for New-Ross and Wexford, which arrangement has been continued under the Reform Act. The county is in the Leinster circuit. The assizes are held at Wexford, and general sessions of the peace at the same place, and in Enniscorthy, Gorey, and New-Ross, twice in the year. The county infirmary and county gaol are in Wexford The county contains the poor-law unions of Wexford, Gorey, Enniscorthy, and New-Ross, the two latter of which include portions of the neighbouring counties, and a portion of the county of Wexford is comprised in the union of Shillelagh, the seat of which is in the adjoining county of Wicklow.

The Forth mountain divides the county into two districts, differing as widely from each other in character as if they were in separate islands. The country to the south of this mountain, containing the baronies of Forth and Bargie, is peopled by the descendants of the English colony which was located here in the time of Henry II. Their manners, customs, mode of dress, and in a great degree their language, still retain traces of the peculiarity of their origin. The appearance of these baronies, when viewed by a spectator placed on the summit of their boundary-ridge, is not unlike the south of Devonshire. The entire district is well peopled, and contains some of the richest lands in the county. The farm-houses, as in Devonshire, are built of clay, and thatched, with neat offices, and generally a vegetable garden attached to them. The unwearied and well-directed industry of the farmers insures a large return from the land, much of which is under tillage, and the vicinity of the sea enables the farmer to obtain a plentiful supply of seaweed and calcareous sand for manure, besides which, marl is found in abundance. Fuel is scarce; but the want of turf is supplied by the use of furze, which thrives here luxuriantly, and with which the mounds of earth that form the general fence of the farm are thickly topped; thus insuring at the same time the most perfect security against trespass, shelter for the cattle in severe weather, and a supply, sufficient though not profuse, of fuel from the prunings of the furze. It is said that there was a turbary along the shore, which the encroachments of the sea have long ago covered with sand, and with water during flood-tides. The principal crops are barley and beans. These are to be seen, in the peninsula of Carne, growing luxuriantly on land so overspread with stone as to induce the opinion that the ground was wholly unproductive. Poultry of every kind is reared in all the farm-houses, chiefly for exportation. Many farmers pay much attention to the rearing of bees, and efforts are frequently made to preserve the stock while taking the honey. The sandy reaches near the coast form burrows for immense numbers of rabbits, the flesh of which is deemed to be of a peculiarly good flavour. The shores are frequented by numerous flocks of wild and sea fowl, among which the barnacle is most highly prized. Round fish is taken in large quantities on the eastern extremity of Nymph Bank, which is off the coast; and also at the station of the floating light off the Saltees. The inshore fishing employs many hands, their open boats being enabled to run for shelter during rough weather into the numerous creeks and inlets which indent the coast. Shell-fish is plenty. Wexford. The Wexford oyster is carried to Dublin, where it finds a ready market, more on account of size than flavour. Wexford town is the chief market for the produce of the farms, and many of the inhabitants have never travelled farther, looking on all beyond the mountain as a foreign country. The dialect of the peasantry, of which some vestiges are still preserved in common conversation, was Saxon-English of the time of the Henries and Edwards. The rector of a parish there, when reading Chaucer's Canterbury Tales while overseeing his reapers in a field, was struck with the similarity between many words in his book and the expressions he heard from those around him. On reading some passages of it to them, he was peculiarly struck with the surprise and pleasure expressed by them when they found themselves able to understand what was written in a book. They were fully competent to interpret what was read, and gave explanations of phrases and passages which to him were abstruse, in a manner more satisfactory than the commentators whose notes were annexed to the printed text. Their usual mode of saluting each other is simple and pleasing. On meeting, one asks, "Is it long since?" meaning to inquire whether the interval of absence has appeared long. The reply is couched in similar terms of artless courtesy, "Yea, joy." At their marriages, which in other respects were celebrated according to the forms usual elsewhere, an apple was cut into small pieces and thrown among the crowd, a custom derived from England, but the origin of which is unknown. The dress of the peasantry, until of late years, was for the men a jacket or short coat, waistcoat, and trunk breeches, with a round narrow-brimmed hat; for the women, a short jacket and petticoat, bordered at bottom with several rows of coloured ribbon or tape; the head-dress was a kerchief. The women do all manner of field-work, except ploughing, and receive equal wages with the men. The manners and customs of the inhabitants of the other baronies resemble those of the Irish peasantry throughout the surrounding counties: there is less attention to external appearance and to domestic comfort and cleanliness. The soil also is poorer, and the farming less precise. In the western baronies, where there is neither seaweed, marl, nor limestone, the petty farmer will take long journeys to draw home a load of lime, forty loads of which are required to manure an acre. In most respects the system of tillage or the description of crops differs little from those of similar soils elsewhere. But it is observed, that even in those districts of the northern baronies in which the soil is good, abounding with marl alternating with a clayey loam, and adequate, by proper management, to give an abundant return to well-directed industry, the same extent of activity, comfort, or happiness of the people existing in the southern baronies does not appear. This difference has generally been most striking on the estates in which the practice of letting lands to middle-men was most prevalent.

The extent of land under each description of crop, in 1849 and 1859, was—

	1849.	1859.
	Acres.	Acres.
Wheat	44,592	27,268
Oats	80,136	67,626
Barley, Bere, Rye, Beans, and Pease	36,563	44,383
Potatoes	32,017	31,607
Turnips	9,763	15,041
Other green crops	2,955	5,236
Flax	115	74
Meadow and clover	39,343	50,258
Total	245,514	241,493

Wexford. The quantity of live stock in the county at the same periods was—

	1849.	1859
	No.	No.
Horses	26,271	28,228
Cattle	76,163	111,147
Sheep	54,064	114,058
Swine	51,290	61,354

The manufactures carried on in the county are those of woollen cloth, checks, and coarse linens, all for the home-consumption of the district, and wrought in the farm-houses. At present the raising of grain and rearing of cattle is almost exclusively the occupation of the inhabitants, and the export of the agricultural produce the sole article of commerce. The principal markets for grain and flour are Wexford, Enniscorthy, and New-Ross. Much butter is sent to Dublin and exported to Liverpool, together with swine and poultry. The exports of the county through Wexford have been estimated at 30,000 tons, value L.330,000, and the imports through the same channel at 40,000 tons, value L.600,000. The communication with the counties in the interior is carried on chiefly by the Barrow, which is navigable for barges to Athy, where it meets the Grand Canal.

Every part of the county, but more particularly the southern baronies, abounds with reliques of Danish, Saxon, and Norman antiquities. Raths are very numerous. There are two of considerable magnitude near Dunbrody, and two others near Enniscorthy and New-Ross. A heap of stones, near Wicklow Gap, at the northern extremity of the county, marks the spot where the bodies of those who fell in a sanguinary conflict there, between the king's troops and the insurgents of 1798, were interred together. The abbey of Dunbrody, situate near the confluence of the Suir and Barrow or Ross river, still exhibits the remains of one of the finest monastic buildings in Ireland; it was founded in 1182 by Henry de Montmorency, marshal of Henry II. Tintern Abbey, called also "De Voto," was founded in 1200 by William, Earl Marshal of England and Earl of Pembroke, near the Bannow, on the spot where he landed after a storm, in performance of a vow made by him while in peril. On the head of Bagenbon, so called from the names of the ships, Bag and Bun, in which the Anglo-Norman adventurers first crossed the channel, are the vestiges of a strong earthen intrenchment called Strongbow's Camp; but it was more probably that of Fitzstephen and his followers on their first landing. Ferns Castle, built by Strongbow, continued to be looked upon as a place of great military importance to the time of Cromwell's campaigns, when it was destroyed by the parliamentary forces under Sir Charles Coote: the position was also occupied during the insurrection of 1798. Enniscorthy Castle, built by Raymond le Gros at the same period with the former, was also a place of strength in the time of Cromwell, and in 1798 was used as a prison by the insurgents while in possession of the town. Buttermilk Castle, or Cuislan-na-Blahie, consists of two small dark towers at the foot of a steep hill near Dunbrody; it was used as a toll-house for the adjoining pass across the river, and as a place to receive and cure the fish due to the monks. Duncannon Fort was erected during the alarm of the threatened invasion of the Spanish Armada in the reign of Elizabeth. It is still kept up as a military position, having a bomb-proof magazine, and arrangements for mounting forty-two guns, with suitable accommodations for a garrison.

WEXFORD, the county-town, is situate on the southern side of the mouth of the Slaney, where it falls into Wexford haven. It was founded by the Danes, and after having been taken by the English on their first landing in Ireland, became a place of some importance. It obtained a charter in 1318, which was confirmed and enlarged by James I. in 1608. A parliament was held in it by the Earl of Desmond in 1463. At the breaking out of the war of 1641, it took part with the Irish, and continued in their possession till taken in 1649 by Cromwell, either by force or treachery, when the inhabitants, like those of Drogheda, were subjected to military execution. In the war of 1688 it declared for King William, and in the insurrection of 1798 was seized and occupied by the insurgents until their main body was utterly defeated at Vinegar Hill near Enniscorthy. The town still retains many vestiges of antiquity. The streets are narrow and winding. It is connected with the northern part of the county by a wooden bridge, 722 feet long, thrown across the Slaney. A broad quay proceeds from the bridge along the border of the haven for upwards of half a mile. The corporate jurisdiction of the town under the charter of James is vested in a mayor, burgesses, and commons. The mayor holds a court of conscience for debts under 40s. The county court-house, prison, union workhouse, infirmary, and fever-hospital are in the town. The borough exercised a prescriptive right of returning two members to the Irish parliament, which number was reduced to one at the Union. The number of electors in 1859 was 301. By the municipal corporation act for Ireland the corporation was dissolved, and power granted to form a new corporate body, according to conditions expressed in the act, under the name of "the mayor, bailifs, free burgesses, and commonalty of the town or borough of Wexford." Nine fairs are held during the year. The town is the principal place of export for the county. Together with the suburbs, it forms an ecclesiastical union, consisting of eleven parishes, in which there are two churches. There are also several Roman Catholic chapels, some of which belong to monastic institutions. The population was, in 1821, 8326; in 1831, 10,673; in 1841, 11,252; and in 1851, 12,471. In 1834 the members of the Established Church numbered 2031, the Protestant dissenters 28, and the Roman Catholics 12,641; the Protestants being to the Roman Catholics as 1 to 6. The population of the other towns in the county whose numbers exceed 1000 each was, in 1851, Enniscorthy, 6095; New-Ross, 7941; Gorey, 2973. (H. S—R.)

Weymouth. WEYMOUTH, a town of England, forming along with the adjacent MELCOMBE REGIS, a parliamentary and municipal borough in Dorsetshire, at the mouth of the Wey, 8 miles S. of Dorchester. The former town stands on the S., and the latter on the N. shore of the narrow outlet of the Backwater, or estuary of the Wey; and they are connected by a handsome stone bridge erected in 1770. Weymouth is an ancient place irregularly and meanly built, and inhabited chiefly by fishermen. The same character belongs partially to Melcombe Regis, especially in the back parts of the town; but as the sea here forms a beautiful bay with fine sand well adapted for bathing, it has attracted many visitors; and for their accommodation several fine ranges of houses have been built, chiefly along a broad terrace called the Esplanade, which faces the sea. The parish church of Melcombe Regis, rebuilt in 1817, is a large edifice not very remarkable for its architecture; and the chapel of ease in Weymouth is a beautiful modern Gothic structure. Wesleyans, Independents, Baptists, Quakers, and Roman Catholics, have also places of worship. In Melcombe Regis there are a town hall, a theatre, assembly rooms, libraries, baths, and other establishments usual in watering-places. Education is provided for by national, British, and infant schools; and there are alms-houses and other charities. The harbour, which is formed by the arm of the sea below the bridge, has a pier and fixed light; but is obstructed by a bar, having only from 6 to 8 feet of water, so that it is inaccessible to

Wharton. large vessels. But the roads outside afford good anchorage in 7 or 8 fathoms; and will be completely sheltered by the Portland breakwater, now in course of construction (see PORTLAND). The number of sailing vessels belonging to the port, December 31, 1858, was 81, tonnage 8126; of steamers 6, tonnage 411. In the year ending on that day there entered the port 374 sailing vessels, tonnage 28,645; and 309 steam vessels, tonnage 39,724: and there cleared 133 sailing vessels, tonnage 7840; and 313 steam vessels, tonnage 40,387. The borough is governed by six aldermen and eighteen councillors, of whom one is mayor; and it is represented in parliament by two members. Weymouth was first brought into notice as a watering-place by a visit that was paid to it by George III. in 1789. A royal lodge was built for him; and a statue has since been erected in his honour. Pop. (1851) of Weymouth, 2669; of Melcombe Regis, 5039: total of the borough, 7708.

WHARTON, PHILIP, DUKE OF, a nobleman of the most brilliant parts, but of the most whimsical, extravagant, and inconsistent turn of mind, was the son of Philip, marquis of Wharton, and was born in December 1698. He was educated at home; and his father's great aim was to render him a complete orator. At a very early age he married a young lady, the daughter of Major-general Holmes, which disappointed his father so greatly that he is said to have died in six weeks. The son, being now free from paternal restraints, and possessing a fortune of L.16,000 a year, plunged into those excesses which rendered him, as Pope expresses it,

> A tyrant to the wife his heart approved,
> A rebel to the very king he loved.

In the beginning of the year 1716 he began his travels; and as he was designed to be educated in the strictest Whig principles, Geneva was thought a proper place for his residence. He first passed through Holland, and visited several courts of Germany; and being arrived at Geneva, conceived such a disgust against his governor, that he left him, and set out post for Lyon, where he wrote a letter to the Chevalier de St George, who then resided at Avignon, and presented him with a very fine horse; which the chevalier no sooner received than he sent a man of quality to him, who took him privately to his court, where he was entertained with the greatest marks of esteem, and had the title of Duke of Northumberland conferred upon him. He however remained there but one day, and then returned to Lyon, whence he set out for Paris. He likewise paid a visit to the dowager of James II. then residing at St Germains. During his stay at Paris, his winning address and abilities gained him the esteem and admiration of all the British subjects of rank of both parties.

About the latter end of December 1716, he arrived in England, whence he soon after set out for Ireland, where, though still under age, he was allowed the honour to take his seat in the House of Peers, as Earl of Rathfarnham and Marquis of Catherlough. Notwithstanding his former conduct, he immediately distinguished himself as a violent partisan for the ministry; and in consequence of his zeal the king created him a Duke. He no sooner came of age than he was introduced to the House of Lords in England with the same blaze of reputation. In a little time he opposed the court, and appeared one of the most vigorous in defence of the bishop of Rochester; and soon afterwards he printed his lucubrations twice a week, in a paper called *The True Briton*, several thousand copies of which were circulated.

The Duke's boundless profusion had by this time so burdened his estate, that by a decree of Chancery it was vested in the hands of trustees for the payment of his debts, allowing him a provision of L.1200 per annum for his subsistence. This being insufficient to support his title with suitable dignity, he went abroad, and appeared to great advantage at the imperial court. From thence he made a tour to Spain. The English minister was alarmed at his arrival, fearing that his grace was received in the character of an ambassador. The Duke received a summons under the privy seal to return home; but instead of obeying it, he endeavoured to inflame the Spanish court against that of Great Britain, for exercising an act of power, as he calls it, within the jurisdiction of his Catholic majesty. He then acted openly in the service of the Pretender, and was received at his court with the greatest marks of favour. While his grace was thus employed, his neglected duchess died in England on the 14th of April 1726, without issue. He soon afterwards fell violently in love with Miss O'Byrne, one of the maids of honour to the Queen of Spain, the daughter of an Irish colonel, whose fortune chiefly consisted in her personal accomplishments. All his friends, and particularly the Queen of Spain, opposed the match; but he falling into a lingering fever, occasioned by his disappointment, the queen gave her consent, and they were soon after married. He then spent some time at Rome, where he accepted of a blue garter, assumed the title of Duke of Northumberland, and for a while enjoyed the confidence of the exiled prince. But not always keeping within the bounds of Italian gravity, it became necessary for him to remove from hence; when, going by sea to Barcelona, he wrote a letter to the King of Spain, acquainting him that he would assist at the siege of Gibraltar as a volunteer. Soon after he wrote to the Chevalier de St George, expressing a desire to visit his court; but the chevalier advised him to return to England.

The Duke seemed resolved to follow his advice; and setting out with his duchess, arrived in Paris in May 1728, whence he soon after proceeded to Rouen, where he took up his residence; and was so far from making any concession to the government of England, that he did not give himself the least trouble about his estate, or any other concern there, though, on his arrival at Rouen, he had only about L.600 in his possession, and a bill of indictment was preferred against him in England for high treason. Soon after the Chevalier sent him L.2000, which he squandered away in a course of extravagance, when, to save the charges of travelling by land, he went from Orleans to Nantz by water, and staid there till he got a remittance from Paris, which was squandered almost as soon as received. At Nantz he was joined by his ragged servants, and from hence took shipping with them for Bilboa, when the Queen of Spain took the duchess to attend her person. About the beginning of the year 1731, the Duke, who commanded a regiment, was at Lerida, but declined so fast that he could not move without assistance, yet when free from pain did not lose his gaiety. He, however, received benefit from some mineral waters in Catalonia; but soon after relapsed at a small village, where he was utterly destitute of all the necessaries of life, till some charitable fathers of a Bernardine convent removed him to their house, and gave him all the relief in their power. Under their hospitable roof he languished a week, and died on the 31st of May, without one friend or acquaintance to close his eyes; and his funeral was performed in the same manner in which the fathers inter the members of their own fraternity. He died without issue, and his titles became extinct. The duchess survived till February 1777, when she died in London in great obscurity.

Two octavo volumes, published under the title of his *Life and Writings*, include seventy-four papers of the *True Briton*, and his speech in defence of Atterbury. Other two duodecimo volumes likewise bear his name; and the same life occurs in a publication called *The Poetical Works of Philip, late Duke of Wharton, and others of the Wharton Family, and of the Duke's intimate acquaintance*, Lond. 1731, 2 vols. 8vo. Ritson intended to publish

Wheat ‖ Whiston.

an edition of the duke's genuine poems, accompanied with an account of his life. Pope's character of Wharton, in his *Moral Essays*, is familiar to most readers.

WHEAT. See AGRICULTURE.

WHEEL. See MECHANICS.

WHEELING, a town of the United States of North America, Virginia, on the left bank of the Ohio, where it receives the Wheeling Creek, 50 miles S.W. of Pittsburg. It stands on a narrow strip of alluvial ground, about 2 miles long, behind which rise steep hills. The Ohio is here crossed by a magnificent suspension bridge, with a span of 1010 feet, and with towers about 50 feet above the level of the water. Its entire length is 1380 feet, and its breadth 24. The principal public edifices in the town are the county buildings, about fourteen churches, two academies, three banks, and a theatre. There are numerous manufactories, including four iron foundries, three forges, three nailworks, two wire-factories, one of steam-engines, several cotton, woollen, and silk factories, paper and flour mills, glass-houses, &c. Abundance of coal is obtained in the vicinity. Pop. (1851) 11,391.

WHIRLWIND. See PHYSICAL GEOGRAPHY.

WHIST, a well known game at cards, which requires great attention and silence: hence the name.

WHISTON, WILLIAM, an English divine of singular character, was born the 9th of December 1667, at Norton, near Twycross, in the county of Leicester, where his father was rector. He was admitted of Clare Hall, Cambridge. In 1693 he took the degree of A.M., and became a fellow. He afterwards began to take pupils, but ill health at length forced him to decline this occupation. Having entered into orders, he became chaplain to Dr More, bishop of Norwich, in 1694; and in this station he published his first work, entitled, *A New Theory of the Earth*, in which he undertook to prove the Mosaic doctrine of the earth perfectly agreeable to reason and philosophy. This work brought no small reputation to the author. In the beginning of the eighteenth century he was made Sir Isaac Newton's deputy, and afterwards his successor, in the Lucasian professorship of mathematics, when he resigned a living he had in Suffolk, and went to reside at Cambridge. About this time he published several scientific works, explanatory of the Newtonian philosophy; and he had the honour to be one of the first, if not the very first, who rendered these principles popular and intelligible to the generality of readers. About the year 1710 he was known to have adopted Arian principles, and was forming projects to support and propagate them. He had translated into English the *Apostolic Constitutions*, which favoured the Arian doctrine, and which he asserted to be genuine. The consequence was, that in 1710 he was deprived of his professorship, and expelled from the university. He nevertheless pursued his scheme, by publishing the next year his *Primitive Christianity Revived*, 4 vols. 8vo, for which he incurred the censure of the Convocation. On his expulsion from Cambridge, Whiston settled in London, where, without suffering his zeal to be intimidated, he continued to write and propagate his Primitive Christianity, with as much ardour as if he had been in the most flourishing circumstances. In 1721 a subscription was commenced for the support of his family, and it amounted to L.470. Though he drew profits from reading astronomical and philosophical lectures, and also from his publications, which were very numerous, yet these of themselves would have been very insufficient; nor, when augmented by the benevolence and charity of those who loved and esteemed him for his learning, integrity, and piety, did they prevent his being frequently in great distress. He long continued a member of the Church of England, and regularly frequented its service, though he disapproved of many things in it; but at last he went over to the Baptists, and attended Dr Foster's meeting at Pinner's Hall, Broad Street. Among other performances, not specified above, he wrote *Memoirs of his own Life and Writings*, which contain some curious particulars. Whitaker.

He was remarkable for speaking the plainest truths on every occasion, and to persons of every degree. During the year 1725, when Whiston, with Dr Clarke, Dr Berkeley, and others, had the honour to attend Queen Caroline on a certain day of every week, to discuss the progress of science, her majesty one evening took occasion to pay him a just compliment on his truth and integrity, requesting that he would, with his usual plainness, point out to her any fault that he might have observed in her conduct. At first he begged to be excused, adding, that few persons could bear to have their faults plainly told to them, and least of all royal personages, who, from their elevation, are necessarily surrounded by flatterers, to whose lips truth is a stranger. Her majesty replied, that he was to consider her not as a queen, but as a philosopher; and that philosophy is of very little use if it cannot enable its professors to bear without offence truths necessary to their own improvement. Upon this he told her, that the greatest fault which he had observed in her conduct was her indecent behaviour in the house of God, which, he assured her, had made very unfavourable impressions on the minds of many persons, who, coming to town from distant parts of the country, had gone to the chapel to obtain a sight of her majesty, the king, and the royal family. The queen made no reply; but in about six weeks afterwards renewed her request, that Mr Whiston would point out the most glaring improprieties in her conduct. To this he answered, that he had laid down a maxim, from which he could not deviate, never to point out to any person more than one fault at a time, and never to give a second reproof till he had observed some good consequence to have arisen from the first.[1] Much to the queen's honour, she was pleased with this plain dealing, and continued to think favourably of Whiston. This honest, but whimsical and credulous man, died on the 22d of August 1752, in the eighty-fifth year of his age. Whiston's writings, taken together, number some fifty-nine in all, of which the only one now met with is his translation of Josephus, published in 1737.

WHITAKER, JOHN, was born at Manchester on the 27th of April 1735. His father, James Whitaker, does not appear to have been in affluent circumstances. At the age of ten, the son was sent to the free-school, and in 1752 was removed to Oxford upon an exhibition of ten pounds a year. He was entered of Brasen-nose College, but on the 2d of March 1753 was elected scholar of Corpus Christi. He proceeded A.M. in 1759, and in the following year was ordained deacon and priest. On the 21st of January 1763 he was elected fellow of his college, and on the 1st of July 1767 took the degree of B.D. For many years he served the curacy of Bray in Berkshire for Dr Berkeley, a son of the famous Bishop of Cloyne; and was subsequently curate of Newton in Lancashire. He gave the first conspicuous proof of his abilities by the publication of *The History of Manchester*. Lond. 1771, 4to. The second volume followed in the year 1775; but although four books were originally promised, only two are thus completed; they embrace the Roman, British, and Saxon periods of the history. This work, which is perhaps the most remarkable of his publications, was immediately regarded as the production of no ordinary writer, but as more conspicuous for bold and ingenious speculation than for cool and judicious dis-

[1] Bishop Berkeley was present at these conversations, and from his son we received the account which we have given of them. They are likewise mentioned, but not so accurately, by Bishop Newton in his own *Life*.

Whitaker. cussion. Like the other works of the same author, it is written in a lively and rambling manner. His impatience and vivacity rendered him incapable of selecting his topics, and condensing his thoughts; and by adhering to his usual method of writing, a large book may be produced on almost any subject. Before he had brought this work to a close, he published *The Genuine History of the Britons asserted*, Lond. 1772, 8vo. This volume is chiefly directed against the historical work of Macpherson, better known as the foster-father of Ossian; and both publications have been considered by competent judges as adding very little to the real stock of information. In the course of the following year we find him residing in the metropolis, and officiating as the morning preacher of Berkeley chapel. For this appointment he was indebted to a Mr Hughes; but their connection was of a very short duration, for he was removed from his situation in less than two months. He thought proper to communicate his grievances to the public, in *The State of the Case between Mr Whitaker and Mr Hughes, relative to the Morning Preachership of Berkeley Chapel*, Lond. 1774, 4to. His resentment was so strong, and his discretion so weak, that he thus subjected himself to the vexation of a lawsuit, and the Court of King's Bench held his printed Case to be a libel. On the 23d of August 1777, he succeeded to the rectory Ruan-Lanyhorne, one of the most valuable livings in the gift of his college. He now withdrew into Cornwall, and took possession of his benefice; and he afterwards married Jane Tregenna, a lady of an ancient Cornish family. Her great-grandfather, grandfather, and father, were successively rectors of Mawgan in Pydar. His next publication was of a professional kind, namely, *Sermons upon Death, Judgment, Heaven, and Hell*, Lond. 1783, 12mo. He afterwards engaged in the famous controversy respecting the character of Queen Mary, and produced an immense work under the title of *Mary Queen of Scots vindicated*, Lond. 1787, 3 vols. 8vo. He published an enlarged edition in the year 1790; and he seems to have been not a little mortified that neither Lord Hailes nor Dr Robertson could be induced to print a single page against him. This production, which is by no means eminent for coolness of reasoning, or sobriety of manner, has probably convinced very few competent judges of historical evidence, who have submitted to the labour of a patient investigation. Having again recurred to his theological studies, Whitaker published a large volume, entitled *The Origin of Arianism disclosed*, Lond. 1791, 8vo. Whatever might be the opinion of others,[1] it is clear that the author himself entertained a favourable enough opinion of this production; which he represents as "a train of historical argumentation, at once novel in its direction, comprehensive in its scope, and decisive in its efficacy." If he could not discuss a point of history without heat and violence, it is easy to conceive how he would be disposed to discuss a point of heresy. Whitaker had contributed to the *English Review* a series of articles on Gibbon's history, which were now reprinted in a separate form, under the title of *Gibbon's History of the Decline and Fall of the Roman Empire, in vols. iv., v., and vi., 4to, reviewed*, Lond. 1791, 8vo. This work, which extends to a considerable volume, is written in his usual vein, with sufficient acuteness and animation, but with little suavity of manner or elegance of style. Whitaker is always an intrepid writer; he is never afraid to deliver a decided opinion; and whether the subject is very familiar or quite new to him, his tone of decision is commonly the same. Thus, for example, in his animadversions on Gibbon's admirable chapter relating to the Roman jurisprudence, he is pleased to declare, that "nothing can subdue the native barrenness of such a field as this." His censure refers to a subject of which he may Whitaker. be considered as in a state of almost total ignorance: he seems to have been alike unacquainted with this science, and incapable of appreciating the masterly manner in which it is here discussed. It may indeed be affirmed that there is no portion of Gibbon's work more remarkable than this very chapter: although his early studies had not prepared him for such a task, he has yet exhibited a rapid and powerful sketch of the Roman jurisprudence, to which it might be difficult to find a parallel in the writings of the professed civilians. And it has accordingly been stamped with the approbation of some of the most distinguished civilians of the present age. It has been illustrated by Hugo and Warnkönig, the former having published it in German, and the latter in French. After an interval of three years, Whitaker produced a copious work on a subject which is certainly curious and interesting. This work he entitles, in his usual form, *The Course of Hannibal over the Alps ascertained*, Lond. 1794, 2 vols. 8vo. Like some of his former publications, it attracted a considerable degree of attention, and, like them, was found to contain many hasty and erroneous opinions. On this ground he was encountered by the late Lord Woodhouselee, who published, but without his name, *A Critical Examination of Mr Whitaker's Course of Hannibal over the Alps ascertained*, Lond. 1795, 8vo. In the year 1795, he endeavoured to enlighten the public by an octavo tract on *The real Origin of Government*, which we have never had the pleasure of seeing, but which his friend, formerly quoted, describes as a very singular production. The last work which Whitaker lived to communicate to the public is *The Ancient Cathedral of Cornwall historically surveyed*, Lond. 1804, 2 vols. 4to. His vigour was still undiminished, and he had formed the plan of many other works, particularly a history of Oxford, and a history of London: the former he intended to comprise in an octavo volume, the latter he contemplated as "quite new and original, and fit to make a quarto." While he was prosecuting his ardent researches into the antiquities of the metropolis, his friends remarked the first indications of declining health. It was followed by a stroke of palsy, from which his recovery was never so complete as to allow him to resume his occupations with his former vigour. During the last year of his life, he lingered in a state of gradual decay; and he is said to have contemplated his approaching dissolution with the cheerful resignation of a Christian. On Sunday the 30th of October 1808, he sank as into a quiet slumber, without any indication of suffering, and with a smile on his countenance. He died at Ruan-Lanyhorne, in the seventy-fourth year of his age. Of his three daughters, two survived him. One of these, named Anne, was married in 1821 to Dr Taunton, a physician of Truro.

He had recently sent to the press an antiquarian volume, which, after his death, was published under the title of *The Life of Saint Neot, the oldest of all the Brothers of King Alfred*, Lond. 1809, 8vo. He had likewise made some progress in preparing a life of Queen Mary; and his materials were consigned by his widow to George Chalmers, who adopted them as the foundation of his own performance. He wrote, besides, an introduction to Flindell's *Bible*, and a supplement to Polwhele's *Antiquities of Cornwall*, and was a contributor to *The Cornwall and Devon Poets*. His connection with the *English Review* has already been mentioned; but he likewise appears to have lent his aid to the *British Critic* and the *Anti-Jacobin Review*.

"It is true," says a writer of the time, "to the same warmth of temper, together with a sense of good intentions, we must attribute an irritability at times destructive of so-

[1] "I confess this book has satisfied me how little erudition will gain a man now-a-days the reputation of vast learning, if it be only accompanied with dash and insolence. It seems to me impossible that Whitaker could have written well on the subject of Mary Queen of Scots, his powers of judgment being apparently so abject." (Coleridge's *Literary Remains*, vol. iv. p. 306.)

Whitby. cial comfort, an impetuousness that brooked not opposition, and bore down all before it. This precipitation was in part also to be traced to his ignorance of the world; to his simplicity in believing others like himself—precisely what they seemed to be; and, on the detection of his error, his anger at dissimulation or hypocrisy. But his general good humour, his hospitality, and his convivial pleasantry, were surely enough to atone for those sudden bursts of passion, those flashes which betrayed his 'human frailty,' but still argued genius." (See *Gentleman's Magazine*, vol. lxxviii. p. 1037; Nichol's *Literary Anecdotes of the Eighteenth Century*, vol. iii. p. 105, and Baines's *History of the County of Lancaster*, vol. ii. p. 385.)

WHITBY, a parliamentary borough and seaport town of England, in the north riding of Yorkshire, on both sides of the Esk, at its mouth in the German Ocean, 45 miles N.E. of York, and 236 N.N.W. of London. The river is crossed by a handsome iron drawbridge, admitting vessels of 500 tons to the inner harbour. On both sides, especially on the E., the ground rises steeply from the river; and the best and largest part of the town is built on the W. bank, where the streets have been carried over the ridge of the hill. On the other side there is only a narrow stripe of houses along the bank. The streets in both parts are narrow, and many of the houses are old and indifferently built, partly of stone and partly of brick. Recently, however, several new and handsome streets have been added to the town, and some of the old ones improved and widened. The parish church is not very conveniently situated on a cliff on the E. side of the river, about 350 feet above the sea, and it is reached by a flight of steps from the town. It was originally a Norman building, but has been very much altered at various times since its first erection. Near it stand the ruins of the ancient abbey, which was originally founded by Oswy, king of Northumberland, in the seventh century; and after having been destroyed by the Danes, was restored on the Norman conquest. These ruins comprise parts of the cruciform church of the abbey, the beautiful tower of which fell in 1830. Whitby has also a chapel of ease, erected in 1778, two other churches in the early English style, and Presbyterian, Independent, Methodist, Quaker, Roman Catholic, and Unitarian places of worship. There are also a town-hall, custom-house, baths, library, museum, mechanics' institute, national, British, and infant schools, alms-houses, and a sailors' hospital. Whitby rose into commercial importance in the reign of Queen Elizabeth, when the working of the alum-mines in the vicinity formed the most important branch of industry. During the last French war, seven dock-yards were kept in constant employment for ship-building; and sail-cloth, ropes, cordage, &c., were also made here; but since that time these manufactures have considerably declined, and some of the dock-yards are now entirely disused. Whitby is still, however, an important seaport. The harbour is formed by a pier projecting from each side of the river; that on the west being about 1000 feet long, and having a light-house at the end. Two inner piers protect the harbour from the waves of the German Ocean. There are commodious quays, and wet and dry docks. The number of sailing vessels belonging to Whitby, at the end of 1858, was 455, tonnage 74,387; of steamers 3, tonnage 60. In the same year there entered the port 842 sailing vessels, tonnage 42,835; and 2 steamers, tonnage 40; and there cleared 140 sailing vessels, tonnage 7601; and 19 steamers, tonnage 516. Whitby returns one member to Parliament. Pop. (1851) of the borough, 10,989.

WHITBY, Daniel, a learned divine, was born at Rushden in Northamptonshire in the year 1638. In 1653 he was admitted of Trinity College, Oxford, and was elected a scholar in 1655. He took the degree of A.B. in 1657, and of A.M. in 1660. In 1664 he was elected a fellow of his college, and about the same time began to distinguish himself by the publication of some controversial works against the papists. The credit which he thus obtained recommended him to Dr Ward, bishop of Salisbury, who appointed him his chaplain, and in 1668 collated him to two different prebends in that cathedral. In 1672 he was admitted precentor of the same church, and about the same time took the degree of D.D. He was likewise preferred to the rectory of St Edmund's at Salisbury; but his next publication had no tendency to advance him in the church. It appeared anonymously, under the title of *The Protestant Reconciler*, Lond. 1683, 8vo. The churchmen of that period were unprepared for the reception of such doctrines; and the author was immediately exposed to a storm of controversial abuse. The bishop obliged him to make a formal retractation; and in a second part of the *Protestant Reconciler*, he endeavoured in some measure to recover the good opinion of his more bigoted brethren. He now sent to the press a treatise on a less hazardous subject; *Ethices Compendium, in usum academicæ juventutis*, Oxon. 1684, 8vo. His most important work, the principal labour of fifteen years, was his *Paraphrase and Commentary on the New Testament*, published in 1700, in two volumes folio. He afterwards published additional annotations, and an *Examen variantium Lectionum Johannis Millii in Novum Testamentum*. Among the other works which he produced, are *The Necessity and Usefulness of the Christian Revelation*, Lond. 1705, 8vo. In 1710 he published two works against Calvinism. One of these, a discourse with a long title, is commonly described as "Whitby on the five Points." In 1711 he published a Latin treatise on original sin. According to Bishop Tomline, he confuted Calvinism almost to a demonstration; but the bishop was himself a very slender and superficial theologian. He likewise wrote *Dissertatio de Scripturarum Interpretatione secundum Patrum Commentarios*, Lond. 1714, 8vo. The scope of this dissertation is to evince, by copious examples, that the fathers are for the most part very incompetent and unsafe guides in matters of theological controversy. Dr Whitby had now become a decided Arian; and to these opinions, apparently derived from Dr Clarke, he adhered till the time of his death. Having preached at St Edmund's church on the preceding day, he died on the 24th of March 1726, at the age of eighty-eight. Of the changes in his creed he left an account in *The last Thoughts of Dr Whitby*, &c., Lond. 1727, 8vo. This posthumous publication was accompanied with an account of his life by Dr Sykes.

White. WHITE, Gilbert, one of the most pleasing and popular writers on natural history, was born in 1720, in the little village of Selborne, in Hampshire, which his writings have rendered familiar to all lovers of nature. He was the eldest son of John White, Esq., and his ancestors had been long connected with Selborne. He was educated at Basingstoke, under the elder Warton, father of the historian of English poetry. In 1739 he entered Oriel College, Oxford, where he graduated at the usual time, and became a fellow; and his estimation at the university is attested by his election in 1752, to be one of the senior proctors. He possessed considerable acquirements, and might easily have obtained a college living; but he seemed insensible to the longings of ambition, and retired to his native village, where he devoted his life to the study of natural history from the best of all sources, the observation of nature. The principal results of his observations are contained in two series of letters to Mr Pennant and Daines Barrington, which have been repeatedly printed, and under the name of the *Natural History of Selborne*, have acquired a permanent place in English literature. Probably no work on natural history has found more admirers than this unpretending little treatise. It operates upon the reader with somewhat of the charm that characterizes Walton's *Angler*; and if many of

White. the disciples of the "gentle craft," owe their first love of its mysteries to the genial inspiration of "honest" Izaak, many of the students of natural history received their first impulse from the pleasant pages of Gilbert White. The style of his work is simple and graceful, possessing all the elegance of a highly cultivated mind and a refined taste, and free from the pedantry of the scholar. His observations of nature are distinguished for their minuteness and accuracy; and with little parade, formed the most important contribution of his time to the science which he so assiduously cultivated. Besides his *Natural History*, White wrote some letters on the antiquities of Selborne, and a few poetical pieces of some merit. He died in 1793.

WHITE, *Henry Kirke*, an amiable young poet, was the son of a butcher in Nottingham, where he was born on the 21st of March 1785. He began to indite poems at the age of thirteen, and he showed a passion for books from his earliest years. His father was compelled to employ him as message boy on all available occasions; and he might be seen frequently poring over a volume as he bore along the butcher's basket. The lad's mother, who, both by ability and by education, was considerably above her class, got the father to change his intention of bringing up the youth to his own trade. Accordingly, at the age of fourteen, Kirke White was placed at a stocking-loom to learn the trade of a hosier. He remained at this business only a year, when he was placed in an attorney's office in his native town. During his leisure hours he acquired a fair knowledge of Latin, Italian, Spanish, Portuguese, chemistry, astronomy, electricity, drawing, and music. He, besides, practised as a speaker in a literary society in Nottingham, and exercised his pen on prose and poetry for various periodicals. White became much impressed about this time with serious views of religion, which accordingly tinges all his future writings. In 1804 he was induced by the proprietor of the *Monthly Mirror*, to publish a volume of poems, which was crushed by the critics before it had well seen the light. The little book was fortunate enough to gain him the friendship of Southey, to whose generous care the memory of the youthful poet is now largely indebted for its fame. White had cherished for some time the apparently impossible idea of ultimately gaining a university education, and of becoming a clergyman. This prospect he was enabled to carry out in 1804, by the liberality of the Rev. Mr Simeon who procured for him a sizarship in St John's College, Cambridge. White studied night and day for two years at the university, and was rewarded by seeing his name placed first in the list of the general college examinations of each year. But while the poor youth was gaining college laurels, he was burning out the feeble lamp of his own life. He died of consumption on the 19th of October 1806, in his twenty-second year.

The touching circumstances of Kirke White's death, more than any inherent excellence in his verse, have made his name be remembered, and his poems be quoted much longer than is ordinarily allotted to the author of mediocre numbers. His poetry, while always pervaded by Christian feeling, and generally by rhythmical melody, is nevertheless flat in tone, and but feeble or imitative in manner. *The Remains of Henry Kirke White*, which have often been published, were committed to the care of his friend Southey, who, in 1807, performed the part not only of a literary executor, but of an enthusiastic eulogist.

WHITE, *Joseph Blanco*, was born at Seville in 1775. His grandfather, William White, was an Irishman, who settled at Seville, engaged in business, became a large exporting merchant, and was ultimately raised to the ranks of the nobility. Under his son, the house failed; but, after a temporary suspension, business was again resumed. The son married a lady of rank, descended from an old Andalusian family, and Blanco White was the issue of this marriage. The youth, as soon as he was able to render any service, was taken into the counting-house; but he showed a strong disinclination to mercantile pursuits, and, at his own earnest request, he was sent to college and educated for the priesthood, to which he was regularly ordained in 1799. His new profession suited him no better than the mercantile life from which he had escaped; he disliked his clerical duties, and doubted the truth of the doctrines which he was required to teach. In 1814, he left his native country and repaired to London, where, shortly after his arrival, he established a monthly Spanish paper, which he conducted with much ability till the events of 1814 rendered it no longer necessary to continue it, when he received from the English government a pension of L.250 per annum for life. About the same time, he renounced the Romish Church and joined the Church of England; but he never inquired long or deeply into any form of religious faith: his creed varied from year to year, and at last settled in something very like scepticism. He resided chiefly in London, but the last few years of his life were spent in Liverpool. He occupied himself mainly in literary pursuits, and was the author of several works, none of which have retained any permanent place in our literature. Among these may be mentioned:—*Practical and Internal Evidence against Catholicism*, 1825; *Poor Man's Preservative against Popery*, 1825; *Second Travels of an Irish Gentleman in search of a Religion*, 2 vols., 1833. He also contributed to the *Quarterly* and *Westminster Reviews*, and wrote a series of "Letters from Spain," in the *New Monthly Magazine*, which were subsequently issued separately in 1822. His most interesting work, however, was an autobiography, which was published posthumously in 1845, in 3 vols. He died at Liverpool in 1841.

Whitefield. WHITEFIELD, GEORGE, was born at the Bell Inn, in the city of Gloucester, on the 16th of December 1714. He received his education at the grammar-school of that city, where he made some progress in classical learning; and his talents for elocution enabled him to appear to advantage in the speeches which he delivered before the corporation on their annual visitation. He was taken from school before he was fifteen, and, as his mother's circumstances were by this time much reduced, he began to assist her in the business of the tavern. At the age of eighteen, he was entered as a servitor at Pembroke College, Oxford, where he formed an acquaintance with Charles and John Wesley, and several other young men under religious impressions, who "lived by rule and method," and were, therefore, called Methodists. Whitefield soon adopted their opinions and manners; and so far did his enthusiastic disposition carry their ascetic practices, that his health became seriously injured. After a severe illness, which brought him to the brink of the grave, he found it necessary to retire to Gloucester for the benefit of his native air. His general character there, his demeanour at church, his visiting the poor, and praying with the prisoners, attracted the notice of Dr Benson, bishop of Gloucester, who informed him, that although he had resolved to ordain none under three and twenty (and Whitefield was only twenty-one), he should think it his duty to ordain him whenever he applied for holy orders. This offer Whitefield accepted, and was made deacon in 1736. The week following, he returned to Oxford, took his degree, and diligently employed himself in the instruction of the poor and the prisoners. During the two succeeding years, by his preaching in London, Bath, Bristol, and other places, the fame of his eloquence was widely diffused, and immense multitudes everywhere attended upon him. In the year 1736, he went to officiate as minister at Dummeer, in Hampshire; but, being invited to join the Wesleys and other friends who had gone out as missionaries to a new colony in

Whitefield. Georgia, he went to London to wait on the trustees for Georgia. During his residence in the metropolis, he preached with remarkable success to crowded assemblies; and so great was the fame of his eloquence, that on Sunday mornings, long before day, the streets were filled with people, going to hear him with lanterns in their hands. In the latter end of December 1737, he left London and embarked for Georgia, which he reached in May 1738. After a residence of three months there, he found it necessary to return to England, in order that he might receive priest's orders, and that he might raise contributions for founding and supporting an orphan-house in the colony.

The separation of the Methodists, and their organization as a distinct sect, was daily becoming more inevitable; for, after his return, the clergy received him with great coldness, and excluded him from most of the parochial pulpits. He was therefore compelled to adopt some new method to preserve his usefulness. He accordingly went and preached in the open air to the colliers in the vicinity of Bristol;—a numerous and lawless race, who had been totally neglected by the parochial clergy, and were as ignorant and savage as heathens. The second and third time of his preaching out of doors, his audience greatly increased, till it amounted to 20,000 persons. "The first discovery of their being affected," says Whitefield, "was by seeing the white gutters made by their tears, which plentifully fell down their black cheeks."

In August 1739, he embarked a second time for America, where he remained nearly two years. During his absence, however, his popularity had sensibly declined at home. The Moravians had made inroads upon the society, and John Wesley had not only preached, but printed, a sermon in favour of sinless perfection and universal redemption, and had exerted himself still more earnestly against the Calvinistic doctrines to which Whitefield was strongly attached. The latter earnestly desired to avoid all disputes, and exhorted Wesley to brotherly kindness and forbearance; but the conduct of injudicious partisans on both sides soon rendered a separation inevitable. Shortly after his separation from Wesley, Whitefield's friends built a large shed for him near the Foundry (Wesley's Church). As it was merely a temporary structure, to screen the audience from cold and rain, he called it the Tabernacle. A fresh excitement immediately began, immense congregations were formed, and new scenes of usefulness opened upon him daily. Having been earnestly invited to visit Scotland by Ebenezer and Ralph Erskine, the founders of the Secession Church, he accepted the invitation in the year 1741, and commenced his labours in the Secession meeting-house in Dunfermline. Whitefield, however, was too liberal in his principles to limit the benefit of his services to any sect. "In every building," he said, "there were outside and inside workmen, and the latter was his province." And having differed from his new associates on this ground, he made a tour through the country, and with the greatest success preached in all the large towns to immense crowds. A large sum of money was contributed for the support of his orphan-school, and he was presented with the freedom of the towns of Edinburgh, Glasgow, Aberdeen, Stirling, Paisley, and Irvine.

From Scotland he went, at the end of October, into Wales, where he married Mrs James, a widow. His marriage, like Wesley's, was not a happy one, and the death of his wife is said by one of his friends to have "set his mind much at liberty." Whitefield was irritable, and impatient of contradiction; and even if his temper had been more happily constituted, his habits of life rendered him unfit for the duties of a husband and a father.

On his return to London, his enthusiasm led him to engage in a singular contest with the showmen and others who then exhibited in Moorfields during the Whitsun holidays, when, he said, Satan's children kept up their annual rendezvous. "This," says Mr Southey, "was a sort of pitched battle with Satan, and Whitefield displayed some generalship upon the occasion." Attended by a large congregation of "praying people," he began at six o'clock in the morning. Thousands who were waiting there for the usual sports all flocked around him. "Glad was I to find," says he, "that I had for once, as it were, got the start of the devil. Being thus encouraged, I ventured out again at noon, when the fields seemed all white, ready, not for the Redeemer's, but Beelzebub's harvest." Thinking that, like St Paul, he should now, in a metaphorical sense, be called to fight with wild beasts, he took for his text, "Great is Diana of the Ephesians." "I could scarce help smiling," says he, "to see thousands, when one of the choicest servants of Satan was trumpeting to them, upon observing me in my black robes and my pulpit, all, to a man, deserting him and flocking to hear the Gospel. But this, together with a complaint that they had taken many pounds less that day than usual, so enraged the owners of the booths, that when I came to preach a third time in the evening, in the midst of the sermon a Merry-Andrew got upon a man's shoulders, and, advancing near the pulpit, attempted to slash me with a long heavy whip several times. Soon afterwards, they got a recruiting sergeant, with his drums and fifes, to pass through the congregation; but I desired the people to make way for the king's officer, which was quietly done." When the uproar became, as it sometimes did, so great as to overpower his single voice, he called the voices of all his people to his aid, and began singing; and thus, what with singing, praying, and preaching, he continued upon the ground till the darkness made it time to break up. So great was the impression produced in this extraordinary scene, that he received 1000 notes from persons under conviction, and, soon after, about 350 persons were received into the society in one day. Whitefield.

In August 1744 he embarked a third time for America, where he continued his usual course of itinerant preaching for upwards of three years. On returning to England, after an absence of nearly four years, with a constitution shattered by his incessant labours and the unfavourable climate, he found his congregation at the Tabernacle nearly dispersed; and such was the depression of his own circumstances, that he was obliged to sell his household furniture to pay his orphan-house debts. But he now obtained an important accession to his cause, and a zealous propagator of his sentiments, from a quarter whence it was least expected, in the person of the Countess of Huntingdon. That noble lady, who was, in will at least, as munificent a patron to the followers of Whitefield as the Countess Matilda was to the papacy, invited him to her house at Chelsea as soon as he landed; and after he had twice officiated there, she wrote to him inviting him again, that some of the nobility might hear him. A large circle attended, among whom were Lords Chesterfield and Bolingbroke. The former complimented the preacher with his usual courtliness; the latter is said to have been much moved at the discourse. The countess appointed Whitefield one of her chaplains; and gave most efficient support to the Calvinistic Methodists, by building and endowing chapels in various parts of the country, and by erecting a college for training up young men for the ministry. The remaining years of Whitefield's life were spent in the same incessant labours. He made several voyages to America; he visited Scotland thrice; he made a laborious excursion through the west and north of England, preaching, as usual, to immense multitudes; he visited Ireland twice, and on the second expedition narrowly escaped with his life from the fury of a Roman Catholic mob. It is stated by one who knew him well, that, "in the compass of a single week, and that for years.

Whitefield. he spoke in general forty hours, and in very many sixty, and that to thousands." These unremitting labours at length exhausted his vigour. On his return from America to England for the last time, Wesley was struck with the change in his appearance. "He seemed," says he in his journal, "to be an old man, being fairly worn out in his Master's service, though he had hardly seen fifty years." In 1769 he returned to America for the seventh and last time. His career was now drawing rapidly to a close. An asthmatic complaint had for some time been making inroads upon his constitution. When it first seized him, one of his friends expressed a wish that he would not preach so often, and his reply was, "I had rather *wear* out than *rust* out." His death was at last somewhat sudden and unexpected. He arrived at Newbury, in New England, on the evening of 29th September 1770, with the intention of preaching there the next morning. On retiring to rest, however, he was much disturbed, and complained heavily of an oppression on his lungs. The symptom was fatal, for he expired on the following morning, in the fifty-sixth year of his age. According to his own desire, he was buried before the pulpit, in the Presbyterian church of the town where he died.

The character of this zealous and enthusiastic divine, like most others possessing warm friends and bitter enemies, has been represented in very different lights. That he had much enthusiasm and some fanaticism in his disposition is obvious, both from his journals and letters. Like Wesley, he magnified the most trifling incidents into miraculous interpositions in his favour, and lent a ready faith to whatever marvels had a tendency to designate him as the favourite of God, or the peculiar object of Satan's fury. But in spite of these defects, it cannot be denied that his unwearied diligence in doing good, his zeal for the truth, his piety, his self-denial, his benevolence and boundless charity, justly entitle him to a place among the most distinguished men of his age. Whitefield had neither the inclination nor the abilities to render himself, like Wesley, the head and absolute ruler of a party; but he was as superior to his distinguished coadjutor in openness and simplicity of character, and in the absence of vanity and personal ambition, as he was inferior to him in intellect and learning. Franklin has justly observed that it would have been fortunate for his reputation if he had left no written works, for his writings of every kind are below mediocrity; they afford the measure of his knowledge and of his intellect, but not of his genius as a preacher. Whitefield's great talent, in fact, was popular oratory; and though occasionally alloyed with some improprieties both of language and manner, yet there was in all his discourses a force and vehemence and passion, a fervent and melting charity, and an earnestness of persuasion, which produced the most extraordinary effect upon all ranks and descriptions of people. Hume pronounced him the most ingenious preacher he had ever heard, and said it was worth while to go twenty miles to hear him. But perhaps the greatest proof of his persuasive powers was when he drew from Benjamin Franklin's pocket the money which that clear, cool reasoner had determined not to give: it was for the orphan-house at Savannah. "I did not," says the American philosopher, "disapprove of the design; but as Georgia was then destitute of materials and workmen, and it was proposed to send them from Philadelphia at a great expense, I thought it would have been better to have built the house at Philadelphia, and brought the children to it. This I advised, but he was resolute in his first project, rejected my counsel, and I therefore refused to contribute. I happened soon after to attend one of his sermons, in the course of which I perceived he intended to finish with a collection, and I silently resolved he should get nothing from me. I had in my pocket a handful of copper money, three or four silver dollars, and five pistoles of gold. As he proceeded I began to soften, and concluded to give the copper; another stroke of his oratory made me ashamed of that, and determined me to give the silver; and he finished so admirably that I emptied my pocket wholly into the collector's dish, gold and all." (J. T—R.)

Whitehaven ‖ Whitelocke

WHITEHAVEN, a parliamentary borough, seaport, and market-town of England, on the west coast of the county of Cumberland, 38 miles S.W. of Carlisle, and 294 N.N.W. of London. It is situated on a small creek of the Irish Sea, and comprises a number of handsome, straight, wide, streets, which intersect each other at right angles, and are well paved and lighted with gas. The town has advanced to its present state of prosperity from being, in 1566, a small place containing six fishermen's huts. For this progress it is chiefly indebted to the family of Lowther, who, having large estates around the town, and valuable possessions of coal underneath it, have liberally come forward, when opportunities occurred, to promote its prosperity. There are four churches, and places of worship belonging to Presbyterians, Independents, Methodists, Baptists, Quakers, and Roman Catholics. The institutions for educational purposes comprise a marine school, national, British, and infant schools. There are also an infirmary, a fever hospital, a dispensary, and a house of industry. The public buildings, including a town-house, market-house, custom-house, theatre, and news-room, are well adapted for their respective purposes. Its harbour is spacious and commodious, having several piers extending into the sea in different directions, and affording ample security to the shipping. There is attached to the harbour a patent slip, erected at the expense of Lord Lonsdale. There are two lighthouses at the entrance of the harbour, and a third is situated on the promontory of St Bees' Head, three miles to the south-west. The commerce of this port is very extensive; the principal export articles being coal, iron, and iron ore. The chief manufactures are coarse linens, and articles connected with the fitting out of vessels. The town contains iron and brass foundries, and breweries. The coalworks in the vicinity are very important, and are the principal source of wealth to the town. The mines extend for upwards of two miles under the sea; and such vast quantities have been excavated, that they have the appearance of a subterranean city. The quantity of coal shipped from the port in the year 1859–60 was 195,508 tons, and of iron 198,397 tons, besides about as much more used at the iron furnaces of Cleator Moor, and Workington, and sent by railway. The net amount of custom dues collected in that year was L.68,931. In the end of 1858 there were 179 sailing vessels, tonnage 27,499; and 3 steamers, tonnage 564, belonging to the town. In the same year there entered the port 751 sailing vessels, tonnage 32,077; and 252 steamers, tonnage 53,569. And there cleared 3339 sailing vessels, tonnage 228,637; and 301 steamers, tonnage 74,730. Steam-vessels sail regularly to Liverpool, Belfast, Dublin, and the Isle of Man. Whitehaven is governed by 21 trustees elected triennially, and returns a member to parliament. The population of the borough in 1851 amounted to 18,916, including Preston Quarter, which contained 5102. In 1801 the population of the town of Whitehaven was 8742, and of Preston Quarter 1886; in 1831, of the former 11,393, and of the latter 4323.

WHITELOCKE, Bulstrode, the son of Sir James Whitelocke, one of the judges of the Common Pleas, was born in 1605. He was educated at Merchant Taylors' School, and at St John's College, Oxford, where Laud was then president. From him he received much kindness, in return for which he refused to draw up the charges against Laud when desired to do so by the Long Parliament. On leaving the university, he entered the Middle Temple, and

White Sea ‖ Whithorn.

in 1640 he sat in the Long Parliament as member for Great Marlow. He may be considered as a type of the large class of waverers whose uncertain conduct in the great events of the reign of Charles, prolonged the civil strife, and perplexes the historian who attempts to trace the motives of their actions. Thus he acted as chairman of the committee for impeaching Strafford; on the militia question he steered a middle course, maintaining that the power of raising them lay neither in the king nor in the parliament, but in both jointly. He was one of the commissioners appointed to treat at Oxford; but was also a member of the Assembly of Divines, where, however, he opposed the claims to a *jus divinum* put forth by the more extravagant of the Presbyterians. In the second treaty at Oxford, he was so anxious for peace, that he made secret proposals to the king, the discovery of which exposed him to some danger. He opposed the self-denying ordinance, yet with characteristic vacillation he informed Cromwell of Essex's designs against him. When the independent party began to adopt more violent measures, Whitelocke was more decided in espousing the king's cause as the only means of retaining a vestige of the old constitution. He refused to serve on the committee for accusing Charles, and in the House boldly condemned what he called "that bad business." On the king's execution, he seems to have looked to Cromwell as the only person able to govern the country; yet, as he had no other title to his dignity than force, he longed for some legally constituted authority. Thus, while he became one of the commissioners of the Great Seal, he also proposed to make terms with Charles II. or his brother, and was actually hardy enough to recommend Cromwell to do so. He went as ambassador from the Commonwealth to Sweden; and though he was not nominated to Cromwell's first parliament, he sat in the second, and was for a short time speaker in the third. He was mean enough to become one of Cromwell's lords, and was one of those who offered him the crown; yet he was constantly offending him by protesting against his arbitrary and tyrannical proceedings. He took also a prominent share in the proceedings of the shifting governments which followed the death of Cromwell, and though he was so unskilled in reading the signs of the times as to have joined an engagement to renounce all allegiance to the house of Stuart, he soon after changed his purpose, and is said to have wished to carry the great seal to Breda. After the Restoration, his name was, with some difficulty, placed in the Act of Oblivion, and his political life being over, he retired to his country seat in Wilts, where he died in 1676. During his retirement, he wrote his valuable *Memorials of the English affairs from the beginning of the Reign of Charles I. to the happy Restoration of Charles II.; An Account of the Swedish Embassy in* 1653–4; and *Memorials of the English affairs from the supposed Expedition of Brute to the end of James I.'s Reign;* all of which were published posthumously.

WHITE SEA. See RUSSIA.

WHITHORN, a royal and parliamentary borough of Scotland, in the county and 11 miles south of Wigton, and 2½ miles west of Wigton Bay. It consists chiefly of one street lying north and south, and nearly half a mile in length. The houses are not inelegant, though somewhat irregularly built. The only public buildings are the town-house and jail, the parish church, Free church, United Presbyterian, and Reformed Presbyterian places of worship. The town is devoid of manufactures, but maintains two branch banks. The population in 1851 amounted to 1652. The Isle of Whithorn, a village about 3 miles to the S.E., is the port of the borough. The municipal government is vested in a provost, two bailies, and six councillors; and Whithorn unites with Stranraer, Wigton, and New Galloway in sending a representative to the House of Commons. Municipal revenue, 1858–9, L.266. Whithorn is celebrated for its antiquity, and is conspicuous in the annals of the Church. Its original name was *Candida Casa*, White House, from the circumstance that, in the beginning of the fifth century, a church was erected there of white stone, supposed to be the first in Scotland built of such solid materials. The founder of it was St Ninian, a native of the place, who died and was buried there in 432. His memory was held in such veneration, that many places both in England and Scotland were called after his name, and pilgrimages were frequently made to his shrine until the Reformation, when such superstitious practices were prohibited. The kings of Scotland not only visited this spot themselves, but encouraged others to do so, and granted protection to all strangers coming on pilgrimage to Whithorn. James IV. performed the pilgrimage several times, and once did so *on foot*. James V. was the last royal personage that paid a visit to St Ninian's shrine. Candida Casa was, till 1689, the seat of the Bishop of Galloway; and about the middle of the twelfth century, a monastery was founded at Whithorn by Fergus, Lord of Galloway, for monks of the Premonstratensian order. The most eminent persons connected with this monastery were James Beaton, afterwards archbishop of St Andrews and Gavin Dunbar, afterwards successively tutor to James V., archbishop of Glasgow, and chancellor of the kingdom. Of the cathedral and monastic buildings scarcely any remains can be traced, except a few arches, particularly a very beautiful one of the Saxon order, and several vaults.

Whitstable ‖ Whytt.

WHITSTABLE, a market town and seaport of England, in the county of Kent, on a bay near the mouth of the Swale, opposite the isle of Sheppey, 5 miles W.N.W. of Canterbury. On an eminence overlooking the town, stands the ancient parish church, and there are also here places of worship for Independents and Wesleyans, and national schools. An extensive oyster-fishery is carried on here; and there are breweries, ropeworks, and boatbuilding yards, and a considerable trade in coals. Some Roman pottery has recently been found among the oyster-beds, which would seem to indicate that there had been a Roman station here. Pop. 3086.

WHYDAH, a seaport of Africa, Guinea, N. Lat. 6. 14., E. Long. 1. 36., formerly the capital of a rich state, now tributary to Dahomey, and the principal port in that kingdom. Until recently it was notorious as a slave-port, and at present it is the seat of a brisk trade in oil, especially with Marseilles. Pop. 7000.

WHYTT, ROBERT, an eminent physician, was born at Edinburgh on the 6th September 1714. After receiving the first rudiments of school education, he was sent to the University of St Andrews; and after the usual course of instruction there, in classical, philosophical, and mathematical learning, he came to Edinburgh, where he entered upon the study of medicine under those eminent medical teachers, Monro, Rutherford, St Clair, Plummer, Altson, and Innes. After learning what was to be acquired at this university, in the prosecution of his studies he visited foreign countries; and after attending the most eminent teachers in London, Paris, and Leyden, he took the degree of doctor of physic at Rheims in 1736, being then in the twenty-seventh year of his age. Upon his return to his native country, he had the same degree conferred upon him by the University of St Andrews, where he had before taken with applause, the degree of master of arts. Not long afterwards, in the year 1737, he was admitted a licentiate by the Royal College of Physicians of Edinburgh; and the year following he was raised to the rank of a fellow. From the time of his admission as a licentiate, he entered upon the practice of physic at Edinburgh; and the reputation which he acquired for medical learning pointed him out as a fit successor to the first vacant chair in the univer-

Wiborg ‖ Wick.

sity. Accordingly, when Dr St Clair resigned his academical appointments, Dr Whytt was elected his successor on the 20th of June 1746, and began his first course of the institutions of medicine at the commencement of the next winter session. In 1752, he was elected a fellow of the Royal Society of London; in 1761, he was appointed first physician to the king in Scotland; and in 1764, he was chosen president of the Royal College of Physicians at Edinburgh. But the fame which Dr Whytt acquired as a practitioner and teacher of medicine was not a little increased by the information which he communicated to the medical world in different publications. His celebrity as an author was still more extensive than his reputation as a professor. His first publication was *An Essay on the Vital and other Involuntary Motions of Animals.* The next subject which employed the pen of Dr Whytt was one of a nature more immediately practical. His *Essay on the Virtues of Lime-Water and Soap in the Cure of the Stone* first made its appearance in a separate volume in 1752. His third work, entitled *Physiological Essays*, was first published in the year 1755. His *Observations on the Nature, Causes, and Cure of those Disorders which are commonly called Nervous, Hypochondriac, and Hysteric*, was published in 1764. The last of Dr Whytt's writings is entitled *Observations on the Dropsy in the Brain.* This treatise did not appear till two years after his death, when all his other works were collected and published in one quarto volume, under the direction of his son and of his intimate friend the late Sir John Pringle. Besides these five works, he wrote many papers, which appeared in different publications, particularly in the *Philosophical Transactions*, the *Medical Essays*, the *Medical Observations*, and the *Physical and Literary Essays.* He died on the 15th of April 1766, in the fifty-second year of his age.

WIBORG, or VIBORG, a town of European Russia, Finland, capital of a government of the same name, on the N.E. shore of the Gulf of Finland, at the head of a small arm of the sea. It is strongly fortified, and, though an ancient town, has a very handsome appearance, with broad and regular streets. It contains the ruins of an old castle, three Protestant, a Roman Catholic, and a Greek church, a gymnasium, and an hospital. An extensive trade is carried on in fish, timber, tar, and tallow. Pop. (1857) 5381.

WICK, a parliamentary and royal burgh of Scotland, in the county of Caithness, on the bay of the same name, 137 miles N.N.E. of Inverness. It stands in a low situation, and its houses are irregularly built, and crowded together. The river Wick, here crossed by a handsome bridge, separates it from the suburb of Pulteneytown, which, along with that of Louisburgh, is included within the parliamentary limits of the burgh. Pulteneytown was founded in 1808, under the auspices of the British Fishery Society; and it is well and regularly built, containing all the houses of the better class of inhabitants. The public buildings comprise a town-house and jail, town and county hall, and custom-house. The parish church is at Wick, and there is a chapel of ease at Pulteneytown, Free churches in both places, and places of worship for United Presbyterians, Independents, Episcopalians, and Roman Catholics. There are an academy, a parish school, a Free church school, library, and savings-bank. The burgh is governed by a provost, 2 bailies, and 12 councillors; and it unites with Cromarty, Dingwall, Dornoch, Kirkwall, and Tain, in returning a member to parliament. It has been a royal burgh since 1589, and represented in parliament since the Union. Since 1828, sheriff-courts have been held here instead of at Thurso, which was till then considered the head burgh of the county. It has several ropeworks, a gaswork, distilleries, ship and boat building yards, and a bank. The trade consists chiefly in the herrings which are here caught, cured, and exported. In 1858, there were employed in this fishery, in the district of Wick, 935 boats, manned by 3593 fishermen and boys, and valued, along with the nets and lines, in all at L.85,741. There were also engaged 127 fishcurers and 329 coopers, in curing and barrelling the fish. In the same year, 101,661 barrels of herring were cured, and 36,866 cod, ling, and hake, taken or purchased. Flagstones for pavements are also prepared and exported here. The bay, though somewhat dangerous, is much resorted to by shipping, and during the herring season presents a lively and interesting appearance, being covered with 600 or 800 fishing-boats, mixed with some larger craft, among which is often to be seen a government cruiser. Harbours have been constructed by the British Fishery Society at Pulteneytown, and there is one at the village of Staxigo, a little to the E., near Noss-Head; but these being all inadequate to the shipping, and there being a great want of harbours of refuge on this part of the coast, a royal commission has recommended, March 3, 1859, the formation of one here, by means of breakwaters to enclose the whole bay. The cost of such a work is estimated at L.250,000, of which half is to be raised in the district, and the other half supplied by a government grant. In the year 1858, the number of registered sailing-vessels belonging to Wick was 58, tonnage 3537; and of steam-vessels 2, tonnage 188. In the same year, there entered the port 568 sailing-vessels, tonnage 33,507; and 299 steamers, tonnage 53,083; and there cleared 484 sailing-vessels, tonnage 26,672; and 298 steamers, tonnage 53,063. Steamers touch regularly at Wick on their way between Leith and Shetland; and trading-smacks ply to London, Hull, and other English ports. Pop. (1851) of the royal burgh, 1514; of the parliamentary do., 6722.

Wickliffe ‖ Wicklow.

WICKLIFFE, JOHN. See WYCLIFFE.

WICKLOW, a maritime county in the province of Leinster, in Ireland, bounded on the north by Dublin county, on the east by St George's Channel, on the south by Wexford, and on the west by Carlow, a detached portion of Dublin, and Kildare. It lies between 52.40 and 53.14 north latitude, and 5.57 and 6.46 west longitude, extending forty miles in its greatest length from north to south, and thirty-three in its greatest breadth from east to west, and comprehending an area of 781 square miles, or 500,178 acres, of which 280,393 are arable, 200,754 uncultivated, 17,600 in plantation, 341 in towns, and 1090 are covered with water.

The central part of the county consists of a range of elevated mountains, which contains the 201,000 acres of unimproved pasture land, 130,000 of which are situated in positions exceeding 1000 feet in elevation. It is probable that about 20,000 acres may be drained and cultivated advantageously; 70,000 acres may be drained, and thereby improved as pasture for sheep and young cattle, and about 111,000 acres must be considered as wholly unimprovable.

According to Ptolemy the geographer, the northern part of the county was the residence of the tribe of the Cauci, and the southern that of the Menapii. It was afterwards occupied by the Irish septs of the Byrnes and O'Tooles, who, though the district was claimed by the English after their settlement, as part of the county of Dublin, maintained their independence, and carried on an almost continual war against the new settlers, until the end of the reign of Elizabeth, after whose death the district was made shire-ground by her successor, James I., in 1605. The inhabitants adhered to the royal cause during the war of 1641, until the arrival of Cromwell, to whose superior force they submitted without opposition. No other occurrences of historical importance took place until the year 1798, when several bands of insurgents sought refuge in the mountain-fastnesses after the dispersion of their main body in Wexford, and continued to harass the neighbouring

Wicklow. counties, until tranquillity was restored, partly by making terms with their leaders, and partly by cutting roads and establishing military posts through the interior of the country, which till then had been nearly impassable.

The county forms one of the four great mountain-groups of Ireland. The land rises from the valley of the Liffey and Dublin Bay on the north, by successive ridges, increasing in height, and occasionally intersected by deep glens, to the middle of the county, whence it again subsides to the borders of Wexford and Carlow. The direction of the range is from north-east at Bray, to south-west, the central part of the line being usually the most elevated, and the surface declining to the sea on the east, and the level country of Kildare and Carlow on the west. Lugnaquilla, to the east of Baltinglas, is the most elevated point of the range. Its summit is 3039 feet above the sea-level. To the north, on the verge of Dublin county, are the Butter Mountain, 1459, Kippure, 2473, and the Three-rock Mountain, 1763 feet high; more southerly, Douce, 2384 feet, and Sugar-loaf, 1126. In the centre are Thonalagee. 2683; Comaderry, 2296; Lugduff, 2148; Knockreagh, 1559; and Croghan, 2175. The glens form very striking and picturesque features of this romantic district, being deep, narrow, and several of them densely covered with wood. The most celebrated are the Dargle, near the county of Dublin; Glencree, the Glen of the Downs, the Devil's Glen, Glenmalure. More open and fertile are the Glen of Imaill and the Vale of Ovoca. The rivers are few and small, all having their sources in the central group. The Liffey, which rises in Douce Mountain, and after a circuitous course through Kildare, discharges itself into Dublin Bay, is known chiefly as having the metropolitan city on its banks. The Slaney, which rises near Glendalough, is not navigable until it has traversed the greater part of Wexford county. The Ovoca is formed by the junction of the Owenmore and Owenbeg at the meeting of the waters in the romantic Vale of Ovoca. It is afterwards joined, at the "second meeting of the waters," by the Aughrim from the west, and empties itself into St George's Channel at Arklow. The Vartrey, a small stream, falls into the sea north of Wicklow Head. Numerous small lakes lie in the valleys between the central mountain-ridges. The most remarkable are Lough Bray, in Glencree, near the borders of Dublin; Lough Dan, Lough Tay, Luggela, and the lakes of Glendalough. The last form an object of peculiar interest, from their romantic situation, the remains of ancient ecclesiastical structures in their neighbourhood, and the popular legends connected with them. The coast presents a succession of fine prospects, but is much dreaded by mariners, in consequence of the sand-banks that skirt it. These are, the Kish Bank, each extremity of which is marked by a floating light; Bray Bank, the Codling, South Ridge, Wicklow, and Arklow Banks. The southern extremity of the last named is also marked by a floating light. The only harbours in this line of coast are those of Wicklow and Arklow, both fit only for small vessels. The projecting point of Wicklow Head is marked by two fixed lights. A few creeks afford shelter for fishing-craft. Herrings and round fish are taken off Wicklow Bank, where also oysters and lobsters are caught.

The western side of the county presents one of the great granite formations of Ireland, extending from Kingston Harbour to the south-western extremity of the county, and bordered on each side by a range of clay-slate rock. The rest of the county consists of clay-slate, graywacke, and graywacke slate, interspersed in various places with small patches of granite, quartz-rock, and greenstone-trap protrusions, with whin-dykes. The eastern side of the granitic range abounds with metalliferous veins, while the western is totally destitute of them. Lead has been raised near Lough Dan, at Luganure, in Comaderry Mountain, at Glendalough, and in Glenmalure; copper at Ballymurtagh, and elsewhere. In 1858, the mines of Wicklow produced 70,696 tons of iron pyrites, valued at L.57,546. The granite supplies inexhaustible quantities of stone for building and flagging. Slates for roofing are procured at Dunganstown and Carnew. The climate, though moist, is healthy; the lower lands near the sea produce the arbutus, myrtle, and laurestinus, which flourish in the open air, seldom requiring artificial protection during winter. The character of the soil is very various; near the sea, and along the banks of the larger rivers, it is rich, abounding with limestone, limestone-gravel, and marl. The mountainous tracts have generally a deep thick covering of heath and turf, based upon disintegrated granite. This part contains large tracts of bog. Along the verge of Dublin boundary, a substratum, lying within a few inches of the surface, forms a crust impenetrable to water, thus rendering the upper soil wholly unprofitable until this layer be broken up with the axe; for it resists the action of the spade or plough. Much of the natural timber with which the county was at a former period nearly covered, is still preserved, forming an important feature in the landscape; and young plantations are yearly rising around the mansions and villas with which this district, the chosen pleasure-ground of Ireland, is thickly studded. Wicklow.

The numbers of the population, as far as ascertained by reliable authorities, has been stated as follows:—

Year.	Authority.	No. of Inhabitants.
1760	De Burgo	43,872
1792	Beaufort	58,000
1812	Parliamentary census	83,109
1821	Ditto	110,767
1831	Ditto	121,557
1841	Ditto	126,143
1851	Ditto	98,978

The latest of these returns gives an average of 127 inhabitants to each square mile, the smallest number in any county of Ireland. The return of the Commissioners of Public Instruction in 1834 gives a gross population of 118,661, of whom 25,005 were members of the established church, 322 Protestant dissenters, and 93,334 Roman Catholics. The number of children receiving instruction in the public schools at the under-named periods was—

Year.	Males.	Females.	Sex not ascertained.	Total.
1821	5597	3108	...	8,705
1824-6	6377	4671	285	11,333

The number of schools, and of pupils attending them, in 1851, was found by the Census Commissioners to have been—

	No. of Schools.	No. of Children.		
		Males.	Females.	Total.
National	55	1,557	1,470	3,027
Church Education	21	362	352	714
Endowed	6	180	111	291
Boarding	3	71	30	101
Private	31	445	268	713
Parochial	21	466	403	869
Free	22	414	575	989
Workhouse	4	462	521	983
Total	163	3,957	3,730	7,687

The number of the children of each religious denomination, as stated in the return of 1824–26, being the only one

Wicklow. in which this point is noticed, was, members of the Established Church, 3666; dissenters, 31; Roman Catholics, 7270.

The county is divided into eight baronies:—

Baronies.	Acreable Contents.	Annual Valuation.
	Acres.	L.
Arklow	67,357	68,772
Ballinacor, North	74,110	15,676
Ballinacor, South	78,316	20,335
Newcastle	52,296	38,730
Rathdown	32,879	24,372
Shillelagh	44,349	23,046
Talbotstown, Lower	88,361	28,224
Talbotstown, Upper	62,510	32,636
Total	500,178	251,791

These are subdivided into fifty-eight parishes, of which forty-nine are in the diocese of Dublin, two in Ferns, and seven in Leighlin. The diocese of Glendalough, which anciently comprehended the greater part of the county, having been united to that of Dublin in 1497, has been so intimately amalgamated with it that their respective boundaries cannot now be ascertained. The county returned ten members to the Irish parliament, two for the county at large, and two each for the boroughs of Baltinglas, Blessington, Carysfort, and Wicklow. All the boroughs were disfranchised at the time of the Union. The county is in the Leinster circuit. The assizes are held in the town of Wicklow, where the county court-house, prison, and infirmary are built. General sessions of the peace are also held there and at Baltinglas. There is a second infirmary at Baltinglas. Lunatics are sent to the district asylum in Dublin. Baltinglas, Rathdrum, and Shillelagh, are the seats of Poor Law Unions; and a small portion of the county is included in the neighbouring union of Rathdown.

The rich low lands near the sea, and along the banks of the Slaney and Ovoca, are under tillage, all the operations of which are carried on according to the most approved systems. The extent of land under each description of crop in 1849 and 1859, was—

Crops.	1849.	1859.
	Acres.	Acres.
Wheat	7,817	7,994
Oats	44,527	31,109
Barley, bere, rye, beans, and pease.	4,272	2,494
Potatoes	11,177	16,315
Turnips	5,303	3,850
Other green crops	1,357	1,467
Flax	7	4
Meadow and clover	50,793	56,716
Total	126,251	119,949

Much of the mountain-district is adapted for pasturage, particularly for feeding a small breed of sheep, whose meat is much prized in the Dublin market. The quantity of stock in the county in 1849 and 1859 was—

Live Stock.	1849.	1859.
	No.	No.
Horses	11,464	12,748
Cattle	67,428	82,781
Sheep	139,235	161,393
Pigs	19,972	21,728

The mountain of Lugnaquilla has a fine sheep-walk on its summit. Lime and marl are the chief manures: the former is brought by sea from Howth to the districts near the coast; it is also drawn in large quantities from Carlow to the inland parts. Butter is made in large quantities in the dairies, which are generally attached to the farm-houses. The fences in the most highly improved districts are of white thorn; in other parts earthen mounds, and in the rocky mountainous heights dry stone-walls. Wicklow.

The manufacture of flannels was formerly carried on extensively, and a market-house for their sale was erected at Rathdrum; but it has declined, and the woollen manufacture is now nearly confined to the fabrication of friezes and coarse cloths for home-consumption. Some coarse linen is also wrought for the same purpose. But the county owes its wealth wholly to its agriculture.

Though the high state of prosperity this county displays is mainly attributable to the well-directed efforts of agricultural industry, yet some portion of it must be allowed to arise from the number of men of landed property whom the extraordinary beauty of the country has induced to make it their chosen place of residence, thus heightening its natural advantages of scenery by the adventitious ornaments of splendid mansions and villas, surrounded by demesnes laid out in the most refined style. Two main lines of road conduct the stranger through it. The one on the eastern side, and mostly near the sea-coast, presents an almost uninterrupted succession of splendid prospects, through a highly-cultivated country. Proceeding from the city of Dublin, through the Scalp, are the lands of Powerscourt, the Dargle, the Glen of the Downs, Delgany, the Devil's Glen, Luggela, Glendalough, and the Vale of Ovoca, and the eye finds everywhere scenes of rural beauty. The other main road, along the western side, chiefly through the rich valley of the Slaney, presents a similar succession of scenery of a less romantic character. Even the intermediate space, though wholly composed of mountain-tracts little capable of high cultivation, presents several wild landscapes of combined cliff and glen, to which an easy access is found through the military road already noticed.

The peasantry, notwithstanding the proximity of the metropolis, resembles that of the more remote agricultural districts in habits, dwellings, and mode of life; the chief article of food being the potato, and the fuel turf, though coal imported from England is in general use among the wealthier classes, especially near the sea.

There are several cromlechs still existing, and many raths. Ruins of monastic buildings are to be seen at Baltinglas, Wicklow, Rathdrum, and Glendalough or "the Glen of the Two Lakes," where there is a pillar-tower, and the remains of several places of religious worship (one of them being the cathedral of the ancient diocese), from which it has acquired the name of "the Seven Churches." It had been the site of a city, the metropolis of the sept of the O'Tooles, and is now a place of great resort for visitors, from its picturesque scenery. Several castles were built in this county by the English, the sites of most of which can still be ascertained by what is left of their structures.

Wicklow, the assize-town, is built on an elevated spot projecting into the sea near the mouth of the Vartrey. It was originally the site of a castle erected by Maurice Fitzgerald, and was long maintained as a post of importance, under the superintendence of a constable. It is a branch of the port of Dublin, the harbour being formed by the river Vartrey, but owing to a bar it is only accessible to vessels of small burthen. There are eight feet of water on the bar at spring tides, and only five at neap. Most of the ore produced by the Wicklow mines is shipped here for smelting. The town is small and irregularly built, owing most of its support to the assizes and sessions. It was a borough by prescription, but its corporate rights were confirmed by a charter of James I., granted in 1613, to be enjoyed under a port-reeve, burgesses, and freemen, who

Widin ‖ Wieland.

had a right of exemption from harbour-dues, and of pasturage on the common. By the municipal corporation act, the old corporation was dissolved, and, under certain conditions, power is to be given to create a new one, styled "the portreeve, free burgesses, and commonalty of the town of Wicklow." There are a Saturday market, and four fairs annually. Races are held every year at the Murragh, a border of dry sandy land, extending for several miles along the seashore to the north of the town, forming a peninsula, which encloses a long narrow basin. The population in 1821 amounted to 2146, in 1831 to 2472, and in 1851 to 3141. The population of the other towns having each upwards of 2000 inhabitants was, in 1851, as follows:—Bray, 3156; Arklow, 3306. (H. S—R.)

WIDIN, or VIDDIN, a town of European Turkey, capital of a sanjak of the same name, in Bulgaria, on the right bank of the Danube, opposite the village of Kalafat, and 130 miles E.S.E. of Belgrade. It is well defended by a double line of fortifications, which were repaired and strengthened by the Turks in 1853–54, having been previously in a state of disrepair and decay. The town, however, is commanded by a hill on a large island in the river; but from its position it is of much importance in a military point of view. It has not quite so narrow streets as most Turkish towns; and contains the palace of a pasha, some mosques with elegant minarets, and a range of bazaars. An active trade is carried on in corn, wine, and salt. The Austrian steamers on the Danube touch here. Pop. about 25,000, consisting of Turks, Greeks, and Armenians.

WIELAND, CHRISTOPHER MARTIN, was born near Biberach, in Suabia, in 1733. His father was a Protestant clergyman, and educated him with great care. His pains were well rewarded by the extraordinary scholarship of his son, who wrote poems in German and Latin while only in his twelfth year. The young Wieland was sent when fourteen to the neighbourhood of Magdeburg, with the view of being prepared for the University; and while there he not only acquired an intimate knowledge of the classics, but made himself acquainted with the productions of the great masters of French and English literature: with Voltaire, with Steele, with Addison, and, above all, with Shaftesbury, whose style and speculations seem to have exercised a peculiar fascination over more than one German writer. In 1750, he was sent, much against his will, to the University of Tübingen, to study law; but he still remained devoted to literature, and in 1751 issued his first work, *Ten Moral Letters*, addressed to Sophia, a lady of whom he had become enamoured in Biberach. They met with a favourable reception; and the next year, abandoning his legal studies, he went to Zurich, where he acted as a sort of literary assistant to Bodmer, a German poet of some note, who translated the *Iliad*, *Odyssey*, and *Paradise Lost*, into German, but whose hasty habits of composition were likely to exert a very unfavourable influence over a young and enthusiastic mind like Wieland's. Several of Wieland's writings were produced at this period, but they were written hurriedly, and have not retained any reputation. During the seven years' war he began a poem on the story of Cyrus, which was intended to be an encomium on Frederick the Great, the hero of the war, for whom Wieland entertained a very high admiration; but it was never completed, and the fragment of it which was published was not much esteemed. About the same time, also, he composed his beautiful story, *Araspes and Penthea*. In 1760 he returned to his native town, and while there undertook to translate Shakspere into German, the earliest German version of our great dramatist, but by no means the best. His works after this date exhibit a considerable change of style, and are unfortunately tinged with a slight hue of sensuality, which might lead the reader to form an erroneous estimate of the moral character of their author. Of the various productions of this period it is unnecessary to particularize any other than *Agathon*, his best novel, which appeared in 1766. In 1769 he removed to Erfurt, where he had been appointed Professor of Philosophy, and where he had to defend himself against attacks which were made upon him from all quarters. Employing satire and humorous invective as the best instruments of defence, he bantered his assailants in his amusing poem "Cupid Accused" (*Der Verklyte Amor*) and "Dialogues of Diogenes of Sinope" (*Nachless des Diogenes Von Sinope*). He also directed his ridicule against the speculations of Rousseau, which he satirized in a whimsical novel, entitled *Koxkox und Kikeguelzet*. At Erfurt also he composed, in a very different mood from the preceding, his "Golden Mirror" (*Goldener Spiegel*), a collection of the lessons which history might teach those in power. In 1772, the Duchess of Wiemar invited him to come to Court to superintend the education of her two sons; and he at once complied with her request, as it afforded him an abundant income and plenty of leisure for literature. The patronage of the duchess speedily made Weimar the centre of a galaxy of distinguished writers, the greatest of which Germany could then boast, including, among other names of minor note, Goethe and Herder. At Weimar, Wieland devoted himself with ardour to literary pursuits; he wrote tragedies, he composed poetry, he compiled histories, and edited a monthly critical journal, the *German Mercury*. Of his poems the best is his "Oberon," an epic romance, which, though open to censure on various accounts, is the most meritorious of his works. To this period of his life also belongs his "History of the Abderites" (*Die Abderiten*), in which, under the guise of giving a humorous account of the manners of the Abderites, he satirizes, as Swift had done, but with less acrimony, the follies and foibles of mankind. Towards the end of his life he devoted himself more especially to the elucidation of the Latin and Greek authors; and he himself considered his *Letters and Commentaries on Horace* the most valuable of all his works. For a short time he retired to an estate which the labours of his pen had enabled him to purchase, but afterwards returned to Weimar, where he spent the remainder of his days, and died in honoured old age in 1813.

Wiesbaden ‖ Wiffen.

WIESBADEN, a town of Germany, capital of the duchy of Nassau, in a small and beautiful valley covered with vineyards and orchards, on the south slope of Mount Taunus, five miles N.N.W. of Mayence. It was formerly walled, but is now quite open; and is a neatly built and rapidly improving town, with broad and regular streets. It owes its prosperity entirely to the celebrated hot springs, which were known as early as the time of the Romans, under the name of *Fontes Mattiaci*. They are fourteen in number; and the principal one, the *Kochbrunnen*, has a temperature of 156°. The principal buildings are the ducal palace, the ancient townhall, and the *Kursaal*, a splendid edifice, containing dining-saloons, gaming, reading, and ball rooms, and having beautiful gardens attached to it. There are here Evangelical and Roman Catholic churches; and the Duke of Nassau erected in 1855 a magnificent Greek chapel, containing the tomb and a beautiful statute of his first wife, who was a Russian princess. Wiesbaden is the see of a Protestant bishop; and has courts of law, a gymnasium, theatre, public library, and museum; the last two being in the ducal palace. There are also many large and splendid hotels for the accommodation of visitors, of whom there is a large influx annually from June to September. It is one of the principal gambling-places in Germany. The permanent population is 16,500, but during the season that number is often doubled.

WIFFEN, JEREMIAH HOLME, was born near Woburn, in 1792, and assumed the profession of a schoolmaster when he reached man's years. He wrote a *Geogrophical Primer*

Wigan.

in 1812, and contributed poems, on a variety of subjects, to public and private collections of verse. *The Russells*, consisting of some spirited stanzas on the portraits of Woburn Abbey, drew upon him the notice of the Duke of Bedford, himself a Russell, who appointed him his librarian and private secretary. Henceforward his life flowed in an even course of literary usefulness. He wrote *Aonian Hours* in 1819, *Julia Alphinula* in 1822, an English translation of the poems of Garcilasso de la Vega, a translation of Tasso's *Jerusalem Delivered* in 1830, three volumes of *Historical Memoirs of the House of Russell* in 1833, &c. Tasso is free and flowing, but nothing like Fairfax's. In his history Wiffen draws considerably upon his imagination; but when he reaches the authentic period, or when history really begins, he is as faithful as a partial writer could be. He died, as he had lived, a stanch Quaker, on the 2d of May 1856.

WIGAN, a market town, parliamentary and municipal borough of England, Lancashire, 40 miles S. by E. of Lancaster, and 17 W.N.W. of Manchester, on the river Douglas, and the Liverpool and Leeds Canal. It is an ancient place, and is divided by the river, which is crossed by several bridges, into two parts; that on the right bank being the older, and the suburb called Scholes, on the other side, more modern. Though a straggling and irregular town, it is not ill built; but from the numerous collieries and furnaces in the town and neighbourhood, where most of the inhabitants are employed, it has a very blackened and dirty appearance. In recent years many good new streets have been built, and the whole town has been much improved and extended. The parish church, a fine old edifice in the perpendicular style, with a square tower, occupies the summit of a hill overlooking the old town, but closely surrounded on almost all sides with buildings. A second church, St George's, was erected here in 1781; and a third, St Catherine's, in the modern part of the town, in 1841. There are also several district churches within the parish; and the Presbyterians, Methodists, Independents, Baptists, and Roman Catholics have places of worship. Among the public buildings of Wigan are to be numbered the Town Hall, rebuilt in 1720, and the Commercial Hall, a large brick edifice, erected in 1816 for the sale of cloth and hardware. There are here, besides a free school, which has existed since the time of James I., national and infant schools, a mechanics' institute, with a library and museum, a newsroom, dispensary, and poorhouse. The manufactures of the town are extensive and various. Besides the large collieries in the vicinity, which give employment to many of the people, there are in the town iron and brass foundries, manufactories of nails, agricultural implements, cutlery, machinery, and chemical substances; paper and flour mills, cotton factories, woollen and linen works. By means of the Liverpool and Leeds Canal, and the many railways that meet at Wigan, trade is facilitated, and easy communication is afforded with all parts of the country. Markets are held twice a week, and fairs three times a year; and an active trade is carried on. The borough is governed by ten aldermen and thirty councillors, of whom one is mayor; and it is represented in Parliament by two members, a privilege which it enjoyed as early as 1295. In the vicinity are many beautiful walks and drives, and some fine mansions and villas. Within the bounds of the parish rise several sulphureous springs, which have been found beneficial in several complaints. Wigan probably owes its origin to a castle built here by the Saxons, although some have supposed that it was a Roman station. Many bloody conflicts are said to have taken place here during the wars between the Saxons and the Britons. In the civil war of the seventeenth century the town was strongly attached to the royalist cause; and a battle was fought here in 1651, in which the king's troops under the Earl of Derby were defeated by Colonel Lilburne. A monument has been erected in the town to Sir T. Tyldesley, who fell in this engagement. In 1745, Wigan was visited by the Pretender on his march southwards. Pop. of the borough (1851) 31,941.

Wight, Isle of.

WIGHT, Isle of, lies opposite the coast of Hampshire, from which it is separated by a channel, varying in width from 1 to 6 miles, which has long been known as the Solent (from, it is said, *solvens*, *solveo*, to disunite.) It is placed between 1. 4. and 1. 36. W. Long., and 50. 34. and 50. 47. N. Lat. Its greatest length is computed at 22½ miles; its breadth, from N. to S., at 13¾ miles. In form it is rhomboidal, and has been aptly compared to a turbot. Its area is 98,320 acres; population in 1851, 50,324; inhabited houses, 8928; uninhabited, 559; building, 123. The gross estimated rental in 1858 was L.185,518; rateable value, L.164,344. For the same year the rate levied for the relief of the poor was L.10,869.

Position and population.

The island is divided into two hundreds, named from their position with respect to the Medina river, the East and West Medina, the former containing 14 and the latter 16 parishes. There are two rural deaneries (East and West Medina) and forty-three ecclesiastical districts. The island was designed by the 26 Henry VIII. to become the seat of a suffragan bishopric, and, at an earlier period, had been placed in charge of "a dean of the island," but it is now included in the diocese of Winchester. There are 39 churches in connection with the Anglican Establishment, containing 15,320 sittings, and 92 places of worship, with 15,400 sittings, belonging to different religious denominations.

Parishes.

The rivers of the island are three in number. The principal is the Medina (*medius*, the middle), which almost divides the island into two equal portions. It rises at the foot of St Catherine's Down; waters Kingston, Gatcombe, and Carisbrooke; receives the Lugley at Newport, and at Cowes, where it joins the Solent, widens into a considerable estuary. The main river, or Eastern Yar, rises near Niton, and flows past Whitwell, Godshill, Newchurch, and Sandown, into Brading Haven. The Western Yar rises at Freshwater Gate, where it is only separated from the sea by a narrow bank of pebble, flows northerly, and expands at Yarmouth into an estuary.

Natural peculiarities.

The geological characteristics of the Wight are of peculiar interest, and have been ably illustrated by Dr Mantell, Dr Fitton, and other eminent *savans*. It is crossed from east to west by a noble range of chalk-hills, rising in many places to a considerable height, from which a chain of downs branches off to the south, and terminates in the bold abrupt cliffs of St Catherine's Point. Of the central range, the Culvers, east, and the Needles, west, are the respective terminations. From these natural watchtowers the most splendid prospects are commanded of fertile pastures, leafy vales, and sequestered hollows, and beyond all, and encircling all, the gleaming waters of the channel. The most famous are—St Catherine's Down, with its dismantled lighthouse and dilapidated chantry, 769 feet above the sea-level; Appuldurcombe Down, crowned with a pillar 72 feet high, intended to commemorate Alexander of Russia's visit to England in 1814, 600 feet high; Needles Down and Lighthouse, 474 feet; Ashey Down and Beacon, 424 feet; Bembridge Down, crowned with an obelisk to the memory of the late Earl of Yarborough, 355 feet; Mottistone, 661 feet; St Boniface, 783 feet; Shanklin, 731 feet; and Week Down, 690 feet. The principal inlet or tidal lake is Brading Haven, 800 acres. The most notable chines are those of Shanklin, Luccombe, Blackgang, Walpan, Cowleaze, and Brook.

Its history.

By most modern writers the Isle of Wight is identified with the *Ictis* of Diodorus Siculus, which he represents as

Wight, Isle of.

divided from the mainland by a channel, passable by men and carts at low water, and as the centre or depot of the tin trade conducted between the Greek traders and the Cornish merchants. It was originally peopled by the Celts, who were afterwards expelled or subdued by the Belgæ; and these, in their turn, were compelled to submit, A.D. 43, to the Roman legions under Vespasian. The Saxon kings of Wessex conquered it about 530, after a sanguinary action at Wiht-garas-byrig, supposed to be the modern Carisbrooke. In 661 it was subdued by Wulfhere, son of Penda, king of Mercia, who introduced the Christian religion; but when Ceadwalla, in 686, became possessed of it, he found that paganism was still dominant, and, in pursuance of his vow, bestowed 300 island families on Wilfrid of York, bishop of Selsey, to be converted to a purer faith.

After the Conquest it was granted as an independent lordship to William Fitzosborne, the powerful earl of Hereford. On its escheat to the Crown, through the treason of his son, it was conferred by Henry I. on Richard de Redvers, earl of Devon (A.D. 1102), and remained with his descendants until Isabella de Fortibus, countess of Albemarle, and Lady of the Wight, sold it on her deathbed to Edward I. for 6000 marks (A.D. 1293). It was afterwards governed by successive "Lords of the Wight" up to the death of Sir Edward Woodville in 1488. From that period it has been ruled by captains or governors appointed by the crown, though, of late years, the office has become a complete sinecure, and since the death of the Earl of Malmesbury in 1841 no salary has been attached to it.

Invasions.

The Danes invaded the Wight in 787, in 897, in 981, in 998, and again in 1003, when they destroyed the town of Waltham, supposed to be identical with the modern Werror. The French landed at St Helen's Point in 1340, but were repulsed by the islanders under Sir Theobald Russel. In 1377 they burnt the towns of Yarmouth, Newtown, and Newport, but were defeated in an attack which they hazarded upon Carisbrooke Castle. In 1545 the French forces, which had assembled under Claude D'Annebault, and fought an indecisive action with Lord Lisle at Spithead, threw themselves upon the island in four detachments at Sea View, Bembridge, Shanklin, and Bonchurch, but were repulsed with signal loss.

Besides NEWPORT, RYDE, and COWES, *West*, already described under their respective heads, the principal towns are Yarmouth, Sandown, and Ventnor. Yarmouth (pop. 572), is seated on the north-west coast, opposite Lymington, where the Yar pours its waters into the Solent. At the W. end of the town is Yarmouth Castle, erected by Henry VIII. Admiral Sir Robert Holmes, while governor of the island, entertained here Charles II. and his suite, in 1671, at his mansion, now the George Inn. Sandown (population 1030), on the shore of a beautiful bay, is attracting much consideration as a watering-place. Sandown Fort was built in 1632, by Lord Conway, in the place of a block-house erected about 1540, whose foundations the sea had undermined. Wilkes, the demagogue, had "a villakin" at Sandown, now Royal Heath, Cottage, where he spent the latter years of his life. Ventnor (population 2660) and Bonchurch (population 523) adjoin each other, on the east coast, at the commencement of that remarkable and picturesque tract of lofty chalk cliffs and wooded terraces known as "the Undercliff." The climate is deliciously genial, and their natural charms of the most romantic order.

Nestling at the base of lofty downs, or clustering in leafy hollows, the Isle of Wight villages have usually a picturesque and attractive aspect which the tourist cannot fail to admire. Brading was formerly a market town and corporation, and is placed at the head of a wide tidal lake, known as Brading Haven. Its church is handsome, and one of the oldest in the island. Brighstone, on the south-west coast, is a lovely spot. The rectory has been held by Bishop Ken and Samuel Wilberforce, bishop of Oxford, during whose residence here the village became a favourite retreat of his father, the great philanthropist. Chale lies about half-a-mile from Blackgang Chine, a curious ravine produced in the cliff by the gradual action of the water-courses; and Chale Bay, a rock-bound sweep of ocean, which has been the scene of many a disastrous wreck. Carisbrooke is famous not only for its castle, but its church, which boasts of a noble perpendicular tower, and some interesting memorials. There are interesting churches at Freshwater, Gatcombe, and Shorwell; and at St Lawrence's is the smallest but one in England. The churches at Shalfleet, Wootton, and Yaverland are partly Norman.

Wight, Isle of.

Principal seats.

Appuldurcombe (the valley of the apple trees), the ancient seat of the Worsleys, where Henry VIII. and his minister Cromwell were entertained in 1539, is now degraded into an hotel. Of the old family seats and manorial mansions, there remain but Nunwell (Sir H. Oglander), near Brading, visited by Charles I. in November 1647; Swainston (Sir J. Simeon), near Calbourne, originally a palace of the bishops of Winchester; and North Court (Sir H. Gordon), near Shorwell, a fine old Jacobean house. Mottistone, which belonged to the Cheke family, has been converted into a farm. The best modern houses are Steephill (A. Hambrough, Esq.), 1 mile from Ventnor; Appley Tower (G. Young, Esq.), and West Hill (Sir Aug. Clifford), at Ryde. St Clair (Col. Vernon Harcourt), near Ryde; Northwood Park (G. H. Ward, Esq.); Norris Castle (R. Bell, Esq.), and East Cowes Castle (Mrs Tudor), are mansions of considerable pretensions. Her Majesty's marine palace at Osborne is a pile of stately and imposing character.

Remarkable places.

It cannot be said that the Isle of Wight is deficient in those associations which are so dear to the antiquarian and the historical student. Carisbrooke Castle is not only of interest architecturally, from its Norman keep and fine Edwardian gateway, but from the memories which attach to it. Here William the Conqueror surprised and discomfited Odo, bishop of Bayeux, on his way to Italy to assert his claim to the popedom. Here the De Redvers held their state; William de Vernon, one of the stout barons who resisted the tyranny of John; and Isabella de Fortibus, "the Lady of the Isle," whose almost regal splendour has been commemorated by the old chroniclers. From November 23, 1647, to November 29, 1648, it was the prison of Charles I., who made two abortive attempts at escape from his thraldom. The Princess Elizabeth, his daughter, died within its walls, September 8, 1650. Quarr Abbey, founded in 1132, was once a Cistercian house of some pretensions. The body of the Lady Cicely, daughter of Edward IV., was brought hither from her house at Standen for interment in 1507. The remains are inconsiderable. At Mottistone there are two or three singular stones, which have been supposed to belong to a Druidic cromlech. The barrows on the downs are numerous, and have yielded some interesting Celtic and Saxon relics. A good Roman villa has been recently discovered at Carisbrooke. Traces of ancient British villages may be seen at Rowborough, Newbarns, and Gallibury.

This beautiful island has not been fertile in great men. Newport has given birth to three worthies, Sir Thomas Fleming, L.C.S., *temp.* James I., and the two literati, Dr Thomas and Mr Richard James. Dr Hooke, one of the early members of the Royal Society, was born at Freshwater; Admiral Sir Thomas Hopson, at Bonchurch; and, greatest of all, Dr Arnold, the famous head-master of Rugby, at East Cowes. Tennyson resides at Faringford.

[Sir Richard Worsley's *History of the Isle of Wight;* Sir H. Englefield's *Isle of Wight;* Tomkins' and Barber's *Descriptive Tours;* Adams's *History, Topography, and Antiquities;* Dr Mantell's *Geology of the Island;* Dr

Wigtown. Bromfield's *Flora Vectensis; A Guide to the Isle of Wight*, by the Rev. Edmund Venables; *The Undercliff*, by Dr G. A. Martin, &c.] (W. H. D. A.)

WIGTOWN, a peninsular county situated at the south-west corner of Scotland, is bounded on the west by the Irish Channel, on the north by Ayrshire, on the east by Kirkcudbrightshire and the Solway Firth, and on the south by the Irish Sea. It is the nearest part of Great Britain to Ireland, the ferry between Port-Patrick and Donaghadee being only about 20 miles across. No part of the county is above 13 miles from the sea, which indents it in three great bays, viz., those of Wigtown, Luce, and Lochryan, the latter of which affords a safe harbour of refuge. The length of the county from east to west is 34 miles; its mean breadth 24. It is divided into three districts, the Machars or low country, lying between Wigtown and Luce Bays; the Rhinns, which comprehends the portion lying west of a line drawn between Luce Bay and Lochryan; and the Moors, which include the remainder, being the uncultivated heaths and sheep-walks forming more than a third of the whole county, but now every year undergoing diminution from the progress of agricultural improvement.

The following list shows the population of the county at different dates:—1755, 16,466; 1801, 22,918; 1831, 36,258; 1851, 43,389.

The population has thus nearly doubled within the last fifty years. The number of square miles in the county being 511, there are 85 inhabitants to each square mile. The number of inhabited houses in 1851 was 6902.

Wigtown, being a comparatively isolated county, the native inhabitants can trace their connection with each other's families, and their own descent, through many generations. There are few Galloway families, even among the better class of farmers, who cannot count back to the times of persecution in the seventeenth century. The surnames which prevailed in the county at a very remote period are still common, such as Macdowall, Macculloch, Mackie, Maclellan, Macmillan, Macgill, Macguffie, Macgeoch, Maccracken, Adair, Agnew, Stewart, Hannay, Broadfoot, Donnan, Milroy. The family of Stewart, Earl of Galloway, claims the representation of the line of Darnley. One of the oldest families in the county is that of Macdowall of Logan, a very remote ancestor of whom is said to have slain a Scottish king of the period. But the proximity of this county to Ireland has naturally led to a considerable influx of Irish settlers of the poorer class, and among the labouring population so large an infusion of that element has taken place that it is now rare to find a peasant family of purely Scottish blood. Very many of the best of the native agricultural labourers have been forced by the competition of Irish labour to emigrate to America, where their industry and frugal habits have found a better recompense than at home.

The climate is salubrious. On the seacoast, and in sheltered situations, the range of the thermometer during the winter months is nearly the same as that of South Devon. The soil rapidly dries after rain, so that, although there is a considerable fall of rain during the year, the air is not relaxing. And as there is never a heavy fall of rain without being followed by a brisk wind, the climate is found to be on the whole clear and bracing. The summer temperature is not in proportion so high as that of winter, but the sheltered shores and bays of this county afford many eligible places of residence for the invalid, milder than almost any other part of Scotland, and very little inferior to the south of England.

The surface of the county does not anywhere rise to a great elevation. The Moors are a range of elevated table-land, sloping towards the streams by which they are drained. From the peninsular character of the county the rivers are not important. The Cree and the Bladenoch, both of which flow into the Bay of Wigtown, are navigable, the former three miles, and the latter two. But the county abounds with spacious bays and harbours. The most important harbours are Stranraer and Cairnryan on Lochryan; Port-Patrick on the Irish Channel; Stairhaven, Dromore, and Port-William, on the Bay of Luce; Isle of Whithorn, Garliestown, Wigtown, and Carty, on the Bay of Wigtown. These two latter bays form two remarkable promontories, the Borough Head on the south-east, and the Mull of Galloway on the south-west, the two most southerly points in Scotland. Kirkmaiden parish ("frae Maidenkirk to Johnny Groats") extends to the extremity of the Mull of Galloway, and is the southernmost parish of Scotland. Wigtown.

The principal towns in the county are Stranraer, Wigtown, and Whithorn, of which a separate account has been given. Newton-Stewart, though not a royal burgh, is in point of business and population the second in the county. Port-Patrick, whose population has been for some years stationary, is likely to rise into more importance having become the terminus of the railway from Dumfries, which forms the great line of communication, by the shortest sea-passage, between Great Britain and Ireland.

The rapid advance which takes place, under improved systems of agriculture, in the culture of the better kinds of corn is well exemplified in this county. Seventy years ago hardly any wheat was produced in even the most fertile parts of the county, the soil and climate being then considered wholly unadapted for wheat. In 1855 the county produced 174,000 bushels of wheat. In 1791 so rare was a crop of turnips that the worthy minister of Mochrum declares of his parish then, that "the boys set upon the only plot, and carried it off like the apples of an orchard." In 1855 there were upwards of 15,000 acres of turnips in the county; and a like progress is visible in every department of husbandry.

There is much diversity of soil in the county. The Rhinns and Machars are chiefly a hazelly loam, dry and well adapted for turnip husbandry and the dairy. The Moors are chiefly devoted to pasture, and as yet the old black-faced breed of sheep have been found the most useful kind of stock on such land. But the introduction of railway communication, opening up markets, and rendering the conveyance of lime and other manures matter of little difficulty, will make a change of more importance on the Moors than along the seacoast, which has long possessed these advantages. No part of the Moors is at a great elevation, and the greater part does not exceed 450 to 500 feet above sea-level. Agricultural improvement in that district may therefore be expected to make great and rapid progress as soon as facilities for the conveyance of lime are afforded.

The richest district in the county lies along the Bay of Wigtown, from the Burgh Head to Newton-Stewart. It possesses a warm southern aspect, and escapes much of the rain which falls along the opposite range of highlands in Kirkcudbrightshire. The Baldoon estate is a tract of rich alluvial soil, lighter in character but otherwise very similar to the carse-lands of Falkirk, Stirling, and Perth. But owing to the moister western climate, the corn, however bulky it may appear, seldom yields anything like the produce per acre of those drier districts. The most approved systems of husbandry have been introduced into this county, tile-drainage having been early and extensively adopted, and the use of artificial manures and sheep-feeding on turnips very generally practised. A great stimulus has been given not only to the agriculture of this county, but to that of the whole kingdom, by the example of Mr David M'Culloch of Auchness, in the Rhinns.

The admirable breed of black polled Galloway cattle have their origin in this and the neighbouring county; but for cheese-making the Ayrshire breed is preferred.

Wigtown. Dairy farming is practised extensively. For many years the Dunlop or Ayrshire system of cheese-making was alone followed. In 1845 Mr Caird introduced the Lancashire fashion on his farm at Baldoon, which proving entirely successful, he a few years afterwards adopted, with similar success, the Cheshire system. It was thus satisfactorily established that the superior quality of English over Scotch cheese was due far more to the mode of manufacture than to any peculiarity of either soil or climate. In the following year the Ayrshire farmers brought down to their county a celebrated Cheddar cheese-maker from Somersetshire, who gave lessons in his process in various parts of the district. Simultaneously with this, a native of Wigtownshire visited the Cheddar district, acquired a knowledge of the process, and carried it out successfully in his own county. The Cheddar system of cheese-making thus came to be introduced simultaneously in Wigtownshire and Ayrshire, and no agricultural improvement of modern times has contributed more immediately to the wealth of the dairy farmers. It is now either adopted altogether, or in part, by every cheese-farmer in the south-western counties, and the annual increase of value obtained in these counties, simply by the adoption of an improved system of cheese-making, cannot be estimated at less than L.100,000.

The land of the county is held by little more than a dozen proprietors, being chiefly in large estates which are never subdivided. There are very few properties with a rental under L.500, and the bulk of the land in the county belongs to landlords having a rental of from L.3000 to L.30,000. The average rent of land in 1810 was 8s. 6d. an acre; that of 1860, on an aggregate of L.170,000, was 11s. 8d.; so that the gross increase in a period of fifty years is about 34 per cent. Leases generally extend to nineteen years, and the class of farmers in point of general intelligence and professional skill is equal to that of any other district of Scotland.

Wigtownshire has no wealth but that derived from agriculture and live stock. There are no mineral treasures, nor any manufactures of importance. A distillery at Bladenoch, of some celebrity for the quality of its whisky, a woollen manufactory at Kirkcowan, large steam sawmills at Stranraer, three or four potato starch-mills, with several breweries, comprise the whole of its manufacturing industry. The salmon and white fishery is followed at the mouths of the rivers and along various places on the coast. Ship-building, on a very limited scale, is carried on at Garliestown, Port-William, and Stranraer; but, except for annual cargoes at each of those ports, of North American timber, there are no ocean-going vessels in the district.

The county is distinguished for the antiquity and number of its religious houses. The oldest Christian church built of stone in Scotland was situated at the Isle of Whithorn, and in the twelfth century a monastery was founded at Whithorn by Fergus, Lord of Galloway. The same individual established an abbey at Saulseat, near Stranraer. The abbey of Luce was founded in 1190, and that of Wigtown in 1262. At the Reformation, Wigtownshire contained twenty-one parish churches, exclusive of various subsidiary chapels. The number of parishes is now reduced to seventeen. There are likewise fourteen Free Churches, nine United Presbyterian, three Reformed Presbyterian, one Original Seceder, one Congregationalist, and two Roman Catholic chapels in the county.

The history of Wigtownshire, as part of Galloway, is not uninteresting. The aborigines, who were of Celtic origin, were the *Novantes*. Galloway was invaded by the Romans, and after their retirement in 448 was successively overrun by the Anglo-Saxons of Northumbria, and by the Picts. But their characteristic customs and manners continued to predominate, and some remains of them may even be traced to this day. They were distinguished for daring heroism and intrepidity, insomuch that they were called the wild Scots of Galloway, and obtained from the Scottish kings the privilege of forming the van of every battle at which they were present. The province was for a considerable period independent, and governed by its own princes and lords. Alan, who died in 1234, was the last of the ancient lords of Galloway. John Balliol was grandson of Alan, and thus possessed extensive estates in Galloway. The county of Wigtown, with the title of Earl, was conferred (1341) by David II. on Sir Malcolm Fleming, but Fleming in 1372 was obliged to dispose of his estates to Archibald Douglas. From this date the Douglases reigned supreme till their forfeiture in 1453. The county was then parcelled out among different families, many of whom still remain, and the Agnews of Lochnaw were created hereditary sheriffs. This office remained in their family till the abolition of hereditary jurisdictions in 1747, with the exception of seventeen years previous to the Revolution when Graham of Claverhouse, and his brother Colonel David Graham, were appointed joint-sheriffs.

Several eminent men were natives of this county, namely, St Ninian, who founded the bishopric of Candida Casa (Whithorn), and who died in the fifth century; Gavin Dunbar, tutor to James V., and afterwards Bishop of Glasgow, and Lord Chancellor of the kingdom; Sir Patrick Vans, ambassador to Denmark in the time of James VI., and a Lord of Session; Andrew M'Dowall, Lord Bankton, author of *Institutes of the Law of Scotland*. Some distinguished men were connected with the county either by office or the possession of property, such as Archbishop Beaton, prior of Whithorn; Bishop Cowper; Lord Stair, the famous lawyer; his son, the first Earl of Stair; and grandson, Marshal Stair; and, in recent times, John, eighth Earl of Stair, a distinguished agricultural improver.

There are various noblemen and gentlemen's seats in the county, of which the principal are, Galloway House (Earl of Galloway), near Garlieston; Glasserton House (S. Stewart, Esq.), not far from Whithorn; Monreith (Sir William Maxwell), near Port-William; Dunragget (Sir James D. Hay), between Glenluce and Stranraer; Culhorn (Earl of Stair), near Stranraer; Lochnaw Castle (Sir A. Agnew), likewise in the neighbourhood of Stranraer; and Dunskey (Sir E. Blair), near Port-Patrick. (J. C—RD.)

Wigtown ‖ Wilberforce.

WIGTOWN, a market-town, royal and parliamentary burgh of Scotland, capital of Wigtownshire, at the mouth of the Bladenoch in Wigtown Bay, 9 miles N. of Whithorn, and 129 S.W. of Edinburgh. It stands on a slight eminence, and contains many well built and handsome houses. The principal street is broad, and has in its centre a square containing a bowling-green. Near this stands a handsome granite cross. The town-hall is an old building, with a spire at one end. A new parish church has recently been built; but the old building is still standing, and in the churchyard there are interesting monuments of several martyrs of the time of Charles II. On a hill to the north-west of the town, a "martyrs' monument" was erected in 1858. The other places of worship belong to the Free Church and to the United Presbyterians. Wigtown has a grammar school, subscription library, assembly rooms, court-house, prison, and custom-house. There are no manufactures here of any importance, except a distillery in the adjacent village of Bladenoch. The harbour, which is in the mouth of the river, is difficult of entrance, and nearly dry at low water. On the 31st December 1858, the number of vessels belonging to the port was 51, tonnage 2813. In that year there entered 577 sailing vessels, tonnage 18,140; and 80 steamers, tonnage 19,349: and there cleared, 390 sailing vessels, tonnage 11,740; and 91 steamers, tonnage 33,434. The burgh is governed by 18 councillors, among whom are a provost and 2 bailies; and it unites with Stranraer, Whithorn, and New Galloway in returning a member to parliament. Pop. (1851) of the parliamentary burgh, 2120; of the royal do., 2232.

WILBERFORCE, WILLIAM, was born at Hull on the 24th of August 1759. His father, a merchant of that town, traced his descent from an ancient family which had long

Wilberforce.

possessed a large estate at Wilberfoss, in the East Riding of the county of York. The father of Wilberforce died before his son had completed his tenth year, and he was then transferred to the care of a paternal uncle, on whose death the ample patrimony which he inherited from his father was largely increased. His uncle's wife was a great admirer of Whitefield's preaching, and, through her instrumentality, his early years were not suffered to pass away without permanent impressions of religion. From school, Wilberforce was transferred, at the age of seventeen, to St John's College, Cambridge. On leaving college, he immediately entered upon active life. At the general election of 1780, when he had just completed his twenty-first year, he was returned to the House of Commons for his native town, and soon found his way into fashionable and political society. At Cambridge he had formed an acquaintance with Mr Pitt, which speedily ripened into an affectionate union that none of the vicissitudes of political life could afterwards dissolve. In the autumn of 1783, Wilberforce set out with Pitt for a tour in France; and on his return to England he gave his friend most efficient support in his memorable struggle against the majority of the House of Commons. At a public meeting held in the Castle Yard at York in March 1784, he attacked the measures of the coalition with such eloquence and success that he was immediately nominated as a candidate for the representation of Yorkshire; and so strongly did the current of popular opinion flow in his favour, that in spite of the hitherto predominant influence of the great Whig families of that county, his opponents gave up the contest without venturing to the poll. In the autumn of 1784, accompanied by some female relations, and by the celebrated Isaac Milner, dean of Carlisle, he undertook a journey to the continent. This excursion forms a memorable era in his life; for, through the influence of Milner his early impressions of religion, which had been greatly dissipated, were revived, and a deep and fervent piety now took entire possession of his mind, and regulated the whole of his future conduct. In the year 1787, he was much occupied in concerting measures for the reformation of public manners; and about the same time he became the founder of an association for the discouragement of vice. It was in this year also that Mr Wilberforce entered upon his labours in that great cause with which his name is unalterably associated, the abolition of the slave-trade. To that cause he now dedicated his days and his nights, even to his closing hours. It was in 1789 that he first proposed the abolition of the slave-trade in the House of Commons; and the zeal, the patience, the talents, and courage which he displayed during the many dispiriting delays and formidable difficulties which he had to encounter before the cause of justice and humanity finally triumphed, are above all praise. In 1797, he published his celebrated work on *Practical Christianity*, which met with such remarkable success that within half a year five editions had been called for. Not less than fifty large editions have been published in England and America; and it has been translated into the French, Italian, Spanish, Dutch, and German languages. Ecclesiastics of every class, from old John Newton to the Archbishop of Canterbury, welcomed it with the loudest applause; and Burke spent much of the last two days of his life in reading it, and said that he derived much comfort from its perusal. It would be difficult to overrate the influence of this work in stemming the tide of irreligion and nominal Christianity, especially among the higher classes of society, and in giving a powerful impulse to that warmer and more earnest piety which has happily distinguished the last half century. In 1807, after twenty years of anxiety and unremitting labour, Mr Wilberforce had the high gratification of seeing the slave-trade abolished, and that stain on our national character for ever obliterated. During the debate on the second reading of the abolition bill, when Sir Samuel Romilly entreated the young members of parliament to let this day's event be a lesson to them how much the rewards of virtue exceeded those of ambition, and then contrasted the feelings of the Emperor of the French in all his greatness, with those of that honourable individual who would this day lay his head upon his pillow, and remember that the slave-trade was no more, the whole house, surprised into forgetfulness of its ordinary habits, burst forth into acclamations of applause,—a tribute of approbation "such as was scarcely ever before given," says Bishop Porteus, "to any man sitting in his place in either house of parliament." Though Mr Wilberforce survived the abolition of the slave-trade for more than a quarter of a century, he quitted the House of Commons in the year 1825. He had resigned the representation of Yorkshire in 1812, on account of his declining health; and during the remainder of his parliamentary career he was returned for the borough of Bramber. The interval between the passing of the abolition bill and the close of his parliamentary labours was devoted to a ceaseless watchfulness over the interests of the African race. He lived to witness the consummation of the struggle for the abolition of slavery throughout the British dominions; and the last public information he received was, that his country was willing to redeem itself from the national disgrace at any sacrifice. He died 27th July 1833, when within a month of completing his seventy-fourth year, and was interred in Westminster Abbey, near the tombs of Pitt, Fox, and Canning. "Few persons," says Lord Brougham, "have either reached a higher and more enviable place in the esteem of their fellow-creatures, or have better deserved the place they had gained, than William Wilberforce." His immense influence was no doubt greatly owing to the homage paid to his personal character, but he possessed many other qualifications which must of themselves have raised him to great eminence. As a public speaker, he enjoyed great and well merited celebrity. His eloquence, though for the most part of the persuasive and pathetic kind, was also occasionally bold and impassioned; and he possessed an extraordinary power of sarcasm, which, however, the singular kindness and gentleness of his disposition rarely permitted him to employ. Sir Samuel Romilly esteemed him "the most efficient speaker in the House of Commons;" and Pitt himself said repeatedly, "Of all the men I ever knew, Wilberforce has the greatest natural eloquence." In politics, Mr Wilberforce uniformly acted on independent principles, and steadily refused all office through his whole life. Though strongly attached to Pitt, both by political opinions and by the ties of friendship, he pursued his course wholly unfettered by party connection; and he differed from his illustrious friend upon the two most critical emergencies of his life,—the question of peace with France in 1795, and the impeachment of Lord Melville ten years later. Mr Wilberforce married, in the year 1797, Miss Barbara Spooner, daughter of a banker of that name in Birmingham. By this lady he had six children, four sons and two daughters. (J. T—R.)

Wilberforce. || Wilde.

WILDE, THOMAS, first Baron Truro, was the son of a respectable solicitor in London, and was born in 1782. He became an attorney in 1805, and in 1817 he was called to the bar, and went the Western Circuit, where he speedily rose to be leading advocate. Having been made king's serjeant in 1827, he was engaged as junior counsel in the defence of Queen Caroline; and subsequently, in 1844, he conducted the trial of Daniel O'Connell before the House of Commons. In 1831 he sat in parliament for Newark, and again he was re-elected in 1835, and retained his seat, along with W. E. Gladstone, till 1841, when he was chosen member for Worcester. Wilde was made attorney-general in 1841, was raised to the bench as chief-justice in 1846,

Wilkes ‖ Wilkie.

and was finally elevated to the woolsack and made a peer in 1850. He resigned his chancellorship on the retirement of his party from office in 1852. Lord Truro was a patient, painstaking lawyer, and an upright and just judge. He might have dwelt with less minuteness on many of the unimportant details of a case, but few could surpass him in faithfulness or in the judicious summing up of a question, where so many points are involved as there ordinarily are in all legal disputes. Lord Truro likewise stands eminent as a legal reformer. He died at his seat, Bowes Manor, Southgate, Middlesex, on the 11th November 1855.

WILKES, JOHN, who occupies so conspicuous a place in the political history of the early part of the reign of George III., was born in London in 1727. He received a liberal education, and retained throughout life a strong love for the Latin classics. On completing his education he travelled on the Continent, subsequently married a lady of fortune, and in 1761 entered parliament as member for Aylesbury. It was a period of great political excitement; the king had begun his contest with the great Whig families who had ruled supreme since the accession of the Hanover dynasty; and Wilkes, espousing what was termed the cause of liberty, attacked the government with great violence in the *North Briton* newspaper, of which he was editor. He had even the temerity, in the well known No. 45 of the newspaper, to charge his Majesty with falsehood; and for this flagrant offence a king's messenger, armed with a general warrant against editor, printers, and publishers, apprehended him. His papers were seized, and he was lodged in the Tower. A few days after he was brought to trial in Westminster Hall, and released on privilege of parliament. The offending number of the *North Briton* was, however, burnt by the hangman; and Wilkes was expelled the House. Nothing daunted, Wilkes prosecuted the Secretary of State for having seized him illegally; and the trial definitively settled the important constitutional maxim, that general warrants are inconsistent with the laws of England. About the same time, Wilkes was prosecuted for printing an obscene poem, and was outlawed for non-appearance. He retired to France; but at the general election of 1768, he stood for Middlesex, and was returned by a large majority. His outlawry on submission was reversed, but he was liable to imprisonment. He was accordingly arrested, but a riot ensued, and the mob rescued him. The House of Commons voted that their censure disqualified him for ever from sitting in the House; his constituency considered this vote of the House as an infringement of their privileges, and returned Wilkes four times in succession as their member, while the House as often rejected him. The contest agitated the whole country; Wilkes became the popular idol; a general subscription defrayed his debts; and in 1774, the year of his mayoralty, he took his seat without opposition. More important events, however, now attracted attention, and Wilkes sank into obscurity, and died unnoticed in 1797.

WILKIE, SIR DAVID, the greatest of recent Scotch artists, was born in 1785, in the manse of Cults, a small parish in Fifeshire, of which his father was minister. Like most other great artists, he displayed at a very early period a taste for drawing, and according to his own account was able to draw before he could read. His father, after unsuccessfully opposing an inclination which seemed ominous of misery, at last reluctantly gave up opposing what was inevitable, and resolved to give his son the best training for pursuing with success the career which he had chosen. He accordingly placed him as a pupil at the Academy at Edinburgh, where he entered upon the study of art in 1799. Sir William Allan was one of his fellow-pupils; and under the instruction of Graham, young Wilkie made rapid progress. When he was eighteen, he gained a prize awarded for the best painting on "Callisto in the bath of Diana;" and he had already prepared the sketch for his "Village Politicians," thus exhibiting a careful study of character seldom manifested at so early an age. In 1804 he returned home, and employed his pencil on rustic subjects; painting, among other pictures, "Pitlessie Fair," for which he received from Kinnear of Kinloch twenty-five pounds.

Wilkie.

With the view of perfecting his education as an artist, he resolved to study for a short time in London, and he accordingly repaired to the metropolis, taking with him his "Village Recruit," which he exhibited in a shop-window at Charing Cross, and as he asked only the modest sum of six pounds for it, it soon found a purchaser. The proceeds furnished him with the means of providing himself with lodgings, and he forthwith entered as a student of the Royal Academy. His first patron in London was Stodart, the piano manufacturer, who employed Wilkie to paint his portrait, and introduced him to a valuable connection of his friends. Among these was the Earl of Mansfield, who, on inspecting the young artist's sketches, commissioned a picture from the sketch of the "Village Politicians," for which Wilkie asked fifteen guineas. The earl made no stipulation, but advised him to consult his friends as to the price. On the completion of the work, Wilkie was at once offered a hundred pounds; but he honestly offered it to Lord Mansfield, asking, however, the sum of thirty guineas, which the economical earl paid not without some hesitation. In a short time he found himself in the list of rising artists, with an abundance of commissions flowing in upon him; and he wisely determined to abandon his original intention of returning to Scotland, and settled in the metropolis, which offered a wider field for his genius. Among his early patrons were Mr Whitbread, Sir George Beaumont, who remained during life his constant friend, and Lord Mulgrave; and to this period of his life belong the following pictures, which are familiarly known to all through engravings, the "Blind Fiddler," painted for Sir George Beaumont; "Alfred in the Neat-herd's Cottage," "Card-Players," "Jew's Harp," "Cut Finger," and "Rent Day," which last was painted for Lord Mulgrave. His talents in the line of art which he had selected as his especial province were now so generally recognised, that he was able to obtain handsome prices for his works. Thus, for his "Village Festival," which now forms part of the collection in the National Gallery, he received from Mr Angerstein eight hundred guineas. The usual honours that attend the successful prosecution of art were also conferred upon him; in 1809 he was elected an Associate of the Royal Academy, and in 1811 he was advanced to the full dignity of Academician.

The assiduity with which he devoted himself to his work had, however, begun to affect his health, and by the advice of his physician he returned for a short time to Scotland, where the bracing air of his native hills speedily restored him to his customary vigour, and he once more bent his face southwards. In 1812 the death of his father left him the sole support of his widowed mother and sister; and with his characteristic warmth of heart he immediately took them to London, and settled with them in a commodious house in Kensington. Continuing the chronological list of his pictures, we come now to his well known "Blind-man's Buff," which he painted for the Prince Regent in 1813; to which year also belong his "Letter of Introduction," and "The Rejected Lover," otherwise styled "Duncan Gray." In the next year, besides paying a visit to the Louvre in company with his friend the unfortunate Haydon, he painted his "Distraining for Rent," which the British Institution purchased for six hundred guineas; the "Pedlar," and the "Rabbit on the Wall." In 1816 he paid a visit to Holland and Belgium, the great seats of that

Wilkie. school of art which he had so successfully naturalized in Britain, and painted a small picture for the Marquis of Stafford, called "The Breakfast." The following year he paid a visit to his native country, during the course of which he painted the familiar group of "Sir Walter Scott and his Family," so well known to all admirers of the great novelist. Washington Irving, in his recollections of Abbotsford, has left us an amusing account of the various interruptions that the picture met with; and, after all, though it is sufficiently characteristic of Scott acting the *laird*, and unbending from his severer pursuits, the extremely simple guise in which the other members of the family are depicted strikes one as somewhat incongruous; and the picture, though universally known, is, in consequence, not universally admired. The great work of 1818 was the "Penny Wedding," for which the Prince Regent paid upwards of five hundred pounds. The next year produced the "Reading of the Will," which was painted for the King of Bavaria. During the greater part of 1820 and 1821 he was busied on his greatest work, "The Chelsea Pensioners listening to the news of Waterloo." This work was painted for the Duke of Wellington, who gave the artist twelve hundred guineas for it, and it has always been considered Wilkie's masterpiece. The colouring is true to nature, without artificial brilliancy; the drawing is good, which is not always the case in Wilkie's works; the composition is excellent; and the story so admirably told as to need no interpreter. In the particular line of art to which it belongs,—the English modification of the Dutch school,—Britain has not produced any painting entitled to rank before this *chef-d'œuvre* of Wilkie's.

The subsequent works of Wilkie did not increase his reputation. From some unaccountable mistake, he abandoned the style by which he had so nobly earned his reputation, and adopted instead the more showy and ambitious mode of painting in which all his recent works were executed. One of the first and worst of his paintings in this new style was his "Entrance of George IV. into Holyrood." Notwithstanding this deterioration, however, Wilkie still retained his popularity; and, on the death of Sir Henry Raeburn, was appointed limner to His Majesty for Scotland, an honour which he well merited. In 1824, on account of the weakness of his health, he set out on a lengthened tour to the Continent. During this tour, which lasted for four years, he visited France, Switzerland, Italy, Munich, Dresden, Prague, Vienna, and Spain, receiving everywhere the admiration due to his fame; at Rome, in particular, a public dinner was given to him, at which the Duke of Hamilton presided. During his peregrinations he painted a number of works, of which the "Defence of Saragossa" is the only one that has found much popular favour. They were all in his new style, or, as he thought it, his revival of the style of the old masters, and which had the double recommendation of being more effective and more rapid in its execution. Time, however, has shown that these advantages have been purchased at too dear a rate; for it is said the works painted in this new style are rapidly perishing, whilst those in the discarded style are in as good preservation as when they first left the easel. In 1830 he was made painter in ordinary to his Majesty on the death of Lawrence, and became a candidate for the presidentship of the Royal Academy, but had only one vote recorded in his favour. Between 1830 and 1840 he painted a considerable number of works, most of which are familiar to all who occasionally look at print-shop windows, without possessing any high merit. This list embraces, among others, "John Knox preaching before Mary," "Escape of Mary from Lochleven," "Discovery of the body of Tippoo Saib at Seringapatam," and "Benvenuto Cellini submitting a vase to the inspection of the pope." In 1836 he was knighted, and in 1840 he set out on his last tour. Passing through Holland, he sailed up the Rhine and down the Danube to Constantinople, where he had the honour of painting the Sultan. From Constantinople he proceeded, in 1841, to Smyrna, Rhodes, Beyrout, and Jerusalem, a city which he viewed with intense rapture. After visiting the Dead Sea, he travelled by Jaffa into Egypt, and embarked at Alexandria for England. He, however, never reached his native country; on the 1st of June, he died off Gibraltar, and his body, after the burial service was read by torch-light, was committed to the deep. An interesting account of his life, with a critical estimate of his works, is given in Cunningham's *Life of Wilkie*, London, 3 vols., 1843.

Wilkie ‖ Wilkins.

WILKIE, WILLIAM, a poet of some note, was born in the parish of Dalmeny and county of Linlithgow on the 5th of October 1721. His father was a small farmer, and was not very fortunate in his worldly affairs. He, however, gave his son a liberal education, the early part of which he received at Dalmeny school; and at the age of thirteen he was sent to the University of Edinburgh, where he soon distinguished himself. Among his fellow-students were Dr Robertson the historian, Mr Home the poet, and some other eminent literary characters. In the course of his education he also became acquainted with David Hume and Adam Ferguson. Before he completed his studies at the university, his father died, leaving him only the stock and unexpired lease of his farm, with the care of three sisters, one of whom being afterwards married to an experienced farmer, Wilkie availed himself of his knowledge of agriculture. He formed a system of farming which fully answered his own expectations, and secured to him the approbation of all his neighbours. After becoming a licentiate of the Church of Scotland, he still continued his former mode of living, cultivating his farm, reading the classics, and occasionally preaching for the ministers in his neighbourhood. In 1753, he was presented to the living of Ratho by the Earl of Lauderdale, who was sensible of his worth, and admired his talents. The duties of his new office he discharged with fidelity, and was celebrated for his impressive mode of preaching, while he did not neglect the amusements of husbandry, and the study of polite literature. In 1757, he published, at Edinburgh, *The Epigoniad, a Poem, in nine books*, which is said to have been the result of fourteen years study. Hume endeavoured to promote its success by addressing a commendatory letter to the editor of the *Critical Review*. A second edition of the poem was published at London in 1769. In 1759, Wilkie was elected professor of natural philosophy in the University of St Andrews. His whole fortune, when he removed to this place, did not exceed L.200, which he laid out in the purchase of a few acres of land in the vicinity of the city. He lived at St Andrews in the same studious and retired manner as he had done at Ratho. In 1766, the university conferred upon him the degree of D.D. He ended his poetical career by publishing a volume of *Fables*, Lond. 1768, 8vo. After a lingering illness, he died on the 10th of October 1772, having only completed the fifty-first year of his age. The personal character of Dr Wilkie exhibited many singularities; but the very distinguished individuals with whom he was acquainted were all disposed to regard him as a man of talents as well as learning. His manners, however, were rude, and his habits filthy, which called down the remark of Charles Townshend, that he never knew a man "who approached so near to the two extremes of a god and a brute as Dr Wilkie."

WILKINS, JOHN, an eminent philosopher and divine, the son of Walter Wilkins, a goldsmith of Oxford, was born in 1614, at Fawsley, near Daventry in Northamptonshire, in the house of his maternal grandfather, John Dod, a nonconformist. After being trained in a private school at Oxford, he was entered of New Inn Hall in 1627, but was

Wilkins. soon afterwards removed to Magdalen Hall, where he took his degrees in arts. On receiving holy orders, he became chaplain to Lord Say, and afterwards to Charles Count Palatine of the Rhine. To the favour of this prince his knowledge of mathematics was a strong recommendation. At the age of twenty-four he published "*The Discovery of a New World; or, a Discourse tending to prove that 'tis probable there may be another habitable World in the Moon; with a Discourse concerning the Possibility of a Passage thither.* Lond. 1638, 8vo. This was followed by *A Discourse concerning a New Planet; tending to prove that it is probable our Earth is one of the Planets.* Lond. 1640, 8vo. Both these works appeared without his name. He next produced *Mercury; or, the Secret and Swift Messenger; showing how a Man may with Privacy and Speed communicate his Thoughts to a Friend at any Distance.* Lond. 1641, 8vo. Another of his works bears the title of *Mathematical Magick; or, the Wonders that may be performed by Mechanical Geometry.* Lond. 1648, 8vo. These four tracts were long afterwards reprinted in a collection of his *Mathematical and Philosophical Works.* Lond. 1708, 8vo. Lond. 1802, 2 vols. 8vo. The earliest of his theological works was his *Ecclesiastes; or, a Discourse of the Gift of Preaching, as it falls under the Rules of Art.* Lond. 1646, 8vo. The ninth edition was printed in 1718. This publication was succeeded in 1649 by *A Discourse concerning the Beauty of Providence in all the Rugged Passages of it;* and in 1653 by *A Discourse concerning the Gift of Prayer.*

On the commencement of the civil wars he adhered to the parliament, and took the solemn league and covenant. The committee for reforming the university appointed him warden of Wadham College. On the 12th of April 1648 he was created B.D., and was next day admitted to the office, for which his learning, as well as his talents and temper, eminently qualified him. Next year he was created D.D., and about the same period married Robina, the sister of Oliver Cromwell, and the widow of Dr French, canon of Christ Church. The Protector granted him a dispensation for retaining the wardenship, notwithstanding his marriage. In 1659, Richard Cromwell appointed him master of Trinity College, Cambridge; but he was ejected in the course of the following year. The Restoration did not, however, deprive Dr Wilkins of all hope of preferment. He soon afterwards became preacher at Gray's Inn, and rector of St Lawrence-Jewry. His next promotion was to the deanery of Ripon. It was about this period that he published the most remarkable of his works, *An Essay towards a Real Character and a Philosophical Language.* Lond. 1668, fol. Of this essay a Latin version was completed by Ray, but was never published. During the same year, 1668, he was advanced to the bishopric of Chester; and his consecration sermon was preached by Dr Tillotson, who had married his step-daughter, Elizabeth French. The high preferment which he so well merited he did not long enjoy. Wilkins was the fourth bishop appointed to this see since the year 1660. His fatal disease was a suppression of urine, which was mistaken for the stone. He died at Dr Tillotson's house in Chancery Lane, London, on the 19th of November 1672, having only attained the age of fifty-eight. His funeral sermon was preached by Dr Lloyd, afterwards bishop of Worcester, who was himself a man of distinguished learning. His papers were left to the disposal of Tillotson, who prepared for the press his treatise *Of the Principles and Duties of Natural Religion, two books.* Lond. 1675, 8vo. This work was very favourably received, and it reached a fifth edition in 1704. The same editor afterwards published a volume containing fifteen of the bishop's sermons. Lond. 1682, 8vo. In the preface he vindicated the character of this excellent prelate from some of the malignant aspersions to which it had been exposed. Wilkins was a man of a liberal and generous mind, and was as much distinguished by his amiable disposition as by his intellectual endowments.

William I. ‖ William of Warham.

WILLIAM I., commonly called "the Conqueror," was born in Normandy in 1027, and became king of England in October 14, 1066, and died at Rouen, from the effects of a fall from his horse, on the 9th September 1087. (See ENGLAND.)

WILLIAM II., improperly called "Rufus," instead of "Ruber," the ruddy faced, was the second surviving son of William the Conqueror, and was born in Normandy in 1056. He became king of England in 1087, and was killed by an arrow in the New Forest on the 2d August 1100. (See ENGLAND.)

WILLIAM III., Prince of Orange, belonged to the house of Nassau, and was by his mother nephew to Charles I., was born at the Hague in 1650, and ascended the throne of England in 1689. He died from the effects of a fall from his horse in 1703. (See BRITAIN.)

WILLIAM IV., usually known as "The Sailor King" of England, was the third son of George III., and was born in 1765. He adopted the navy as a profession, succeeded his brother George IV. as king of England in 1830, and died in 1837. (See BRITAIN.)

WILLIAM *of Malmesbury.* See MALMESBURY.

WILLIAM *of Newburg* (frequently erroneously called William of Newbury), a monk of a monastery in Yorkshire of that name, and author of a chronicle beginning with William I. and ending in 1197. He calls himself Gulielmus Parvus, from whence it is supposed his real name was Little. Pitts (p. 271) decries him as a "flatterer of grandees at court," but there seems no reason for such an assertion. The charge is probably based on the fact, that he justifies Henry II. in his attempts to make the clergy amenable to the common law in criminal cases. He appears to have been one of the earliest to protest against the history of Geoffrey of Monmouth, which he calls, with great reason, "ridicula figmenta." The Welsh historians, however, affirm that it was in consequence of his being disappointed in succeeding Geoffrey (who died in 1165) as bishop of St Asaph. Dr Wats, in the preface to his fine edition of Matthew Paris, prefers Newburg's style to that of the former. The best edition is that of Hearne, Oxford, 1719. (A. A.)

WILLIAM *of Warham*, a celebrated churchman and statesman. The date of his birth is not known, but he was educated at New College, and presented to the living of Horwood in 1487, and seems to have acted as an advocate in the Court of Arches. In 1494 he was appointed Master of the Rolls, and in that year went as ambassador to Austria. In 1502 he was created Bishop of London, the Keeper of the Privy Seal, and Lord Chancellor; and in 1504 Archbishop of Canterbury. He seems to have strongly opposed the ill-fated marriage between Henry and Katharine of Arragon. On the accession of the king Wolsey was taken into favour, and exhibited his envy and opposition to Warham in every way he possibly could,[1] till, on the promotion of the former to the dignity of cardinal and papal legate in 1515, the latter thought fit to resign the seals, which were eagerly grasped by his opponent: Warham having previously observed with sorrow to his friends—"See you not how this Wolsey is drunken with success." On the disgrace of the cardinal in 1529, the seals were

[1] A full account of this is to be found in the second volume of Grove's *Life of Wolsey*, and in the appendices to Strype's *Ecclesiastical Memoirs.*

William of Waynflete ‖ William of Wykeham.

again offered to Warham, who declined them on account of his age. The various historians bear testimony to his amiable and peaceful character. He was a fine scholar, the friend of Dean Colet, and of the great Erasmus; and did vast service to the cause of literature by collecting all the Greek works which he could obtain through those who had fled their native country after the fall of Constantinople. He died in 1532, and lies buried under a magnificent tomb in the north transept at Canterbury. (A. A.)

WILLIAM *of Waynflete*, another distinguished ecclesiastic and statesman, whose name is variously stated to have been Patten, or Barbour. He is supposed to have been born at Waynflete, near Spalding in Lincolnshire, about the end of the fifteenth century. Fuller says his father was a knight. He was educated at New College, and made master of Winchester school, and in 1443 provost of Eton. On the death of Cardinal Beaufort, 1447, he was elected Bishop of Winchester. About this time the fearful civil wars of the Roses broke out; and although strictly adhering to the king's party, he appears to have used all his influence and exertions to restore peace to the kingdom. In 1456, after the first battle of St Albans had restored Henry to power, he made Waynflete chancellor. He however resigned the seals in 1460, a few days before the fatal battle of Northampton. He is said to have continued faithful to the deposed monarch, and to have visited him in his imprisonment, and to have been so much respected by Edward that he gave him a full pardon. He had devoted a large portion of his wealth to the completion of Eton; but he is better known as the founder of the magnificent college of St Mary Magdalen at Oxford, one of the glories of that beautiful city. He lived to see the chief desire of his heart, the union of the two great parties, and died in August 1486, just a year after the battle of Bosworth Field. (A. A.)

WILLIAM *of Wykeham*, a celebrated architect, ecclesiastic, and statesman of the fourteenth century. He was born at Wickham, near Bishops Waltham, in Hampshire, in the latter part of 1324. From researches made by Glover, the Somerset herald, we are told his father was of humble origin,[1] but, the Winton MSS. assert, of honest repute. The name given to him in a pedigree still preserved at Winchester is John Longe; his mother's name was Sibylla,[2] and she, we are informed, was of gentle birth. It appears, from all accounts, they were in straitened circumstances; still, either by the assistance of others, or by their own exertions, he was sent to a place where the present school now stands, and there, says his early biographer, he was instructed in French, logic, arithmetic, and geometry. Common tradition states that his patron and benefactor was Sir Nicholas Uvedale, lieutenant of Southampton, governor of Winchester Castle, and lord of the manor at Wykeham. The Winton MS. speaks highly of his abilities and piety, and states that when he left the school he was appointed Uvedale's secretary, and by him introduced first to the notice of Edyngdon, bishop of Winchester, and afterwards to that of King Edward III.[3] Attempts have been made by some of his later biographers to show that he studied at Oxford for six years, but the MSS. make no mention of such a thing. The MSS. state, that at the age of twenty-two or twenty-three years he was "transferred[4] to the court of our lord king, Edward the Third." His first public appointment seems to have been clerk of all the king's works in his manors of Henle and Yeshampsted. The patent[5] is dated 10th May 1356. On the 30th October,[6] in the same year, he is appointed "chief keeper and surveyor of the castles of the king at Windsor, Ledes, Douer, and Hadlee," and of a great number of manors enumerated in the patent. He appears to have received a shilling a day as his salary while at Windsor, two shillings at other places, and three shillings a week for his clerk. In the next year he received a grant of an additional shilling per day, unless he should happen in the interim to be presented to a benefice. He had absolute power to press any number of workmen into his service, and obtain timber and stone in any quantity to carry on the works. By his advice the greater part of the old castle was pulled down,[7] and rebuilt in a much stronger and more splendid style. He also built a very strong castle at Queenborough, in the Isle of Sheppey,—a work carried out with great difficulty, on account of the swampy nature of the soil. We have every reason to believe the chronicler, that his success as an architect, and his general talents as a man of business, strongly recommended him to the king, who, among other preferments,[8] gave him the rectory of Pulham in Norfolk, although he was then a layman.[9] He took the order of subdeacon about four years after this, and was ordained priest in June 1362. The "fat benefices" alluded to by the chronicler now flowed in so fast on him that they amounted to more than L.800 per annum. To his credit, however, it should be said they were all, with but one exception, without cure of souls. We have now the testimony of Froissart of the high esteem in which he was held by the king.[10] In 1364 he was made Privy Seal, and, in 1366, nominated Bishop of Winchester, on the death of his old friend and patron Edyngdon. But here occurred a most singular difficulty. The pope, by a bull dated 3d December, directed to Wykeham, recites that he has been recommended to him on account of his probity, and commends the diocese to his care. In other words, both the king and pope wished him to be bishop, but could not agree as to which should ostensibly have the

William of Wykeham.

---

[1] Report in the Fiennes and Wickham case, March 1572.

[2] "Ex parte matris nomine Sibillæ, generosa prosapia," &c. (MS. Chandler.) The Winton pedigree gives her the name of Bowade and shows her descent from the Lords of Stratton.

[3] That he was in the bishop's service is more than probable, as in two instances we find him acting as attorney for him, in taking and delivering seisin of certain lands. In fact, Chaundler, in his short *Chronicle*, written only fifty years after his death, tells us "he occupied himself very little with speculative science, nor exercised in the schools of arts, theology, and laws; how could he indeed do so without an exhibition, on account of the poverty of his parentage? but in practical matters he was a man of the highest wisdom." It is said, however, by some, that he studied six years at Oxford, attending the mathematical lectures of Carleton and the civil law of Dorach.

[4] Biennio vel tricennio elapso post annum ætatis suæ vicesimum, *translatus* est in curiam domini regis Edvardi III. (Winton MS.)

[5] Harl. MS. 6960. [6] Ibid., et Rot. Pat. 33 Ed. III.

[7] "About the year 1359, our Lord the King, at the instigation of William Wykeham, clerk, in the castle of Wyndleshore, caused many good buildings to be pulled down (prosterni), and other more beautiful and sumptuous to be built; . . . and after a short time built a new castle in the isle Shepeye, . . . though the site was bad. On account of which the King enriched (ditavit) the said William with many good and fat (pinguibus) benefices, and after a short time made him carry his privy seal, and in succeeding time procured that he should be Bishop of Winchester; and at last, as the cope-stone (cumulum) of his honor, constituted him Chancellor of England." (*Chronicle of Ranulph of Chester*, continued by John of Malverne.)

[8] It must be remembered our kings at that time rewarded their servants less with salaries than by gifts of any preferments they might have the disposal of.

[9] He is repeatedly called "Clericus," but that designation, like the Arabic *Effendi*, was then applied to every learned man, whether n orders or not.

[10] "There was a preest about the Kyng of England, called Sir Wyllyam Wycan, who was so great with the Kynge that all thyng was done by hym, and without hym nothing done." (Lord Berners' Froissart, vol. i. p. 244.)

William of Wykeham.

appointment. The matter was arranged at last,[1] and Wykeham was consecrated 10th October 1367. About a month previous to which he had been created chancellor.

In this capacity he seems to have distinguished himself by his desire for justice, and by the terseness and vigour of his addresses to parliament.[2] As a bishop he visited his diocese,[3] and his various estates, and set everything in order. Our space will not permit us to enlarge on partial reforms among the religious houses; general improvements, as bridges, roads, and causeways, and public and private charities; but two great works must be recorded. Feeling acutely the state of decay of discipline among the monastic bodies, and how impossible it was to carry out the intention of their founders,[4] he conceived the munificent idea of founding a noble college at Oxford, now called New College, and a school at Winchester, on the site where he himself, as a poor lad, had received his education; not by bequeathing money after he had no longer any use for it in this world, but by erecting and endowing them during his life at his own cost, and bringing them to maturity by his own personal care and example. But the king was becoming old, and was entirely governed by the notorious favourite, Alice Piers. The Duke of Lancaster was suspected of having an eye to the sovereign power. A parliament, generally known as the good parliament, was called, and Alice Piers, Lord Latimer, and the chief favourites and Lancastrians, were banished. The Black Prince, the idol of the nation, who had been sinking under a slow disease, died[5] shortly after. Immediately the duke returned to court, and recalled the favourites, with whom he surrounded the doting monarch, and proceeded to avenge himself on those who had opposed him. By his instigation articles were exhibited against Wykeham, charging him with misappropriation to the amount of a million of money,[6] and other very serious malversations. All these charges dwindled at last into one of having, as chancellor, forgiven a fine of half of L.80 to one John Grey. But this was enough; the whole of his property was seized, and he was banished from his see, first to Merton, and then to Waverley Abbey. The king had now reigned fifty years, and, as usual, a jubilee was kept, and an act of general pardon for all criminals was passed; but such was the malice of his enemies, that Wykeham alone was specially excepted[7] from its benefits. These repeated acts of persecution roused the spirit of the clergy, particularly of Courtney the archbishop, who never rested till he got him restored to his dignities and temporalities.[8]

Shortly afterwards the great precursor of the Reformation, Wycliffe, was cited before the Convocation, at which the Archbishop and Bishop of London presided, and at which the good intentions of the reformer were much impeded by the violence of his patron,[9] the Duke of Lancaster. It does not appear that Wykeham took any active part in this celebrated scene, and though, in common with the principal bishops, he signed the condemnation of many of Wycliffe's doctrines, to his great credit he appears to have taken no part whatever in the persecution of the Lollards, which followed shortly after: on the contrary, we have the authority of Fox,[10] that when Dr Rygge fell under censure for preaching these doctrines, Wykeham personally interceded for him, and with difficulty obtained his pardon. On the 18th June 1377 he was restored to full favour, and, in three days after, the pride of England and the terror of France, the great king Edward the Third expired in a state bordering on dotage. On his death the insolent tyranny of his mistress, Alice Piers,[11] ceased at once. The new king received Wykeham into his confidence, and, in 1389, again created him lord chancellor. This office he resigned after three years, during which he had done much to conciliate the king and the parliament; but it was impossible to curb the extravagance, or to steady the conduct of the weak and vacillating prince. Foreseeing the storm that approached, Wykeham seems gradually to have retired from public life, busying himself with bringing to perfection his two noble foundations at Oxford and at Winchester. His last and favourite work was the entire alteration of the old Norman nave at the cathedral of the latter place. Many have thought he entirely rebuilt it; but recent researches have shown it to be the old Norman work of Walkelyn, converted with very great skill to its present form. The time of trouble he had foreseen now arrived, and he, among others of the great ones of the land, was present when Richard abdicated the throne. He had every respect from the successor, but old age, which was creeping on him, gave him a better excuse to devote himself more exclusively to his beloved pursuits. Our limits will not allow us to follow him in all his goodness and charity: we can only record that he was called to his final rest on the 27th September 1404, at Long Waltham, and that he lies in his loved cathedral, under the beautiful chantry designed by himself. His character must be summed up in few words. As an architect he seems almost the only person not in orders who devoted himself in early years to that profession; for, as it has been shown, it was late in life before he entered even the lowest orders of the Church. That he was employed, while a layman, as "clerk of the works," upon several important buildings, particularly the castles, which in that day were half-palaces and half-fortalices, is clear. In addition to the authorities before stated, we have the very curious fact of a sort of testy allusion, from the pen of the great Wycliffe,[12] that he was celebrated in his art. Any commentary on his taste and skill would fill a long

[1] The Duke of Bourbon was then one of the hostages for the King of France, and under ransom to the King of England. The latter promised him an easy ransom if he could arrange matters with the pope. The duke accordingly went to Avignon, and managed the affair so that the dignity of neither was encroached upon. The ransom is said finally to have been fixed at 40,000 crowns. Froissart, vol. i. p. 630.

[2] Before his time the chancellors used to commence with a text, and preach a sort of sermon to the parliament assembled.

[3] St Cross among other places, which seems to have been a sort of *bête noire* to the Bishops of Winchester for ages. Wykeham was in litigation with this place for six years before he could reform it.

[4] See the prefaces to his statutes.

[5] He always had an esteem for Wykeham, and left him one of the executors of his will.

[6] He was charged with embezzling the public revenues, although he was never treasurer, and not a penny ever reached his hands in any way.

[7] The words of the statute are, "that always it is the kynge's mind, that Sir William Wykeham, Byshop of Wynchester, shall nothing enjoye of the said graces, graunts, and pardons, nor in no wise be comprised within the same."

[8] Saddled, however, with a payment of 4000 marks a year to the young Prince Richard, and with the fitting out three ships of war with fifty men-at-arms and fifty archers each.

[9] He talked of pulling down the archbishop by the hair of his head.

[10] *Acts and Monuments*, p. 437.

[11] This woman was Wykeham's implacable enemy; and yet, because it is known he had a niece named *Alice* Perrot, writers have been found ignorant enough to confuse one with the other, and to insinuate he owed his advance to the solicitations of a favourite.

[12] Wycliffe says, complaining that poor priests have no preferment, "Yet lords wolen not present a clerk able of kunning of God's law, but a ketchin clerk, or a penny clerk, or wise in building castles, or worldly doing, though he kunne not reade well his sauter." Against whom this can be pointed but he to whom the architecture of the goodly list of castles from Windsor to Queenborough was intrusted, it is impossible to say.

Williams. treatise. As a statesman, he had the confidence of two princes of opposite tempers, but both of whom, it is to be regretted, were ruled by unworthy favourites: however, in good or evil report, he is shown to have held the scale justly between them and the people. As a churchman, he seems to have been not only liberal of his goods to his friends, but kindly of heart to his opponents. In that intolerant age, no stain of cruelty or persecution attaches to his name. Tradition, that is oftener wrong than right as to facts, is often correct as to character; and while some may have left behind them a more profound, some a more acute, some a more dazzling reputation, his memory is more cherished and loved than that of any founder on record. There is a bond of union among those educated in his foundations it is difficult to describe: the very name of Wykehamist is a sort of clanship of the closest nature; and though the chronicles of the middle ages are dull and obscure, compared with the bright lights reflected from the multiplicity of collected and recorded facts in later times, few names are remembered among British worthies with greater pleasure and respect than that of William of Wykeham. (A. A.)

WILLIAMS, John, a Protestant missionary to the South Sea Islands, was born at Tottenham High Cross, near London, June 29, 1796. His early education was more circumscribed than might have been expected; but having been afterwards bound as an apprentice to a furnishing ironmonger in London, he, without neglecting the duties of the warehouse, manifested a special interest in the processes of the workshop, and eagerly availed himself of opportunities of making himself practically acquainted with them. The mechanical skill which he then acquired he turned to good account in after-life. Having offered his services to the London Missionary Society, he sailed in November 1816 for the South Sea Islands, along with other three missionaries. On reaching the scene of his labours, he settled not on Tahiti but on Raiatea, one of the Society Islands, along with another missionary named Mr Threlkeld. Here, besides communicating religious instruction to the natives, they sought to promote among them the arts of civilized life. Previously the inhabitants had lived in a straggling way over the island, three or four families in one bay, and a little group five or six miles further on; but now, through the advice and influence of the missionaries, they collected together into one place, and erected for themselves a range of neat cottages, extending nearly three miles along the sea-beach, in which the great body of them resided. To this the mechanical skill and the instructions and example of Mr Williams greatly contributed. He threw his whole soul into efforts for the improvement of the natives, through means of the mechanical and other arts of civilized life, being fully alive to the great importance of the advancement of their temporal as well as of their spiritual condition; and he had the satisfaction of seeing great advances made by them in their civil and social, as well as in their religious and moral condition.

But Mr Williams was not satisfied with the limited sphere of usefulness which he had in Raiatea. He was anxious to visit the other groups of islands in the Pacific Ocean, and to introduce the gospel into them. Having had occasion, on account of his own and his wife's health, to go to Sydney, he also thought to advance the civilisation of the Society Islands by establishing a regular communication between them and the colony, and opening a market there for native produce. With these views he purchased, on account of the chiefs, a schooner of from 80 to 90 tons, and after his return to Raiatea, he and his fellow-missionary Mr Bourne sailed for the Hervey Islands, and taking with them six native teachers, settled them in Rarotonga and others of the islands. But he was stopped in the execution of the great scheme which had taken possession of his mind by its becoming necessary to sell the vessel. Though discouraged by this and other circumstances, he never, however, gave up the design. Having, four years afterwards, paid a second visit to Rarotonga for the purpose of introducing a missionary into that island, he was detained there longer than he had originally contemplated, as no ship had touched at it by which he might return to his own field of labour, and he was driven to the necessity of building a small vessel for the purpose. He had little knowledge of shipbuilding, was without suitable materials, had scarcely any tools except the imperfect ones which he himself made, and had to employ natives, who were wholly unacquainted with even the most ordinary things; yet in writing to a friend he was able to say, "I have built a little vessel of between 60 and 70 tons for missionary purposes. She was not four months on hand from the time we cut the keel until she was in the water. I had everything to make—my bellows, forge, lathe, and all the iron work, out of old axes, iron hoops, &c.; but I cannot enlarge on my numerous manœuvres to overcome difficulties, though they would be interesting to you no doubt. Suffice it to say she is finished." Shortly after he sailed in her to Tahiti, a distance of between 600 and 700 miles. Williams.

In May 1830 Mr Williams, accompanied by a fellow-missionary, Mr Barff, sailed in the Messenger of Peace, as his little vessel was called, to the Navigators Islands, in the prosecution of the great object on which his heart had been so long set. Here they met with a very cordial reception from both the chiefs and the people; and, encouraged by this, they left eight native teachers on the island of Savaii, the largest and most imposing of the group. Such was the first step in the commencement of a mission on the Navigators Islands, a mission which has since been attended with remarkable success.

In 1834, Mr Williams returned to England, partly on account of his wife's health, who had long been a great invalid; and having been much employed in addressing public meetings, and also by the publication of a work, entitled *A Narrative of Missionary Enterprises in the South Sea Islands*, he excited a deep interest in his mission and his plans. We question whether any missionary returned from the scene of his labours or any missionary publication ever made an equal impression on the public mind. While in this country he also carried through the press the New Testament in the dialect of Rarotonga, a considerable portion of which had been translated by himself, and likewise several other useful works. For the object on which his heart had been set for so many years, a missionary ship, he also now obtained ample funds.

In 1838, after a lengthened stay in this country, prolonged by his many and important engagements, Mr Williams again sailed for the South Sea Islands in the Camden, as the ship was called. He was accompanied by other nine missionaries; and after visiting the Navigators, the Hervey, the Georgian, and the Society islands, and seeing them settled in the several stations to which they were destined, he sailed with twelve native teachers for the New Hebrides and New Caledonia. On board the ship were also Mr James Harris, and Mr W. C. Cunningham, the British vice-consul for the South Sea Islands. After leaving three teachers on Tanna, they directed their course to the island of Erromanga. Here Mr Williams, Mr Harris, and Mr Cunningham landed, but they had not gone far on shore when they were attacked by the natives. Mr Cunningham effected his escape, but Mr Williams and Mr Harris were overtaken by them and killed with their clubs. An attempt was made to recover the bodies, but the natives carried them off and devoured them. Thus perished John Williams November 20, 1839, a noble specimen of a Christian missionary—ardent, devoted, disinterested, energetic, kind and conciliatory in his manners, yet withal of a compre-

Willis ‖ Wills.

hensive, common sense, practical mind, and ready to make every sacrifice for the great cause in which he was engaged. (W. B—N.)

WILLIS, THOMAS, a celebrated English physician, was born at Great Bedwin, in Wiltshire, on the 27th of January 1621, and studied at Christ Church, Oxford. When that city was garrisoned for the king, he, among other scholars, bore arms for his majesty; and he devoted his leisure hours to the study of physic. The garrison of Oxford at length surrendering to the parliament, he applied himself to the practice of his profession, and soon rendered himself famous by his care and skill. He appropriated a room as an oratory for divine service according to the Church of England, whither most of the Loyalists in Oxford daily resorted. In 1660, he became Sedleian professor of natural philosophy, and the same year took the degree of doctor of physic. In 1664, he discovered the famous medicinal spring at Alstrop, near Brackley. He was one of the first members of the Royal Society, and soon made his name illustrious by his excellent writings. In 1666, after the fire of London, he removed to Westminster; and his practice became greatly extended. He died at his house in St Martin's, on the 11th of November 1675, and was buried in Westminster Abbey. He was justly admired for his deep insight into natural and experimental philosophy, anatomy, and chemistry, for his successful practice, and for the elegance and purity of his Latin style. He wrote in English *A Plain and Easy Method for Preserving those that are Well from the Infection of the Plague, and for Curing such as are Infected.* All his Latin works were printed in two vols. 4to, at Geneva, in 1676, and at Amsterdam in 1682. His grandson, Browne Willis, was the author of several antiquarian works.

WILLS, or TESTAMENTS, are of great antiquity. They were in use among the ancient Jews. Thus, we are informed of Noah's testament, made in writing, and witnessed under his seal, and the bequest of Jacob to his son Joseph of a portion of his inheritance, double that of his brethren. Solon introduced wills into Athens. In Rome they were unknown till the laws of the Twelve Tables. Among the Germans, testaments were not in use in the time of Tacitus.

In England, the power of bequeathing is coeval with the first rudiments of the law. Glanvil informs us, that by the common law, in the reign of Henry II., a man's goods were to be divided into three equal parts; one went to his heirs or lineal descendants, another to his wife, and the third was at his own disposal. If he died without a wife, he might then dispose of a moiety, and the other went to his children; and if he had no children, the wife took one-half, and he might dispose of the other. If he died without wife or issue, he might dispose of the whole. This continued to be the general law of the land, as expressly laid down by Sir H. Finch, in the reign of Charles I. But this law has been from time to time altered, and a testator may now bequeath the whole of his goods and chattels.

The law relating to wills is consolidated and amended by the Statutes 1 Vict. c. 26, and the 15 and 16 Vict. c. 24; and they relate to all wills made on or after the 1st January 1838. Before those acts, a will might be either written or verbal; and with regard to personal property, it was not required to be attested by any witness, if the handwriting of the testator could be satisfactorily proved. Devises of land, however, were ineffectual against the heir-at-law, unless attested by three witnesses. All wills, whether of real or personal estate, must now be in writing, and signed at the foot or end thereof by the testator, or by some person in his presence and by his direction, in the presence of *two* witnesses at least, present at the same time, who must subscribe and attest the will in his presence. By the second act, "the signature must be so placed at, after, following, under, or beside, or opposite *the end of the will*, that it shall be apparent on the face of the will that the testator intended to give effect, by such his signature to the writing signed as his will." Devises without words of limitation will now pass the fee-simple of an estate.

Willughby.

A *married woman* cannot make a will, except of the property settled to her separate use; and a will made by her when sole is revoked by her marriage. *Infants* under the age of twenty-one cannot make a will, either of real or personal property; nor *lunatics* nor *idiots*, nor persons under duress or undue influence, nor *criminals* convicted of such offences as subject their property to forfeiture: in some cases at the time of the commission of the offence, and in others from the time of conviction.

Formerly it was held that if a man married after making his will, *and* there was a child of the marriage, the will was impliedly *revoked;* but now marriage alone is a total revocation of the will; and it is not revoked by any other change of circumstances. It may be revoked by another will or codicil subsequently executed, or by a writing declaring the intention to revoke, or by burning, tearing, or otherwise destroying the will, with the intention to revoke it. A revoked will may be *revived* by re-execution, or by a codicil showing an intention to revive it.

Wills are not void though the *attesting witnesses* be incompetent; but gifts to attesting witnesses, or their husbands or wives, are void. And a creditor of the testator, or the creditor's wife, or an executor, may be a witness.

No *alteration*, obliteration, or interlineation is valid, except so far as the words or effect of the will before the alteration shall not be apparent unless with such alteration. If the signature of the testator and subscribing witnesses be made in the margin, opposite or near the alteration, or at the foot or end referring to the alteration, it will be sufficient.

The will takes effect as if executed immediately before the testator's death, unless a contrary intention be shown by the will; and lapsed and void devises fall into the residue, unless the will shows a contrary intention.

Where a testator dies after 31st December 1854, and his lands are subject to a mortgage, and he does not by his will or otherwise signify to the contrary, the heir or devisee is not entitled, as formerly, to have the mortgage debt discharged out of the personal estate, but the land is, by the 17 and 18 Vict. c. 113, primarily liable to the mortgage debt.

The latest statute on this subject is the Property and Trustee Act, 23 Vict. c. 35, by which every will is deemed to contain a clause for the indemnity and reimbursement of trustees and executors, and rendering them chargeable only for their own acts, and not for any banker, broker, or other person with whom the trust monies or securities may be deposited, nor for signing any receipt for the sake of conformity. It is also provided that executors or administrators making payments under a power of attorney are not liable by reason of the death of the party giving the power. (R. M—M.)

WILLUGHBY, FRANCIS, a celebrated natural historian, was the only son of Sir Francis Willughby, and was born in 1635. He was fond of study from his childhood, by which means he attained great skill in all branches of learning, and particularly in the mathematics. But to the history of animals, which was in a great measure neglected by his countrymen, he particularly applied himself; and for this purpose carefully read over what had been written on that subject by others. He prosecuted his studies in Trinity College, Cambridge, where he took the degree of A.B. in 1656, and of A.M. in 1659. In the following year we find him residing at Oxford for the benefit of the public library. He then travelled in search of natural knowledge, several times over his native country, and afterwards into France, Spain, Italy, Germany, and the Low Countries, attended by his ingenious friend John Ray. He was

Wilmington ‖ Wilmot.

humble, sober, honest, and pious. This learned gentleman died on the 3d of July 1672, at the age of thirty-seven, having impaired his health by his application. He wrote, *Ornithologiæ libri tres*, 1676, fol. It was afterwards translated into English, with an appendix, by Ray. *Historiæ Piscium libri quatuor*, 1686, fol. *Letters of Francis Willughby, Esq., added to Philosophical Letters between the learned Mr Ray and several of his correspondents*, and published by Dr Derham. *Several Ingenious Papers in the Philosophical Transactions.* (See RAY.)

WILMINGTON, a town and river-port of the United States of N. America, Delaware, at the junction of the Christiana Creek with the Brandywine, 2 miles above the mouth of the latter in the Delaware, 28 miles S.W. of Philadelphia, and 70 E.N.E. of Baltimore. It stands partly at the foot and partly on the slope of a hill, is regularly laid out with broad straight streets, and is generally well built of brick. The principal public buildings are a town hall, a large hospital, a handsome Roman Catholic college founded in 1847, and numerous churches belonging to different denominations. Wilmington has several boarding-schools, newspaper offices, and banks. But it is as a manufacturing town that it chiefly deserves notice. The whole of its establishments are estimated to produce annually, on an average, goods valued at L.990,000. Among the more important items that make up this sum are iron and iron goods of all sorts, L.277,000; flour and meal, L.244,000; leather of various kinds, L.142,000; and cotton, L.110,000. Ship-building is also carried on to a large extent; and there is a considerable trade and navigation. Pop. (1853) 16,163.

WILMOT, JOHN, Earl of Rochester, a licentious wit and satirical poet, was born on the 10th of April 1647 at Ditchley in Oxfordshire. He received his education first at Burford, and afterwards at Wadham College, Oxford, which he entered in 1659, and received his master's degree in 1661. After travelling in France and Italy, he devoted himself to the court. Going to sea in 1665, he distinguished himself for his intrepidity, but his bravery seems to have deserted him as soon as he left the salt water. An early inclination to intemperance was indulged by the license of the court, and Rochester, who was a brilliant and dashing wit, soon had his morals corrupted and his manners depraved. He told Dr Burnet that he had been continually drunk for five years, and his gross licentiousness was only equalled by his scandalous infidelity. Aubrey says of him, that when living in the country, Rochester lived a blameless life, but "when he came to Brentford, the devil entered into him, and never left him till he returned to the country again." His drunken pranks and sallies of extravagance are endless. Now he was a mountebank and harangued the mob from Tower-hill; again he was an alchymist, and hoodwinked old women and some young ones by the dexterity of his personation. Yet he was much in favour with the king, who made him one of the gentlemen of the bedchamber and ranger of Woodstock Park. Dryden, Otway, and Crowne, all dedicated dramas to him, yet in his tyrannical capriciousness he lampooned all three, and had Dryden cudgelled. A life thus spent in ostentatious contempt of every rule of civilized society, at last ended in a state of weakness and decay. Wilmot died at the premature age of thirty-four years, on the 26th July 1680. Bishop Burnet wrote a book about the "total change" of the profligate's manners and opinions which followed his lordship's acquaintance with him. Rochester, according to Burnet, "was a graceful and well-shaped person, tall and well made, if not a little too slender." Much doubt exists regarding Rochester's poetical pieces. There is an "Antwerp" (which means in this case *forbidden*) edition, published in 1680, a more obscene one still in 2 vols. 1731–2, besides numerous castrated editions, but all incomplete. There is least doubt about his *Imitation of Horace's Satire*, his *Verses to Lord Mulgrave*, his *Satire against Man*, and his *Verses upon Nothing*. His poems possess much sprightliness and vigour, and "everywhere," as Dr Johnson remarks, "may be found tokens of a mind which study might have carried to excellence."

Wilna ‖ Wilson, Alexander.

WILNA. See VILNA.

WILSON, ALEXANDER, "the American ornithologist," was born at Paisley, in Scotland, on the 6th of July 1766. His father was a hand-loom weaver, and he himself followed the same trade. His education was more liberal than that of many in similar circumstances. Some poems which he published, especially those written in the Scottish dialect, possess great merit. In 1794 he emigrated to the United States, where, after working for some time as a weaver, he betook himself to the not less laborious but more refined employment of schoolmaster. For a series of years his time was occupied in that country with various studies, such as mathematics, the German language, music, drawing, and, above all, natural history. At length he resolved to devote himself entirely to ornithology, and, at whatever hazard, to form a collection of all the birds of the United States. For this he was eminently qualified. In the words of his American biographer, "he was not only an enthusiastic admirer of the works of creation, but he was consistent in research, and permitted no dangers or fatigues to abate his ardour or relax his exertions. He inured himself to hardships by frequent and laborious exercise, and was never more happy than when employed in some enterprise which promised, from its difficulties, the novelties of discovery. Whatever was obtained with ease appeared to him comparatively uninteresting: the acquisitions of labour alone seemed worthy of his ambition. He was no closet philosopher; he was indebted for his ideas, not to books, but to nature....His powers of observation were acute, and his judgment seldom erred. That his industry was great, his work will ever testify; and our astonishment may well be excited that so much should have been performed in so short a time. A single individual, without patron, fortune, or recompense, accomplished, in the short space of seven years, as much as the combined body of European naturalists have taken a century to achieve. The collection and discovery of these birds were the fruits of many months of unwearied research amongst forests, swamps, and morasses, exposed to all the dangers, privations, and fatigues incident to such an undertaking. What but a remarkable passion for the pursuit, joined with an ardent desire for fame, could have supported a solitary individual in labours of body and mind, compared to which the bustling avocations of common life are mere holiday activity or recreation?" With regard to the literary merit of his *American Ornithology*, passages occur in the prefaces and descriptions, which, for elegance of language, graceful ease, and graphic power, can scarcely be surpassed. In America he composed various poetical pieces. The longest of these, *The Foresters*, a narrative in verse of a pedestrian journey performed by himself and two friends to the Falls of Niagara, is decidedly superior to any of a descriptive kind which he had written in Scotland, manifesting great improvement both in his taste and his power of composition. In personal appearance Wilson was tall, handsome, and vigorous; but, adapted as his frame was for a life of activity, it gradually gave way under the accumulated and harassing toils to which he was subjected, and he died of dysentery at Philadelphia on the 23d of August 1813, in the forty-eighth year of his age, when the publication of his great work, which appeared in volumes, was nearly completed. Strong good sense, high moral worth, and a lofty spirit of independence, were the characteristic features of his mind. With the feelings of a poet, he had few of the defects that often cling to the poetic character.

Wilson, Daniel.

WILSON, *Daniel*, fifth Bishop of Calcutta, was the son of Stephen Wilson, a silk-manufacturer of Spitalfields. He was born in Church Street, Spitalfields, 2d July 1778. At school the vigour of his character attracted attention, and his master used to say of him that "he would be something either very bad or very good." At the age of fourteen (1792), he was bound as an apprentice to his uncle, W. Wilson; and it was during this period that those first serious impressions took hold of his mind, which resulted in what he would have termed his "conversion." Hitherto he had probably been neither much better nor much worse than other young men similarly circumstanced; and the bitter self-accusations arising from the poignant remorse of a sensitive and awakened conscience must not be understood in his case (any more than in that of John Bunyan) to indicate unusual depravity. While in this desponding condition, he had the advantage of constant intercourse with several eminent clergymen, whose advice he has recorded. He was especially indebted to Mr Eyre, Mr Cecil, and Mr Newton for religious instruction, and his mind was moulded in their school of thought. Feeling that he had a call to the ministry, he obtained the sanction of his parents to leave his present occupation, and entered as an under-graduate in St Edmund's Hall, Oxford (1798). His studies at the university were characterized by extraordinary assiduity and some success. By unswerving diligence he repaired the defects of his education, and passed through the university with credit. In 1802 he took his degree of B.A., having been ordained the previous year. He began his ministerial work as curate of Mr Cecil at Chobham and Bixley, where he shared one little home with Dr Pearson, afterwards dean of Salisbury. In 1803 he obtained the Oxford English Essay Prize for a paper on Common Sense, —a subject well adapted to his clear and energetic style. It is an interesting circumstance that he was succeeded on the rostrum by his predecessor in the bishopric of Calcutta. Reginald Heber rose to recite his celebrated poem *Palestine* when Daniel Wilson had finished reading his Essay on Common Sense.

In 1803, he was married to his cousin; in 1804, he became assistant-tutor of St Edmund's Hall; and from 1807 to 1812, he was sole tutor and vice-principal, combining with these offices the curacy of Worton. In 1812 he left Oxford for St John's Chapel, Bedford Row; and in 1824 he succeeded to the Vicarage of Islington, the advowson of which had been bequeathed to him by his uncle. In Islington, as indeed at every place where he was long located, his self-denying energy and laborious ministry produced the best effects. He silenced opposition by his earnestness, and churches and Sunday-schools flourished under his guidance. In 1832 he was appointed Bishop of Calcutta and Metropolitan of India; and here, with the exception of a short visit to England in 1845, he continued until his death, which took place, at the age of 80, January 2, 1858.

The best proof of Bishop Wilson's ability and diligence is to be found in the success which attended his efforts both in England and in India. Islington, a parish which up to his time was in no way remarkable, became while he was vicar one of the most eminent parishes in the kingdom for the number of its churches and the multitude of its good works. In India, where he found church discipline extremely lax, he established episcopal jurisdiction over the chaplains on a firm basis, and successfully combated the interference of the Church Missionary Society with the just rights of his ecclesiastical authority. His diocese comprised at first no less than sixteen dioceses of the present day; and he ruled them all with a firmness and wisdom which will long cause his name to be remembered with gratitude, in spite of his occasional freedom of speech and his hearty adoption of party opinions.

His faults, as noted by his son-in-law and biographer, were "hasty impulse, quick action, sharp words, want of consideration for others, something of egotism, and occasional inaccuracy of statement;" yet few will deny to him the praise of having been "a brave and noble soldier, a wise, bold leader," and a most earnest and pious overseer of the Church of God.

Wilson, Florence || Wilson, Horace.

WILSON, *Florence*, better known by his classical appellation of *Florentius Volusenus*, was born about the year 1500. He is supposed to have been born on the banks of the river Lossie, near Elgin, and to have received a part of his education in the university of Aberdeen. He afterwards prosecuted his studies at Paris, and was there employed as tutor to a son of Cardinal Wolsey's brother. He appears to have fixed his residence at Carpentras in the month of November 1535. His earliest publication was a theological tract, printed at Lyon in 1539. He next published the elegant work which has chiefly recommended him to the notice of posterity, *De Animi Tranquillitate Dialogus, Florentio Voluseno autore.* Lugduni, 1543, 4to. Wilson probably continued to reside at Carpentras till the year 1546, when, resolving to return to his native country, he was arrested by the hand of death at Vienne, during the same year.

WILSON, *Dr George*, was born at Edinburgh in 1818, and was educated at the High School and University of his native town. He was destined for the medical profession, and completed his medical education, and took his degree, but never practised. Disqualified by lameness for active pursuits, he devoted himself to the study of science and literature; and his easy transparent style, command of illustration, and ability and neatness as an experimenter, made him a favourite lecturer on chemistry, a post which he held for a number of years in one of the extra-academical institutions in Edinburgh for the study of medicine. In chemistry, as applied to the arts and manufactures, he was peculiarly well versed, and was therefore admirably qualified for the chair of Technology, which, on its first institution in the University of Edinburgh, was at once conferred on him. This office he held in combination with the curatorship of the Industrial Museum, formed in the Scottish metropolis, under the auspices of government, and which owes so much of its completeness and order to the skill and knowledge of the accomplished hand which superintended its formation. Dr Wilson continued to hold these offices till his death, which happened prematurely and unexpectedly in November 1859, when he had only reached his forty-first year. Besides the fame which his skill as a chemist and his ability as a lecturer are likely to secure him, Dr Wilson has left many contributions to every department of literature, which will long sustain his reputation. He even ventured into the domains of poetry, and both *Blackwood's* and *Macmillan's Magazine* have been at various times enriched with his poetical effusions, which possess little strength indeed, but are pleasing, graceful, and melodious. To scientific literature he contributed, among other works which we have not space to enumerate, an excellent *Text-Book of Chemistry*, forming part of Chambers's Educational Course; curious *Researches on Colour Blindness*, a subject which he was the first to investigate systematically; and a pleasing treatise on the senses under the ingenious name of *The Five Gateways of Knowledge.* He was also the author of an excellent *Life of Cavendish*, and of a large number of scientific papers in various magazines and reviews.

WILSON, *Horace Hayman*, one of the most distinguished orientalists to whom England has given birth, was born in London in 1786. He was educated for the medical profession, and on finishing his studies went out to Calcutta as an assistant surgeon in the Company's Bengal establishment. His great ambition was, however, to emulate Sir

Wilson, James.

William Jones, and he accordingly devoted himself with great assiduity to the study of the oriental languages, for which his residence in Calcutta gave him peculiar facilities. In 1813 he published a translation of a Sanscrit poem, and in 1819 he compiled a *Dictionary in Sanscrit and English*, which has been of essential service in removing the difficulties which formerly impeded a European in his endeavours to acquire a knowledge of the oriental languages. He was now recognised as one of the most competent oriental scholars of the day, and became a valuable contributor to the *Asiatic Researches*, for which he wrote *An Account of the Religious Sects of the Hindoos*, which is still our best authority on that subject. In 1827 he published a translation of six Sanscrit dramas, which was received with much favour by the learned both in England and on the continent. His ability, in the meantime, procured him an official position in India of considerable dignity; and any leisure which his duties allowed him was occupied in preparing articles for the various literary journals of India. In 1831 he became a candidate for the Boden Professorship of Sanscrit at Oxford, and after a sharp contest he was elected, and left India for England. Shortly after his arrival he was appointed librarian at the East India House, and various literary honours were conferred on him by the different learned societies in England. He still continued his labours in elucidating the history and language of India. In 1840 appeared a translation of the *Vishnu Purana*, accompanied with learned notes; and shortly afterwards he published an excellent grammar of the Sanscrit language; and several similar works also proceeded from his pen. He also edited a translation of Bopp's *Comparative Grammar;* and a revised edition of *Mill's India*, in which the mistakes into which that historian's ignorance of the Indian language led him are corrected, and the history continued to the year 1855. He died in 1860.

WILSON, *James*, a very remarkable financier, and one of the most practically influential of British economists, was born at Hawick, in Roxburghshire, on the 3d June 1805. He received a sound though plain education at a seminary belonging to the Society of Friends, of which his father was a respected member. At a very early age he went into business as a hat-manufacturer in his native town, and afterwards removed to London, being discontented with so limited a sphere of action. For many years he was very successful in business, and had accumulated considerable property; but in 1837 he was unfortunately induced to engage in an indigo speculation, which proved disastrous. He obtained a release from his creditors on terms which both he and they considered satisfactory, and continued his business as a manufacturer of hats with fair success. When, some years afterwards, it unexpectedly appeared that his former creditors had not succeeded in realizing the anticipated sum from the property assigned to them, he, without solicitation from them, paid the deficiency.

From early youth Mr Wilson had paid great attention to the more practical portion of political economy, and in 1839 he published a small treatise, entitled *Influences of the Corn-laws, as affecting all classes of the community, and especially the landed interest;* and next year another, on the *Fluctuations of Currency, Commerce, and Manufactures, referable to the Corn-laws.* Mr Wilson was among the first to maintain that the influence of the corn-laws was essentially prejudicial to every class in the community: to the agricultural part as well as to the manufacturing part; and he stated the argument with an emphasis and lucidity that had a practical effect at the time. In 1843 he started the *Economist* newspaper, of which he was for many years the chief editor, and was always the sole proprietor. In consequence of his energy and ability, that journal became very efficient in the inculcation of free-trade doctrines and the dissemination of liberal opinions. Mr Wilson's name will be long remembered as one of the most efficient of those sound and practical economists who obtained commercial freedom for Great Britain.

Wilson, James.

In 1841, Mr Wilson published a remarkable tract, called *The Revenue, or what shall the Chancellor do?* in which he showed very perspicuously the *financial expediency* of freeing our commercial industry from forced restrictions. The principles on which Sir R. Peel and Mr Gladstone afterwards acted are stated with concise distinctness in this pamphlet, and are illustrated by telling figures. In 1847, Mr Wilson collected from the *Economist* newspaper a series of articles on capital, currency, and banking, which contain a series of criticisms on the currency acts of Sir R. Peel, and the best contemporary analysis of the panic of 1847, and of the railway mania which preceded it. Mr Wilson was a consistent bullionist, and a strenuous advocate for the sure convertibility of the bank-note, but he was opposed to the technical restrictions of the act of 1844.

In July 1847, Mr Wilson was elected to serve in parliament for Westbury, and very soon established a parliamentary reputation for indefatigable industry, sound business abilities, and an effective readiness in lucid exposition. After he had been a very few months in parliament, he was offered one of the secretaryships of the Board of Control, which he continued to hold until the resignation of Lord John Russell's administration in February 1852. During his tenure of this office he took an active and influential share in the establishment of railways in India, and in the settlement of the peculiar guarantee which the government of India has given to the capital embarked in them.

On the return of the liberal party to power, Mr Wilson accepted the laborious office of financial Secretary to the Treasury, which he continued to fill with singular efficiency for five years. During his tenure of this difficult office, he acquired among the best judges and closest observers a permanent reputation as one of the best administrators of the present day. On the dissolution of Lord Palmerston's administration in the spring of 1857, Mr Wilson resigned his office at the Treasury. During Lord Derby's administration he continued to be in opposition, but was made vice-president of the Board of Trade on the formation of a new liberal ministry in 1859.

In the summer of that year he was appointed financial member of the Council of India. The sepoy mutiny had thrown the finances of India into utter confusion, and Mr Wilson was sent thither to cure a deficit which the financiers of Calcutta seemed unable not only to remedy but even to ascertain. On the 20th October 1859 he sailed for India, and on the 18th February 1860 brought forward at Calcutta an elaborate budget, in which he first proposed the income-tax which is now in operation throughout our eastern empire. On the 5th March 1860 he proposed a careful plan for the establishment and regulation of a paper-currency in India. He likewise commenced a reformation of the system of public accounts in India, with a view of establishing a satisfactory estimate of coming expenditure, and a satisfactory calculation of coming income, neither of which now exist there. These severe labours proved too much even for Mr Wilson's iron frame. He might probably have prolonged his life by an abrupt departure, but he refused to leave Calcutta until his financial measures had reached a certain stage. Unhappily his disease was too rapid. He died of dysentery on 11th August 1860. The regret felt at Calcutta was perhaps unexampled. The higher classes, without exception, and almost the whole population attended his funeral; and when the news of his death arrived in England, it was felt there also, that in such a crisis, at such a post, the loss of such a man was hardly to be replaced. (W. B—T.)

Wilson, James.

WILSON, *James*, the younger brother of the celebrated "Christopher North," was born in Paisley in 1795. The reputation of his elder brother, and his own modest and retiring disposition, have conspired to throw him into the shade, yet few names are more worthy of honour. Shortly after his birth his father died, and his mother in consequence removed with her family to Edinburgh, where her youngest son received his education. From his earliest years he exhibited a fondness for natural history, which prompted him in his many school-boy ramblings around Edinburgh to collect specimens of every variety of bird, beast, and insect that the neighbourhood afforded. This taste was of course developed by attending the lectures of Professor Jameson on natural history; and though he at a subsequent period went through the usual routine of training preparatory for the profession of a writer to the signet, his career in life had been already marked out as that of a naturalist. When only seventeen he became a member of the Wernerian Society, and when twenty he began to read communications on the natural history of the country. We are indebted to the pen of Lockhart for a description of his appearance and habits at this period. "He is a thin, pale, slender, contemplative-looking person, with hair of rather a dark colour, and extremely short-sighted. His voice is low, and his whole demeanour as still as can be imagined. . . The parts of natural science of which he is fondest are ornithology and entomology—studies so delightful to every true lover of nature, that I suspect they are, in some measure, familiar to every poet who excels in depicting the manifestations and in tracing the spirit of beauty in the external universe. . . I have never met with any man who seemed to possess a greater power of illustrating subjects of natural history by quotations from writers of all kinds, and in particular from the poets. Nothing could be more refreshing than to hear some minute details about birds and insects, interrupted and illuminated by a fragment of grand melancholy music from the *Paradise Lost*, or the *Excursion*." (*Peter's Letters to his Kinsfolk*, 1819.) On the restoration of peace after the long wars with Napoleon, he visited the continent, making a tour through Holland, Belgium (where he visited the field of the then recent fight of Waterloo), Germany, and Switzerland; and he has preserved in a lively and well written journal, of which parts have been published, his first impression of the scenes which he then beheld. Shortly after this tour he went to Paris to purchase for the University of Edinburgh the famous ornithological collection of Dufresne; and on his return he found employment in contributing to *Blackwood's Magazine*, which had been recently projected. His weak health obliged him to spend the winter of 1820 in Italy, where he recovered his strength; and shortly after his return, he married and established himself at Woodville, in the vicinity of Edinburgh, in a delightful cottage surrounded by a little patch of ground which his skill converted into a paradise. Here, in the enjoyment of domestic happiness, with all the conveniences of proximity to town and all the pleasures of rural life, he devoted himself to the prosecution of the studies in which he so much delighted, varying and relieving his toils by an occasional visit to some of his numerous friends, a fishing-expedition, or a trip in a yacht round the coasts of Scotland. On the issue of the seventh edition of the *Encyclopædia Britannica*, he furnished all the articles on natural history, including ENTOMOLOGY, HELMINTHOLOGY, MAMMALIA, ORNITHOLOGY, REPTILES, and SERPENTS, &c. These articles taken together amount, in the extended scale in which they appear in the present edition of the work, most of them extended and revised by himself, to upwards of 900 pages, a quantity of matter equal to at least six ordinary octavo volumes. All these articles are distinguished by the peculiar grace of their style, so different from the dry and repulsive air which usually characterizes works of science, and by the felicity of the poetical illustrations which are interspersed. His calm and pleasant life presents no incidents deserving of special note, if we except his declinature of the chair of natural history in the University of Edinburgh, which was offered to him on the lamented death of Professor Forbes in 1854, an office for which every one but himself deemed him eminently competent. He died in May 1856, with the calm composure of a Christian who had nothing to dread in the future. In addition to the works mentioned above, he wrote *A Voyage round the Coasts of Scotland and the Isles; Illustrations of Scripture*, by an animal painter; and several articles in *Blackwood*, and the *North British* and *Quarterly Reviews*. A pleasant memoir of him was published in 1859, by Dr Hamilton of London.

Wilson, John.

WILSON, *John*, poet and essayist, and for thirty years professor of moral philosophy in the University of Edinburgh, was a native of Paisley, born on the 18th of May 1785. His father was a wealthy manufacturer, who gave his son a complete education, and left him a fortune of about L.30,000. Some years of the youth of John Wilson were passed in the country, under the charge of a Scottish clergyman in a rural parish—Mearns in Renfrewshire—and this residence was of vast importance to him both as a poet and a man. It rendered him familiar with the face of nature and the simple life of the country, and it fostered that love of athletic sports and invigorating exercise which continued to be one of the most blessed conditions and marked features of his character, personal and literary. From his boyhood, he was an enthusiastic angler and pedestrian, as well as an eager though irregular student. At the age of fifteen, he was entered of Glasgow University. The two most celebrated professors at that time were Young and Jardine—the former occupying the Greek chair, and the latter that of logic; and Wilson, like Campbell and Jeffrey, has borne testimony to their merits and virtues. Four years were agreeably and profitably spent in attendance at college in Glasgow, and in studies and vacation in the country, and Wilson was then sent to Magdalen College, Oxford. He applied himself assiduously to the classics and to English composition, and was no less devoted to boating on the Isis or Thames, cricket-playing, and long pedestrian rambles. In 1806, he carried off the Newdigate prize for the best English poem of fifty lines. His subject was a recommendation of the study of ancient art, as seen in the Greek and Roman remains, and his style was the regular conventional academic pace—the stately, measured, heroic couplet. The verses of Wilson were always flowing and resonant—his ear for time, if not for tune, was faultless.

In 1808, the young poet completed his collegiate career. He had purchased a small but beautiful estate on the banks of Lake Windermere, and there he resided for many years, enjoying the exquisite scenery of that poetical district, the conversation of Wordsworth and Southey, and the pleasures of rowing, yachting, and pedestrian excursions, for which he entertained as keen a relish. As "admiral of the lake," Wilson was famous for his skill and courage, and for his bounteous hospitality. His stout, robust figure, fair Saxon complexion, blue eye, and long clustering yellow hair (of all which he was as proud as of his poetry), rendered him always a conspicuous personage in town or country. His appearance was singular; to casual observers it appeared theatrical, but in point of fact, as was said of Mrs Siddons, "a manner in itself artificial, sprung out of the *naïveté* of his character." In 1811, Mr Wilson married a very amiable lady, Miss Jane Penny, daughter of a Liverpool merchant; and about this time we find him described by Sir Walter Scott:—"The author of the elegy upon poor Grahame (the poet of the *Sabbath*) is John Wilson, a young man of very

Wilson, John.

considerable poetical powers. He is an eccentric genius, and has fixed himself upon the banks of Windermere, but occasionally resides in Edinburgh. . . . He seems an excellent, warm-hearted, and enthusiastic young man. Something too much, perhaps, of the latter quality places him among the list of originals."—(Letter to Joanna Baillie, Jan. 17, 1812.) Scott's attentions and encouragement were gratefully felt by Wilson, and were acknowledged in a poem entitled *The Magic Mirror*, in which he portrays the mighty minstrel in the character of a great magician, a title by which he was afterwards frequently designated. In the spring of 1812, Wilson's *Isle of Palms, with other Poems*, was published. It was something in the style of Southey, as Scott remarked; the rich descriptions of tropical scenery were not unlike the gorgeous scenes in Thalaba or Kehama, but the general tone and diction of the *Isle of Palms* remind one more of Wordsworth. An intense love of nature approaching to Pantheism, and of all gentle sympathies and affections, is the prevailing characteristic of Wilson's poetry. It wants energy and condensation, the "brief strokes of power" which distinguish the master-hand, but it spreads out into passages of great sweetness and fairy imagery.

The poet now began to think of adopting a profession. The cares of a family and some pecuniary reverses suggested the expediency of such a step, and he commenced the study of the law. In 1815, he passed as an advocate at the Scottish bar. He does not seem, however, to have gone resolutely to work at his new calling, and three years afterwards we find Lockhart describing himself and Wilson as briefless barristers, sweeping the boards of the Parliament House. Literature was to be the vocation of both. Before this time Wilson had put forth a second volume of poetry, *The City of the Plague* (1816), a dramatic poem superior in literary merit and interest to the *Isle of Palms*, and which Byron considered as showing that Wilson had "set up for himself," without reliance on the Lakers. Next year *Blackwood's Magazine* was established, forming a grand era in the history of our author, and in the literary annals of Edinburgh. Wilson became the founder of a new dynasty, the latest dynasty of Edinburgh literati. History and metaphysics had held sway in the previous century under Hume, Robertson, and Smith. The physical sciences were afterwards illustrated by Playfair and Leslie. With Jeffrey, Sydney Smith, and Brougham, came the *Edinburgh Review*, and the advent of free thought and independent criticism. To these succeeded Wilson and Lockhart—young, flushed with genius, scholarship, and ambition, and determined to ostracise whiggism and the *Review* by means of *Blackwood's Magazine*. Their success was great. Over the whole of Scotland there was a springtide of Toryism breaking down the old Edinburgh embankments, sweeping through college halls and the Parliament House, and animating with a wild excitement a large portion of the educated youth of the country. This, in time passed away, but the flood of Wilson's essays and criticism had irrigated and improved our periodical literature. There was originality, with fervour and boldness, in all he wrote. It was mixed with baser matter in the shape of invitations to coarse jollity and fierce political and personal satire, but the frank, genial, literary spirit predominated. There was abundance of illustration, humour, fancy, and mirth. The poetry of Wilson had only displayed delicacy of feeling and purity of sentiment. It was graceful and picturesque. But it was as an essayist, a critic, and humorist, that he made known his various and high powers, and the chivalrous gallantry of his nature. He poured out the whole man in his prose. His critical papers on Homer and Spenser have a magnificent breadth and eloquence, rarely, if ever before found in disquisitions of that class, and his essays on our modern poets—on Thomson, Burns, Wordsworth, Coleridge, and Crabbe—exhibit profound sympathy with the creations and temperament of genius and insight into the sources of emotion and passion. A "frater feeling strong," impelled his teeming fancy and his fluent pen. There was another class of papers in which Wilson was unique—descriptions of the Lake Country and of Highland scenery. These often became in his hands a sort of poetical dithyrambics or idylls, full of true poetry and fine discrimination, yet crossed and streaked with all manner of grotesque images and fancies; the real mingling with the ideal, the high with the low, the beautiful with the gross and extravagant. His glowing imagination seemed to fuse together these incongruous materials, much of which a purer taste would have rejected, yet which none of his contemporaries perhaps could have produced in equal abundance. In *The City of the Plague* Wilson had essayed the grave dramatic style. In *Blackwood* he struck into the walk of the comic drama. The *Noctes Ambrosianæ* contributed to the magazine between the years 1822 and 1835, consist of familiar dialogues among a few interlocutors on the principal topics of the day, men and books, morals and social life. They contain passages of "admirable fooling," shrewd observation, description, and criticism. The style is much the same as that of the essays, but with greater *abandon* of manner, and a larger admixture of poetical exaggeration and farcical humour. Three volumes of serious prose tales were also published by our author.—*The Lights and Shadows of Scottish Life*, 1822; *The Trials of Margaret Lindsay*, 1823; and *The Foresters*, 1824. These are all stories of a domestic character, in which the painting, both light and shade, is generally in extreme, and the incidents, though often strikingly pathetic and sweetly told, are too Arcadian or improbable. They are the works of a poet idealizing whatever he touches—not transcripts of actual life from the hand of a keen and searching novelist. To be relished they must be read with the fresh romantic feelings of youth.

In 1820 the Chair of Moral Philosophy in the University of Edinburgh became vacant by the death of Dr Thomas Brown. Wilson was a candidate, and he succeeded, though not without strong opposition, in obtaining the appointment. It could not be said that his previous studies had fitted him for such an office, and the careless freedom of his life and anonymous writings was urged against him. All the "Tory mischief" in *Blackwood* was laid at his door, although, in reality, the chief part was concocted by Lockhart (whom James Hogg in the *Chaldee Manuscript* had named the scorpion), and Wilson never possessed editorial control over the magazine. It was well known, however, that his strength did not lie in reasoning or mental analysis, or in regard for order and method, and hence part at least of the opposition and its justification. But genius has a faculty of rapid perception, as well as a kindling and creative power. The new professor made his lectures attractive and suggestive; his enthusiasm was contagious; his cordiality and kindness won the hearts of the students; and his literary and social eminence made them proud of him as a chief. As the "Christopher North" of *Blackwood's Magazine*, he became known to all the world, and as "The Professor" he was the great lion of the Scottish capital. After the death of Scott he had no rival in literary popularity, for Jeffrey had then withdrawn from the arena, and devoted himself wholly to law. Lockhart was in London, and the Ettrick Shepherd, who had at one time loomed largely in the view of Edinburgh society, was subsidized by the Professor, and drawn at his chariot wheels in the Magazine.

In 1837 Professor Wilson sustained an irreparable loss in the death of his wife—the accomplished companion of his summer rambles and winter's fireside, and the careful tender mother of his children. For a season books and lectures were neglected: "How could I see them," he

Wilson, John.

Wilson, John.

said, "in the valley and shadow of death?" Literature, however, again became the solace. He resumed work for the Magazine, and in 1841 he wrote, or rather compiled from his previous magazine writings, a copious *Essay on the Genius and Character of Burns*, which accompanied an illustrated work, the "Land of Burns," published for the Messrs Blackie of Glasgow. In 1842 he collected and revised part of his contributions to *Blackwood*, and published them in three volumes under the title of *The Recreations of Christopher North*. In 1844 a poetical jubilee brought him joyously and prominently before the public. A great festival was held at Ayr in honour of Burns, and in recognition of Burns's three sons, two of whom, retired Indian officers, had, after a long absence, returned to their native country. A "demonstration" took place in the open air, near the poet's monument on the banks of Doon, at which, it was calculated, about 80,000 persons were present, and in the afternoon 2000 dined together in a pavilion erected for the purpose. The Earl of Eglinton presided over this assembly, and Professor Wilson officiated as croupier or vice-chairman. To the Professor was assigned the chief toast and speech of the day, a welcome to the sons of Burns, and with characteristic force and impulsive fervour, he delivered a long oration, in which he expatiated on those topics so dear to his heart and imagination, the people of Scotland and their great peasant poet. "The people," he said, "were not lightly moved, but when moved, their meaning was not to be mistaken: tenacious their living grasp as the clutch of death!" And their poet had "reconciled poverty to its lot, toil to its task-work, care to its burden—nay, even grief to its grave: and by one immortal song, has sanctified for ever the poor man's cot—by such a picture as only genius in the inspiring power of piety could have painted; has given enduring life to the image—how tender and how true!—of the happy night passing by sweet transition from this working world into the hallowed day, by God's appointment, breathing a heavenly calm over all Christian regions in their rest—nowhere else so profoundly—and may it never be broken—as over the hills and valleys of our beloved and yet religious land." This fragment may convey some idea of the style and phraseology of the Professor's "large utterances," which were delivered in a deep powerful voice, his broad chest heaving, his eye glancing, and his whole manner indicating the poetical *afflatus* that possessed him. His nationality was always a fountain of inspiration.

The collected works of Professor Wilson have not been generally popular. When seen in a mass, they had a character of sameness and repetition. Much of the original freshness was gone; both bloom and odour had perished in the using. And this is by no means a singular case. The most successful articles in the *Edinburgh Review*, for above twenty years, were those of Jeffrey. Professor Wilson's contributions to *Blackwood* may be said to have sustained the Magazine for a still longer period; and Mr Fonblanque's witty and sparkling "leaders" made the *Examiner* the delight of literary and political circles. Selections were made and published from all the three, yet not one of the reprints can be pronounced a success, or is likely to occupy a permanent place in our literature. Essays on the current events, books, and characters of the day, when not of great historical value or concise and complete (like Macaulay's *Clive and Hastings*), soon lose their interest. When brilliant, high-coloured, and piquant, they serve admirably for perusal in their periodical form; but when presented in three or more volumes, they cloy or repel readers. Their very excellence for immediate use unfits them in a great measure for preservation. "What a waste," exclaimed Coleridge, "what a reckless spending of talent—ay, and of genius too, in Wilson's, I know not how many years' management of *Blackwood!*" Yet the sage of Highgate Grove admitted that Wilson's writings soothed and suspended his bodily miseries and mental conflicts. The world was all the better for the Professor's genial criticism, his broad mirth, and unrestrained revelry. Even yet he can charm. It is delightful to lose oneself with such a companion among Highland lochs and glens—to ramble with him over the milder beauties of the lake country of England—or to hold high converse with him in his graver moments on poetry, philosophy, and religion; when pausing to collect his strength, he dismisses the motley train of images that throng his fancy, and reviewing the issues of life and death, breathes forth "thoughts that wander through eternity." On these occasions his very mannerism, like a well known voice, has a certain fascination. Overflowing with animal spirits, at the same time that his finer sensibilities and intellectual tastes are called into play, he throws his whole soul into such monologues and reveries, and astonishes alternately by the wildness of his imagination, and by the depth of his feeling, humour, and pathos. His faults appear all to spring from the exuberance of his intellectual resources. As was said of his favourite Spenser, "the clouds of his allegory and description may seem to spread into shapeless masses, but still they are the clouds of a glowing atmosphere."

Wilson, Richard. ‖ Wilton.

About the year 1850 the health of Professor Wilson, mental and physical, gave way. In 1851 a pension of L.300 a year was settled upon him by the Crown, and in 1852 he was compelled, from increasing infirmity, to resign his professorship. He was no longer seen by the public, and his absence was felt as a sad blank—a void that has not yet been filled up in the city where he dwelt, for he was the last of the old race of strong men. He lingered on for two more years, and died in his house in Gloucester Place, Edinburgh, on the 3d of April 1854. An edition of his works has been published in twelve volumes, edited by his son-in-law, Professor Ferrier of St Andrews. (R. C—S.)

WILSON, *Richard*, an eminent landscape-painter, was the son of a clergyman in Montgomeryshire, in Wales, where he was born in 1713. Having displayed early a taste for drawing, he was placed by his relation, Sir George Wynne, with an obscure portrait-painter in London, where he made great progress. After practising in portraits for some time in London, he resolved to visit Italy, which he accordingly accomplished in 1749. While in that country, he was advised by Zucarelli and Vernet, who took an interest in his studies, to try landscape. Henceforward Wilson painted little but patches of country; but these he executed with such simplicity and truthfulness, as occasionally to gain for him the epithet of the English Claude. In 1760, after his return from Italy, he exhibited his famous picture of "Niobe," which established his reputation in England. He painted besides a "View of Rome from the Villa Madama," and many other pictures which cannot here be mentioned. But it is sad to relate that, from some cause or other, probably from the surly temper of the artist, or from the uncouthness of his manners, he was in his later years reduced to great straits. The products of his pencil had to go to picture-dealers, who, it is reported, had to hoard them up till their author was gone, when they brought in as many hundreds as they originally cost of pounds. He died at Llanverris, in Wales, in 1782.

WILTON, a municipal and parliamentary borough and market town of England, Wiltshire, stands on a tongue of land formed by the junction of the Nadder and Willey, three miles W. by N. from Salisbury. It is a place of great antiquity, and was the capital of the Saxon kingdom of Wessex. The church, erected in 1844, by the Right Hon. Sidney Herbert, at an expense of L20,000, from designs by Messrs Wyatt and Brandon, is the finest specimen of Lombardic architecture in England. The interior is of great splendour, and the pulpit, which was made at Rome, of

Wiltshire.

Caen stone, is supported upon sixteen columns of black marble. The town-hall is an old plain brick building. Wilton was formerly famed for its carpet manufacture, but this branch of business has declined, though it is still largely carried on. Pop. (1851) of town, 1946; of parliamentary borough, 8607, returning one member to parliament.

Boundaries and statistics.

WILTSHIRE, or WILTON-SHIRE, the 30th of the English counties in point of population, and the 14th in point of size, is bounded by Oxford and Gloucestershire on the N., Dorsetshire on the S., Hampshire on the E., and Somersetshire on the W. Its area is computed at 874,880 statute acres. Population in 1851:—males, 125,728; females, 128,493—in all, 254,221. Greatest length, from N.E. to S.E., 54 miles; greatest breadth, from E. to W., 36 miles. The county returns four members to parliament: the boroughs of Chippenham, Cricklade, Devizes, Marlborough, and Salisbury, two each; and those of Calne, Malmesbury, Westbury, and Wilton, one each. Marlborough confers on the Churchill family a dukedom; Salisbury, on the Cecils a marquisate; Malmesbury, on the Harris family, and Wilton, on the Herberts, an earldom.

Physical features.

The county is naturally divided into North Wiltshire and South Wiltshire—the *plain district*, rich in fertile meadows, pleasant groves, and abundant corn-fields: and the *hill district*, where ranges of chalky downs, undulating and breeze-swept, overlook deep shadowy valleys of an almost romantic obscurity. On these hills occurred that long series of battles between Celt and Saxon which has left to the men of a later time so many memorials of interest, in camps, entrenchments, and tumuli. The chalk-country is almost surrounded by a belt of the Wealden. At Inkpen Beacon, on the borders of Wiltshire, Berkshire, and Hampshire the chalk reaches the height of 1011 feet, and thence sends out four huge far-reaching arms into Sussex, Surrey, Dorsetshire, and even into Norfolk. The oolitic formation is principally detected in the north of the county, and partly in the west, and at Stourhead and in its neighbourhood the greensand attains to a considerable elevation. Alfred's Tower is 800 feet above the sea-level.

Rivers, canals, and railways.

As might be expected from its geological characteristics, Wiltshire is fertilized and enlivened by a multiplicity of "water-courses." The hill-district is the birthplace of many pleasant streams. The Thames cuts off a small angle in the north, and waters Cricklade before it winds into Gloucestershire. The Lower Avon (the Celtic Af, Afon, Avon, *i.e.*, running waters) rises near Wootton Bassett, and flows onwards to Malmesbury, where it is swelled by some tiny tributaries. The Upper Avon rises at Brandon Hill, receives "the gentle Calne," and flows past Amesbury, Old Sarum, and Salisbury, into Hampshire, emptying itself into the Channel at Christchurch. The Willey has its source among the clay-hills; waters Warminster, where the Deverill joins it; and, after enlivening Heytesbury and Wilton, effects a junction with the Avon near Salisbury. "The Kennet swift, for silver eels renowned," rises near Barbury Castle, and runs, with many windings, past Marlborough and Hungerford (famous for its trout fisheries), into the Thames. There are three *canals*:—the Avon and Kennet, which connects the valley of the Avon with the Thames; the Wiltshire and Berkshire; and the Thames and Severn, which crosses the northern part of the county. The *Great Western Railway* has its principal depot at Swindon, and thence penetrates, by way of Warminster and Heytesbury, to Salisbury, where it meets the Salisbury and Andover, and the Salisbury and Southampton branches of the London and South-Western Railway.

Manufactures.

Wiltshire is rather an agricultural than a manufacturing county, and its corn and cheese are in better repute than the products of its looms. Its bacon has long been celebrated, and Kennet ale has a wide-spread notoriety. There is much cloth, however, wrought in many districts, and Wilton carpets are still esteemed.

Wiltshire ‖ Wimborne Minster.

When Cæsar invaded England, Wiltshire was occupied by the Belgæ; and the Wansdyke is pointed to as a portion of the defences which they constructed. It was afterwards included in the province of Britannia Prima, and important Roman stations were established, of which the chief was placed at Sorbiodunum (Old Sarum). The Saxons under Cerdic were defeated by Arthur and his famous knights, but conquered the country when led by Cynric, and annexed it to the kingdom of Wessex. It became the battle-field between Saxon and Dane for many long years of warfare. A great council was held at Sarum in 1086, by William the Conqueror, which firmly fixed upon the conquered land the feudal system of the Normans. During the civil war, many important engagements took place in various parts of the county, and especially at Devizes and Malmesbury, between roundheads and cavaliers.

History.

In antiquities of the pre-historic period Wiltshire is remarkably rich, and there is scarcely a rood of land in its hilly fastnesses which is not "hallowed ground." Of Stonehenge we have spoken at length in our twentieth volume, and we can but allude to the remarkable *Celtic barrows* which encircle the temples of Avebury and Stonehenge, and to the curious and interesting camps on the heights of Battlebury and Scratchbury. The *Roman roads* from Cirencester to Bathford (the Fosseway), from Old Sarum to Calleva (Silchester), from Old Sarum to Winchester, from Cirencester to Aldbourn (the Ermyn street), from Bath to Marlborough (the Julian street), may still be traced. The most important Norman remains are at Marlborough, Devizes, Malmesbury, Wardour, and Ludgershall.

Among the worthies to whom this county has given birth, are Joseph Alleyne the divine, born at Devizes in 1633; the great Earl of Clarendon at Dinton in 1609, which also gave birth to Henry Lawes, the musician, whom Milton has immortalized. Marlborough boasts of Sir Michael Forster the jurist; of Michael Harte, whose *Life of Gustavus Adolphus* is still an authority; and of Dr Henry Sacheverell, who so disturbed the cabinets and councils of Queen Anne. George Herbert the poet was rector of Bemerton from 1630 to 1635, and the fig-tree and medlar which he planted may still be seen there. At Stratford Manor House was born, or at least was nurtured, William Pitt, "the great Earl of Chatham." Malmesbury is identified with the fame of its philosopher, Hobbes, the author of *The Leviathan*. Chippenham has given birth to two theologists of widely different character and genius—the Rev. John Scott, the commentator, and Ludovick Muggleton, the founder of a sect. Addison was born at Millston, near Amesbury, of which place his father was rector, in 1672. Philip Massinger (1584), and John Harris, the author of *Hermes* (1709), were natives of Salisbury.

Among the principal seats and mansions of the nobility and gentry, we may mention Bowood (Marquis of Lansdowne), Littlecot Peak (—— Popham, Esq.), Wilton House (Earl of Wilton), Longford Castle (Earl of Radnor), Wardour Castle (Lord Arundell), Longleat (Marquis of Bath), Stourhead (Sir H. A. Hoare), Laycock Abbey (W. Fox Talbot, Esq.), Chatton Park (Earl of Suffolk), and Corsham Court (Lord Methuen). The picture galeries of Bowood, Wilton House, Charlton Park, and Longleat are of unusual extent and interest. (W. H. D. A.)

WIMBORNE MINSTER, a market-town of England, Dorsetshire, between the Stour and Allen, near their confluence, 21 miles E.N.E. of Dorchester, and 100 S.W. by W. of London. It is a very ancient place, but has greatly declined in modern times, and is now chiefly remarkable for its beautiful minster or collegiate church, parts of which date nearly as far back as the Conquest. It is cruciform in plan, and in various styles, with two square towers.

Winchester

There are here also Methodist, Independent, and Baptist places of worship, a free-school, national schools, and two hospitals. Brickmaking and the manufacture of woollen goods and hosiery are carried on here, and there is a considerable retail trade. Pop. (1851) 2295.

WINCHESTER, a market-town of England, the capital of Hampshire, is situate on the slope of a hill whose base is watered by the river Itchen, 66½ miles S.W. from London, 13 miles from Southampton, 29 miles from Salisbury, and 27 miles from Portsmouth. It returns two members to parliament; had a population, in 1851, of 13,704; and is divided into eight parishes. Its markets are held every Wednesday and Saturday, and its fairs on the first Monday in Lent, and 23d and 24th of October, St Magdalen's on the 2d of August, and St Giles' on the 12th of September. The latter was anciently the largest fair in England, and lasted sixteen days. From 1333 to 1363 Winchester was the great staple or wool-market of England, but its prosperity is now chiefly dependent upon its cathedral and college.

Winchester is the *Venta Belgarum* of the Romans, who latinized the name of the ancient Celtic settlement, *Gwent*, or the "chalk downs," and connected their city by magnificent highways with *Clausentum* (Southampton), *Sorbiodunum* (Salisbury), and *Portus Magnus* (Portchester). It afterwards passed into the hands of the Saxons, and became the capital of Wessex. Alfred held here his Witan, and during the reign of Athelstan, six mints were established, while London had but three. After the Conquest, the city declined in wealth and importance; was seriously injured by fire in 1141; and pillaged by the son of the great Simon de Montfort in 1265. It was here that Henry VIII. entertained Charles V., the great Emperor of Spain and Germany, in 1522. It was taken by Sir William Waller in 1644, and in the following year by Cromwell himself, whose iconoclastic troopers made sad havoc with the decorations of its religious edifices. With Charles II. it was a favourite place of residence, and he even commenced the erection of an immense palace, from the designs of Wren, which was abruptly checked by his death; and the only portion completed is now used as the barracks.

The cathedral.

Winchester was erected into a bishopric by King Kynegils in 635, who commenced a *cathedral-church*, which his son Kynewald completed. The present cathedral was commenced by Bishop Walkelin in 1079, and added to by Bishop Godfrey de Lacy (1189–1204), Bishop Edingdon (1345–66), and William of Wykeham, the last of whom has left the impress of his genius in the perpendicular work of the nave, and in the beautiful architecture of the chantry which bears his name. The extreme length of this noble building is 560 feet; its extreme breadth, 208 feet; length of nave, 250 feet; breadth of nave, 86 feet; height of nave, 78 feet; height of tower, 135 feet; length of choir, 138 feet. Among its numerous monuments are those of Dr Joseph Warton, by Flaxman; Sir George Prevost, by Chantrey; Dr Littlehales, by Bacon; Bishops Willis and Tomline; Miss Jane Austin, the novelist; and Bishop Morley. In the S. transept lies Izaak Walton.

The College.

Winchester College was founded by the great William of Wykeham in connection with his college of St Mary Winton at Oxford, and was intended as a preparatory school whose curriculum should adapt the scholars for their university training. The buildings were commenced in 1387 and completed in 1396. Wykeham's foundation has always held a high position among the public schools of England, and has contributed many illustrious names to the head-roll of English worthies. Thus, among its alumni have been—Archbishop Chicheley; Bishops Waynflete, Ken, and Lowth; Sir Henry Wotton; the poets Young, Collins, Otway, Somerville, Phillips, and Warton; Sir Thomas Browne; Lord Eversley; Archbishop Howley; and Sidney Smith.

Winchester

Winchester, in the reign of Henry I., is said to have possessed no less than sixty churches, and they are still very numerous in proportion to its population. Of those which now remain the most interesting are St John's, with some portions in the Transition Norman style; St Maurice's, the tower of which belongs to another building; and St Peter's, Cheesehill. The *City Walls* are in tolerable condition, and, of the ancient gates, King's Gate and West Gate, *temp.* Henry III., will interest the archæologist. Of *Henry III.'s Palace* (thirteenth century) the hall remains, and is now occupied by the county court officials. It is a noble chamber, 110 feet long and 45 broad, divided into aisles by a double row of pillars and arches. Here is preserved the so-called round table of King Arthur, which, in reality, dates from the early part of the sixteenth century.

The *Castle* itself was originally raised by the Conqueror, but rebuilt and enlarged by Henry III., who had been born in it in 1206. In the area in front was beheaded (A.D. 1330) Edmund, earl of Kent.

The celebrated *Hospital of St Cross* lies about one mile from the city. It was founded in 1136 by Bishop Henry de Blois, and remodelled by Cardinal Beaufort (1404–47) as "the Almshouse of Noble Poverty," for the maintenance of two priests, thirty-five brethren, and three nuns. Its revenues were for many years directed from their original destination, but in 1855 a new scheme was framed by the Court of Chancery, and the Hospital now supports thirteen brethren who wear the distinctive costume of a long black gown with a silver cross on the right breast. Any wayfarer may apply for, and will receive, the Wayfarer's Dole, —namely, a slice of bread and a horn of beer.

The county Bridewell occupies the site of Hyde Abbey originally founded by King Alfred, who was buried within its precincts. Its revenues, at the Dissolution, amounted to L.865. Alfred's tombstone has been removed to Corby Castle, Cumberland. The picturesque ruins of Wolvesey Castle, (Ulf's, or Wolf's, *cy*, or island) demolished by Cromwell in 1645, give but a faint idea of its ancient splendour. It was built by Bishop Henry de Blois 1138, and received Philip of Spain and Queen Mary on the occasion of their nuptials.

Among other objects of interest, we may mention generally Bishop Morley's College, founded in 1672, for the support of ten clergymen's widows; Christ's Hospital, established by James Symons, for the maintenance of six unmarried men, and the board and education of four poor boys; the pent house; the market house; corn exchange; town hall; and the city cross. (W. H. D. A.)

Winchester ‖ Winckelmann.

WINCKELMANN, JOHANN JOACHIM, was born at Stendal, in the old Marche of Bradenburg, in 1717. He was the son of a shoemaker. Though destined by his birth to occupy an humble position in an obscure town of Germany, yet he raised himself to the office of president of antiquities in the Vatican. His course of study appears to have been very desultory, but he contrived to spend two years in the university of Halle. After having been seven years rector of the school of Seehausen, near Salswedel, he went into Saxony, where he resided seven years more, and was librarian to Count Bünau at Nöthenitz. When he left this place in 1754, he went to Dresden, where he formed an acquaintance with the ablest artists, and particularly with Oeser, an excellent painter, and one of the best draughtsmen of the age. Among other acquaintances formed by Winckelmann at this time was Monsignor Archinto, pope's nuncio, who, on learning the great acquirements and the obscure position of the lad, proposed to him to become a proselyte to the Romish faith, on condition that the pope's representative should obtain for him a situation in the Vatican library. Winckelmann wandered about like one in a dream, weighing, in proportion to his light, the different aspects of the question thus opened up

Winckelmann. to him. It need not astonish any one who knows human nature, and who is acquainted with the eager ambition of Winckelmann at that time, to be told that he recanted Protestantism, and was received into the bosom of the Romish Church with no small degree of quiet chuckling on the part of the cunning nuncio. In September 1755, he set out for Italy, and arrived at Rome in December following. His principal object was to see the Vatican library, and to examine the ruins of Herculaneum.

Winckelmann carried with him into Italy a sense of beauty and art, which led him instantly to admire the masterpieces of the Vatican. He soon increased his knowledge; and it was not till after he had thus purified his taste that he began to think of the explanation of other monuments, in which his great learning could not fail to distinguish him. In 1756 he planned his Restoration of Ancient Statues, and a larger work on the Taste of the Greek Artists; and he designed an account of the galleries of Rome and Italy, beginning with a volume on the Belvidere statues, in the manner of Richardson, who, he says, only ran over Rome. He also intended a history of the corruption of taste in art, the restoration of statues, and an illustration of the obscure points of mythology. All these different essays led him to his *History of Ancient Art*, published in 1764, and his *Monumenti Antichi Inediti*, in 1766. It must however be confessed, that the first of these works has not all the clearness and precision that might be expected in its general plan and division of its parts and objects; but it has enlarged and extended the ideas both of antiquaries and collectors. The description of the gems and sculptures of the Stosch cabinet contributed not a little to extend Winckelmann's knowledge. Few persons have opportunities of contemplating such vast collections. Winckelmann's *Monumenti Antichi Inediti*, of which he had begun the third volume in 1767, secured him the high esteem of antiquaries. Had he lived, we should have had a work long wished for; a complete collection of the basreliefs discovered from the time of Bartoli, the greater part of which were in the possession of Cardinal Albani.

When Cardinal Albani succeeded to the place of librarian of the Vatican, he endeavoured to procure a place in the Hebrew department for Winckelmann, who refused a canonry because he would not take the tonsure. In 1761 the Elector of Saxony gave him, unsolicited, the place of Counsellor Richter, the direction of the royal cabinet of medals and antiquities at Dresden. Upon the death of Venuti, 1762, he was appointed president of the antiquities of the apostolic chamber, with power over all discoveries and exportations of antiquities and pictures. This is a post of honour, with an income of 160 scudi per annum. He had a prospect of the place of president of antiquities in the Vatican, about to be created, at sixteen scudi per month, and was named corresponding member of the Academy of Inscriptions. The King of Prussia offered him, by Col. Quintus Icilius, the place of librarian and director of his cabinet of medals and antiquities, vacant by the death of Gautier de la Croze, with a handsome appointment. He made no scruple of accepting the offer; but when it came to the pope's ears, he added an appointment out of his own purse, and retained him at Rome.

In April 1768, he left Rome to travel with the sculptor Cavaceppi over Germany and Switzerland. When he came to Vienna, he was so pleased with the reception he met with, that he made a longer stay there than he had intended. But being suddenly seized with an extraordinary desire to return to Rome, he set out for Italy, deferring his visits to his friends in Germany to a future opportunity. As he passed through Trieste, he was assassinated, June 8, 1786, by a wretch named Arcangeli, a native of Campiglio, a town in the territory of Pistoia, with whom he had formed an acquaintance on the road.

Perhaps the celebrity of Winckelmann is rather that of a pioneer in the history of ancient art than as an original recorder of ancient art treasures. Previous to the time of Goethe, who wrote a masterly dissertation on the genius and writings of Winckelmann in 1805, the reputation of the art-historian was limited to the learned; but now the name of Winckelmann is known in every corner of the civilized world. Wind || Windsor.

WIND. See METEOROLOGY and PHYSICAL GEOGRAPHY.

WINDERMERE. See WESTMORLAND.

WINDSOR, or NEW WINDSOR, so called to distinguish it from Old Windsor, about 2 miles to the S.E., a market town, parliamentary and municipal borough of England, Berkshire, on the south bank of the Thames, opposite Eton, which is reached by an iron bridge of three arches, 22 miles W. by S. of London. It consists of six principal streets, crossed by others of smaller size, and is well and regularly built, chiefly of brick. It has a fine modern parish church, in the perpendicular style; a district church; Methodist, Independent, and Baptist chapels; free, national, British, and infant schools. There are also an ancient town hall, recently renewed, a neat and commodious theatre, and several parochial charities. Windsor Castle has been the principal seat of British royalty for nearly eight centuries. The Saxon kings had a palace at Old Windsor long previous to the Conquest. The present castle was founded by William the Conqueror; but was almost rebuilt by Edward III., with the assistance of the celebrated William of Wykeham, who was made clerk of the works. Great alterations were made by Sir Jeffry Wyatville, during the reign of George IV. The castle at present occupies about 32 acres of ground; and consists of an upper and a lower court, the former to the east, and the latter to the west, of the Keep or Round Tower. In the lower court is St George's Chapel, a splendid specimen of florid Gothic architecture. It contains the stalls of the Knights of the Garter; and here the ceremony of installation takes place. At the east end of the chapel is the royal vault, where the remains of George III. and his queen, George IV., the Princess Charlotte, the Duke of Kent, the Duke of York, William IV. and his queen, and others, are deposited. Edward IV. and his queen, Henry VI., Henry VIII., and Charles I. are buried in the chapel. The upper court has on the west the Round Tower, on the north the state apartments, and on the east and south the private apartments of the queen and royal household. Among the state apartments the most remarkable are, the Vandyck Room, containing a collection of portraits by that artist; the Waterloo Chamber, with portraits, chiefly by Sir Thomas Lawrence, of the great men of the time of Waterloo; the Throne Room, Presence Chamber, and St George's Hall, adorned with the arms of all the Knights of the Garter from the foundation of the order, and portraits of the British sovereigns from James I. downwards. The grand staircase and vestibule leading to this part of the castle are also very fine. Along the sides of the quadrangle occupied by the private apartments, runs a corridor, 450 feet long, and richly adorned with pictures, statues, &c. The terrace along the north side of the castle is a magnificent promenade, a third of a mile in length, and commanding a wide and beautiful prospect. On the north and east of the castle is the Little Park, which is about 4 miles in circuit, and contains the tree supposed to be the "Herne's Oak" of Shakspeare. To the south lies the Great Park, reached by the Long Walk, a magnificent avenue of elms, 3 miles in length. It terminates at an eminence called Snow Hill, where is a colossal statue of George III. In the Great Park is Virginia Water, the largest artificial lake in the kingdom. The borough of Windsor is governed by six aldermen and eighteen councillors, of whom one is mayor; and returns two members to parliament. Pop. (1851) 9596.

WINE AND WINE-MAKING.

Wine and Wine-Making.

WINE (Gr. οἶνος, *Foῖνος*; Lat. *Vinum*; Ital. *Vino*; Fr. *Vin.*), the fermented juice of the grape; the term has also been applied to liquors similarly prepared from the fruit of other plants. As the vine is a native of the temperate regions of the globe, which appear to have been the first abodes of mankind, the knowledge of wine and its properties is probably coeval with the earliest records of the human race. Wine is mentioned in the Mosaic narratives and in the prophetical books of the Old Testament. Its praises were sung by the earliest poets of the Greeks; and the cultivation of the vine and its products were the theme of the most renowned of the Roman writers on agriculture and its kindred pursuits. To it Pliny has devoted an entire book of his great work on *Natural History*; Columella has been equally communicative; Virgil has given it prominent place in the *Georgics*; the most interesting portions of Athenæus are those relating to the use and qualities of wine; and everything connected with viti-culture that could be gleaned from the writers between the first and fourth centuries of Christianity was condensed in the collection of *Geoponics*, compiled in the reign of Constantine VI. Porphyrogenitus.

ANCIENT WINES.—Tradition points to India as the birthplace of the vine, whence the mode of preparing wine was introduced into Egypt, and ultimately extended over Asia Minor, Greece, Italy, Northern Africa, and Spain. The simplicity of the early process, which consisted of the mere expression and fermentation of the juice, was soon combined with more complex measures for increasing the saccharine element by partially drying the grapes, and for stimulating the alcoholic development by the application of heat in stoves and *fumaria*. As the theory of distillation was but partially known, the wines of the Greeks and Romans were free from admixture with ardent spirit, but adventitious flavours were imparted by the infusion of leaves and various aromatic substances, as well as by the introduction of salt, resins, or turpentine; whence the origin of the pine cone as an accessary to the *thyrsus* of Bacchus. The grape-juice or *must* was sometimes boiled down to inspissation, and the "*defrutum*" thus produced was made use of, as at the present day, to impart body and flavour to thin and poor wines. The efficacy of age in ripening and heightening the quality of wine was appreciated by the ancients. Homer speaks of wine "in its eleventh year" (Od. xi. 391); Athenæus praises it when kept for sixteen; Horace commends wine the age of which was equal to the poet's own; and Pliny mentions some which he had tasted 200 years old, which was then thick as honey and rough in taste (lib. xiv. 6). The coarser descriptions of wine were drunk from the *dolia*, in which they underwent fermentation; but the finer kinds were drawn off and preserved, generally in earthen *amphoræ*; rarely in wood; only the choicest and most delicate being kept in flasks of glass. When removed to a distance, wine was carried in hides or in bags made of goat-skins, *ἀσκοί*, whence the scriptural expression of "wine bottles old and rent" (Josh. ix. 13), and the caution against putting "new wine into old bottles," because of the risk of bursting them (Mark ii. 22). Besides its introduction at private entertainments, wine was exposed for sale in the *Thermopolia*, where it was to be had either spiced and warm, or cooled with ice and snow when the latter were procurable.

Greek Wines.—Of the wines known to the ancient Greeks, the most celebrated were the two kinds mentioned by Homer—one which he designates Pramnian, and which was probably made from grapes grown in the vicinity of Smyrna; the other, the produce of the Thracian Ismarus, with which Ulysses was presented by Maron the priest of Apollo. This he extols as "luscious, pure, and worthy of the palate of the gods" (*Od.* iii. 203). In later times the choicest Greek wines came from Lesbos, Thasos, Chios, Cos, Cyprus, and others of the Cyclades; as well as from the coast of Asia Minor, and especially from the slopes of Mount Imolus, between the Hermus and Caÿster.

Roman Wines.—Of the Roman wines, the earliest noticed was the Cœcuban, which grew near the modern Fundi; and this was superseded, in popular favour, by the Setinian from the hills of Setia, overlooking the Pontine marshes. But that which excelled all other in the estimation of the poets who have sung its praises was the Falernian—the "*immortale Falernum*" of Martial—which was made from grapes ripened on the *Falernus Ager*, lying between the Massic Hills and the banks of the Volturnus. This, in colour, was white inclining to amber, and was esteemed fit for the table only after the age of ten years; when, according to Pliny, it was the only wine known to him which took fire on the application of flame (lib. xiv. 8). In proportion to its area, the district of Italy most prolific in wine was the volcanic region of the Campania, the northern and southern extremities of which Fundi, and Sorrento, were alike famous for Fondanum and Surrentinum; the one commemorated by Martial, xiii. 113, and the other recommended by Pliny, "propter tenuitatem salubritatemque" (xiv. 8). Italy, at this period, regarded her own wines as the finest in the world. Those of Gaul, afterwards world-wide in their renown, had not yet developed their excellence. That of Beterræ, in Languedoc (the modern Bezier), was scarcely known beyond its native district; whilst Gallia Narbonensis was notorious in the days of Pliny for the manufacture of spurious compounds, under the semblance of wine; a manufacture in which Cette has to the present day sustained its ancient and unenviable repute. Pliny barely alludes to Sicily as a wine-producing country, and only particularises the Mamertine of Messina; whilst he extols Spain for the abundance rather than the excellence of its vintages. But those of the Balearic Isles were, in his judgment, equal to the choicest growths of Italy. In Egypt, the district of Mareotis, adjoining Alexandria, produced a white wine, highly lauded by Athenæus; whilst Pliny, on the contrary, pronounces all the wines of Africa to be acid and thin.

MODERN WINES.—It is a curious fact, which cannot fail to be remarked in connection with any list of ancient wines, that, with scarcely an exception, no one of the localities famous for the superiority of its produce in the time of Pliny now yields a vintage of merit. The causes of this are to be sought not alone in the neglect of cultivation, and the consequent deterioration of the vines, but also in local changes, geological and social—the alteration of the earth's surface and levels, the disappearance of forests, and the cutting of canals and other operations which have affected the drainage and the soil, and partially influenced even the temperature and climate. But in compensation for this, the production has, in the interim, extended over almost every region of the globe that is capable of sustaining the vine; the islands of the Atlantic, the United States, Mexico, South America, and Australia having been added to the wine-producing regions of the Old World.

France.—In no country has the culture of the vine, and the preparation of wine, been pursued with so much perseverance and ability as in France, and in none has success been at once so signal and so extended. There the precise combination of soil, climate, and treatment, essential to every variety of the vine, has been studied with the minutest care, profound science and skill being brought to the aid of observation and experiment. The result has been an extent of production unequalled in any region of the globe, and an excellence in the choicest descriptions so refined and supreme as to be unsurpassed even by the traditional renown of any wine of ancient times, and unapproachable by any modern rival.

In character and quality the wines of France are so varied that Cavoleau, in 1827, enumerated in his *Œnologie Francaise* upwards of 1500 localities, each yielding a description of sufficient esteem to confer a special distinction on the place of its growth; and the number of these has since been increased by the improvement of cultivation and the formation of vineyards in other localities. With the exception of those elevated regions of Central France, which lie too high to admit the favourable growth of the vine, and of those low lands and valleys where the great proximity of acclivities obstructs the direct action of the sun, and of the extended plains of the west, which are exposed to chill winds blowing unimpeded from the north, vineyards are

successfully worked in almost every department, from the Mediterranean to the Meuse, and from the banks of the Garonne to the bases of the Maritime Alps. The principal regions of the vine are—Champagne, Burgundy, the Lyonnois, Auvergne, Dauphiny, Provence, Languedoc, Roussillon, Gascony, Guienne, and Saintonge; but, above all others in France, the wine which enjoys the most extended reputation is that of the Garonne, and especially that grown in the department of the Gironde and the Bordelais. The wines of this region are still known in England by the term *claret*—a name no longer attached to any variety exported from France, and only applied at the present day to a white wine of inferior value, grown in Languedoc and Dauphiny. Amongst the French, individuals may give a preference to the red wines of Burgundy over those of the Gironde; but the ability of the latter to bear a sea-voyage gives them a signal advantage over all other rivals, and has secured for them an eager demand in every civilised country. The qualities which ensure for them this pre-eminence are thus described by Cavoleau and Jullien :—" Un vin de Bordeaux de 1ere qualité et parvenu à son degré de maturité doit être pourvu d'une belle couleur, de beaucoup de finesse, d'une bouquet très-suave, et d'une sève qui embaume la bouche : il doit avoir de la force sans être fumeux, et du corps sans être âcre; il doit ranimer l'estomac en respectant la tête, en laissant l'haleine pur et la bouche fraîche" (*Œnologie Franc.* p. 122; *Topgr. des Vignobles*, 172).

Although England is one of the principal consumers of claret, such has heretofore been the passion in this country for strong and loaded wines, that Jullien finds it necessary to explain that the above description applies only to that portion of the Bordeaux vintage which is preserved in its natural purity, but that, down to a very recent period, the shipments destined for Great Britain were not exported until after undergoing the process known to the merchants as "*le travail à l'Anglaise.*" This consists in submitting them to a renewed fermentation, mixing with them, at the same time, both alcohol and sulphurised *must*, together with portions of Hermitage, and other strong wines from the Rhone and Languedoc, as well as from Alicante or Benecarlo. The compound is then permitted to recover, and ripen in the maker's cellars for some years, when it is found to acquire a very strong and spirituous character. Claret thus treated, besides being rendered more costly by the expense of the process, is also more intoxicating and less wholesome than the natural wine. Of late years this practice has been less in favour, and larger quantities of pure wine are sent annually to England from Bordeaux.

Of the red wines of the Gironde, the finest are known by the names of the estates and vineyards which produce them, such as *La Fitte*, *La Tour*, *Chateau Margaux*, and *Haut Brion*, in the first class; *Leoville*, *St Jullien*, *St Emilion*, and others, in the second and third. Of the white wines of this region, the finest and most valuable are those of Sauterne, Barsac, Preignac, and Bommes, grown in the *Graves*, or gravelly plains, which lie to the south and west of the Garonne.

Besides the produce of the Bordelais, only two other provinces of France, Burgundy and Dauphiny, yield red wines of the highest quality. Those of Burgundy are distinguished for the refinement of their flavour and the delicacy of their aromatic *bouquet;* but, owing to their susceptibility of injury during carriage, their export is necessarily very limited. Of these the most celebrated are *Romanée Conti*, *Chambertin*, *Richebourg*, *Clos-Vougeot* and *La Tâche*, all grown in the Cote d'Or, a department which owes its name to the richness of the vintages on the low chain of hills extending from Dijon to Mâcon, on the Saône. The wines of Dauphiny and the Lyonnais have not hitherto been largely imported into the United Kingdom, notwithstanding their possession of those elements of strength and flavour which ought to recommend them to English taste, combined with their ascertained ability to endure a sea-voyage. The principal seat of the wine-trade of this district is at Lyons, whence the Rhone and the Saône afford unusual facilities both for carriage and export. Besides red and white Hermitage, which are grown on the hills above Tain, the best wines of the district are produced at *Méal*, *Gréfieux*, *Beaume*, *Muret*, *Guiognières*, *les Bessas*, *les Burges*, and *les Lauds*.

Wine and Wine-Making.

French red wines of the *second* rank (besides much from the localities above named) come principally from Champagne, Beaujolais, Roussillon, the northern slopes of the Pyrenees, and other districts which yield the profuse variety already alluded to, a very small portion of which, however, takes high rank in public esteem.

Of white wines, the most appreciated in France are the effervescent vintages of Champagne, the finest of which are grown in the department of Marne, at Sillery, Ay, Rheims, and Epernay. Both white and black grapes are used for the manufacture of champagne; the red tinge sometimes imparted to pink or *rosé* champagne being obtained by extraction from the skin of the latter. These wines are either still, like that of Sillery, or sparkling; and the latter are again divided with reference to their briskness into *mousseux*, and *demi-mousseux*, or *cremant*. The effervescence which they exhibit is attributable to the escape of carbonic acid imperfectly developed during an incomplete fermentation in the cask, and further generated during their retention in bottle. The treatment of the wine, so as to secure this peculiarity in its highest perfection, is one of those triumphs of skill by which the wine-making of France is so pre-eminently distinguished. The vintage is gathered early in October. The fermentation is generally allowed to go on till Christmas, when the wine is drawn off and mixed with that of other vineyards, with a small quantity of " finings," and a little colouring matter. The bottles must be selected with extreme care, new, symmetrical, and of great and uniform strength. The bottling takes place between April and August, warm weather being essential to produce sparkling wine. Before corking, a small quantity of brandy and syrup is introduced (the proportion being increased to 15 or 16 per cent. for those destined for the English market), and a space of two or three inches is left unfilled in each bottle. In the course of eight or ten days a deposit is formed indicative that the moment has arrived for their removal to a colder cellar, and here they undergo a fermentative process, during which the breakage is a serious consideration to the proprietor. Its extent can neither be foreseen nor checked; it happens chiefly at the season when the vine begins to blossom. In the second winter, means are taken to remove the deposit formed in the summer; the bottles are inverted, so as to place the mouth downward, and shaken from time to time to cause the deposit to descend into the neck. By an extremely dexterous manœuvre, each bottle is then uncorked and the sediment allowed to escape; the vacant space is refilled with brandied syrup, and the whole is then recorked, wired, and tied, and the wine is left to ripen preparatory to removal. In good seasons, Champagne does not yield less than 15,000,000 bottles of white wine; but the average is 7,000,000, of which 6,000,000 are exported to England, Russia, and Germany.

Of the other white wines of France, those next in value to champagne are the growths of Mont Rachet, in the Côte d'Or, of Dauphiny, and the Graves (already particularised), and of Chateau Grillet, in the department of the Loire. *Vins de liqueur*, such as Frontignac, Lunel, and Rivesaltes, come exclusively from the South, from Alsace, Dauphiny, Languedoc, and Provence.

Such is the adaptability of the soil and climate of France to the growth of the vine, that the gross vintage has been

Wine and Wine-Making.

estimated at 1,500,000,000 of gallons. The vineyards, in 1859, covered 2,470,000 hectares, producing on an average 32 hectolitres of wine per hectare. As a hectare is about 2½ acres, and a hectolitre 22 imperial gallons, the gross produce would therefore be above 1,738,880,000 gallons. But, making a large deduction for failures and indifferent seasons, the annual produce of France may be taken at a 1,000,000,000 of gallons of wine; and this is every year increasing, not merely in consequence of the extension of cultivation, but also owing to the greatly improved treatment of the vines and the substitution of more prolific for less productive varieties of vines. A commission appointed by the National Assembly of France, in 1849, to inquire into the condition and prospects of this important branch of industry, made its report in 1851, and attributed the great increase in the production of wine, amongst other causes, to the repeated subdivision of the land, and the greater proportion of labour thus applied by the small proprietors to their own allotments, instead of being hired out as formerly to the proprietors of larger estates. In this transition the consideration of quality has to some extent been postponed to that of quantity; in some districts the increase has been a fifth, in others a half, and in some double or treble the former returns. The delegates of the Gironde gave in evidence that certain vineyards, formerly yielding 8 or 9 hectolitres per hectare, now yield 14 or 15; and the witnesses examined from Burgundy stated that whereas the old plantations had formerly produced 14 hectolitres, the new were giving 60. One of the commissioners states, that in certain parts of Provence and Languedoc, where old vineyards situated on hills yielded only 15 to 18 hectolitres, new ones on plains now produce as much as 100 to 150. Deterioration of character, as well as diminution of price, have followed as a consequence of these changes; and of late years, with the exception of the comparatively circumscribed localities which produce the very choicest descriptions, the general quality of French wines has degenerated. This is more especially perceptible in the medium class. "C'est un fait notoire," say the commissioners, "que généralement; à part les plants de premier choix, la vigne a dégénéré en France, qu'elle a perdu en délicatesse une partie de ce qu'on lui a fait gagner en fécondité; et que l'adoption des nouvelles methode de culture, l'invasion des races communes, l'abus des fumures et des engrais n'ont multiplié ses fruits qu'en altérant leur primitive saveur." (*Enquête Legislative sur l'Impot des Boissons,* tom. xi. p. 13.) The vintage of France was formerly estimated on an average at 40,000,000 hectolitres; it yielded, in 1847, 54,369,799. In 1854, during the height of the vine disease, it fell to less than *one-fifth* of this amount; but it has since rapidly recovered, and in 1858 the vintage yielded 45,105,700 hectolitres, or about 993,000,000 of gallons. Of this prodigious quantity, however, Lenoir, in his *Traité de la Culture de la Vigne,* p. 593, pronounces one-sixth only to be in any degree *good,* another sixth *passable,* a third capable of being drunk without absolute disgust, the rest consisting of *every gradation from bad to detestable.* It may be regarded as evidence of the little taste which prevails in other countries for even the medium classes of French wines, that of the vast quantity produced only a very small portion is taken for consumption out of France. The export in some years has exceeded 2,000,000 of hectolitres; but on an average of ten years, before the destruction of the vintages by the vine disease, the quantity of French wine, of every description, sent to every country in the world, was only 33,000,000 gallons. By a statement founded on official data which appeared in the *Constitutionelle* of the 7th April 1860, it appears that about 18,000,000 hectolitres are sold to dealers in France; 8,500,000 are converted into brandy; 16,000,000 are consumed in the districts where they are made; and it is estimated that from 5,000,000 to 6,000,000 are lost by deficient skill and want of care in the processes of manufacture.

Wine and Wine-Making.

Spain.—Next to the wines of France in quantity, and rivalling them in popularity in other countries, are the wines of the Peninsula. Portugal is remarkable for the excellence of its *Port* from the Alto Douro, and Spain for the white wine of Xeres, Port Saint Mary, and St Lucar. Great Britain, in 1859, consumed 2,876,554 gallons of wine from Spain, and 2,020,561 gallons from Portugal, whilst she took but 695,913 gallons of the finest wines of France. The portion which she drew from Spain was almost exclusively sherry, grown in the district of Cadiz. This was probably the dry *vino secco* known as "sack" in the reign of Queen Elizabeth. So much has taste in England been diverted from pure wines, that no sherry is now drunk in the United Kingdom in its simple and unadulterated state. It was given in evidence before a Committee of the House of Commons in 1852, that "no natural sherry comes to this country; no wine-house will send it. The article we get is a mixed article; if the Spaniards gave us the natural produce of Xeres, it would not suit, because our taste is artificial." (*Evidence,* 5717 to 5723.) Spain literally abounds in wine. Mr Porter, formerly of the Board of Trade, estimated its production at 120,000,000 gallons, good, passable, and bad; and probably this is below the truth. But such is the supremacy of habit, that a vast proportion of the wines of Spain are unknown even by name in Great Britain; and so intently is taste directed to particular descriptions, that, according to the evidence quoted above, these wines "do not come here,—first, because we would not drink them if they did; and secondly, because they cannot come, owing to the position of the wine-growing districts, which are distant 120 or 200 miles from the seaports, with no cross-roads, no coopers, and no casks." A large proportion of those rejected are converted into brandy, and exported to America and Europe. The driest description of sherry is known as *Amontillado,* and was at one time said to have been made in imitation of the montilla grown near Cordova. But the peculiar flavour designated by the name is as often the result of accident as of design; and from some cause, as yet imperfectly known, certain portions of an ordinary vintage, and treated in no way differently from the rest, sometimes present all the qualities of "amontillado."

No province of Spain is without its vintage, but those of the north—Galicia, the Asturias, Biscay, Navarre, and Aragon—are little known beyond their immediate localities. The same remark applies to the central provinces of Castille, Leon, and Estremadura, although, in the latter, the *tinto* of Olivença has acquired a certain repute, as well as the red and white *val de peñas* of La Mancha. On the Mediterranean shore, Catalonia abounds in vineyards; but with the exception of those of Cordova, their produce is not of superior character; and like that of Alicante, Vinaroz, and Benecarlo, in Valentia, it is principally taken on account of its high colour and flavour, to blend with more delicate wine of other countries. Murcia and Granada are chiefly celebrated for their *vins de liqueur;* so that it is mainly through the rich and abounding vineyards of Andalusia, and above all, of Cadiz, that we are acquainted with the produce of Spain.

The destructive disease among the vines made its appearance in the district around Cadiz in the year 1853. Such were its disastrous effects, that the vintage which had previously reached 60,000 to 70,000 butts, of an average value of L.7, fell in the course of a few seasons to 18,000 or 20,000 butts, with an increase in price to L.16 or L.20. For some time the export from Cadiz, which had been 53,357 butts of 108 to 110 imperial gallons, did not very much decrease; but the averages being maintained, not by the

produce of accruing vintages, but by the reduction of the stocks in the hands of the merchants. Spain yields some sweet wines of very high quality, such as the *Pedro Ximenes*, the Malmsey of Sitjes in Catalonia, the Paxarète of Xeres, and the *vins de liqueur* of Malaga.

Portugal.—Of the gross production of wine in Portugal, as of that in Spain, it is difficult to obtain accurate information, the only returns accessible being those of the quantities exported. But it is a significant fact as to the prolific vintages of this portion of the Peninsula, that in recent years the value of the shipments of wine from the Douro and the Tagus has exceeded that of all the other exports of the kingdom. The two great centres of the wine-trade are Oporto and Lisbon, the former for the red wine, which bears its name, the latter chiefly for the white wines which grow in the surrounding provinces. The wine known in England as "Port," is the production of a district about nine leagues in length, along the banks of the Douro, to the east of Oporto; its limits were arbitrarily fixed by the Portuguese government, and, under restrictions no less capricious than unwise, the produce of the vintages was divided into classes, distinguishing that qualified for exportation from the inferior portion retained for home consumption. No denunciation of a system so artificial and unsound could be more emphatic than that pronounced in the preamble to a project submitted to the Cortes by the minister at Lisbon in 1860, by which it was proposed to abolish the Douro Company. "To write the history of the trade in these wines," says this document, "of the laws which have regulated it, and of the motives and reasons assigned by legislators during more than a century, would be to recapitulate all the errors which it has been the task of science in the first instance, and of practice subsequently, to annihilate. The decree of the 10th September 1756 confirmed the formation of the Company, with almost regal powers and privileges, at the sacrifice of other industrial interests; and the sacrifice was carried out in such a violent and barbarous manner, that it became necessary to disregard the rights of property, and to pull up and destroy the farmers' vineyards, for in their simplicity they could not comprehend the fundamental theory of the Douro legislation, viz., *that an abundant production is the bane of agriculture.* Finally, gallows were erected and armies manœuvred to compel the people to become rich and prosperous by the means marked out by their governors. It is no longer contested that these restrictions are of no advantage to the Douro wine-growers, but, on the contrary, cause more injury to them than to the wine-growers of the vicinity, who do not enjoy their privileges, but are the victims of their monopoly. One object avowed was to restrict the supply of Douro wine abroad, with a view to keep up its prices, and appreciation consequent on scarcity; and another was, to furnish a guarantee to foreigners for the genuineness of the article. But the prohibition to export from Oporto any but *first-class* wines declared legally "exportable," in attacking the principles of liberty and property, and in depriving the country of the advantages of trade in the inferior kinds of wine, has not obviated nor restricted the base imitations of port wine in other places; whilst the choice of a restricted quantity for shipment has induced the vine-grower to adulterate his wines with pernicious mixtures, in order to give it artificially the appearance and qualities required." Such were the vices and consequences of this absurd system, coupled with the ascendant taste for strong wines in England, that it may safely be said that for nearly a century not a pipe of port wine has ever reached the United Kingdom in its original purity.

Before the appearance of the *oidium*, which seized on the vines of Portugal about the year 1854, the gross annual production of the *Demarçao* or legalised district, had attained to *ninety thousand* pipes, of which less than one half was declared fit for foreign export. In 1856–7, the wine shipped from the Douro was but 38,264 pipes, and it fell in 1857–8 to 19,212, and to 17,597 in 1858–9. During the same period, the wines shipped from the Tagus, chiefly the production of Estramadura, including Lisbon, Bucellas, Carcavellos, and Setuval, amounted in 1856–7 to 14,250 pipes, in 1856–7 to 8655, in 1857–8 to 14,366. Of these latter wines a small and declining quantity comes to the United Kingdom; the bulk of those exported being taken by Brazil.

Wine and Wine-Making.

The entire production of Portugal has not been calculated with any accuracy, but judging by what is known of the Alto Douro and other districts, it must be very large. The province of Estramadura alone, in 1859, was computed at 200,000 pipes. Looking to the large internal consumption of the country, the gross vintages of an average year may be fairly estimated at from 8,000,000 to 10,000,000 gallons.

Germany.—With the exception of the countries bordering on the Rhine, Northern Germany can scarcely be said to produce any wine of value. But from the confines of Switzerland to the confluence of the Moselle, the river and its tributaries traverse regions which have been aptly described as the "gardens of the vine,"—and between Mayence and Coblentz it flows between hills scarped and terraced to their summits, and yielding those vintages which have conferred celebrity on the district known as the "*Rhoingau.*" With the exception of Asmanshausen and a very few other red wines, the produce is almost entirely white, and ranges in excellence and estimation from the costly Johannisberg, Steinberg, and Hockheim, down to numerous growths of far inferior quality and price. The vineyards of Johannisberg, which surround the chateau, on a hill in the duchy of Nassau, a short distance from Mayence, were originally planted by the monks of Fulda at the end of the eleventh century. On the secularisation of the lands of the convent they were transferred to the Prince of Orange, and eventually became the property of the House of Metternich. The finest vines grow above the vaults surrounding the castle; and the story is told that during the early wars of the French Revolution, Hoche was only prevented by the entreaties of the peasants, aided by the remonstrances of Marechal Lefebvre, from blowing them and the castle into the air. They yield annually, according to Jullien, about 1300 bottles of wine, so esteemed that it has been valued, in special years, at 25 francs a bottle. Johannisberg is characterised at once by its superior bouquet and delicious flavour, and by its total freedom from the piquant acidity of other wines of the Rhine.

The proportion of choice German wine as compared with the gross production is so infinitesimally small, that Northern Germany imports for her own use a larger quantity of wine than the exports to all the rest of the world. Out of the annual vintage, estimated at 45,000,000 gallons, Great Britain consumes about 60,000.

Austria.—Southern Germany, on the contrary, not only yields a prodigious quantity of wine, but of late years exports a large and increasing proportion. Exclusive of her Italian possessions, Austria, in 1855, had a vintage which amounted to 456,048,318 gallons. Of this Hungary furnished more than a half, including the only descriptions with pretensions to a high degree of excellence. Hungary sustains sixty varieties of the vine, principally introduced from Italy, Asia, and Greece. Of its wines the most renowned is the Tokay grown at the confluence of the Theiss and Bodrog, near the village of Tarczal, and incontestibly regarded as the finest *vin de liqueur* in the world. The Emperor Probus is said to have planted the vines in the third century of Christianity. The vintage does not take place in any year

Wine and Wine-Making.

till the grapes have not only been allowed to get over ripe, but partially to dry upon the vines. Next to Tokay the favourite wines of Hungary are those of Sirmien, Buda, Erlau, and Gyoengyoesch, at the foot of Mount Matra.

Croatia and Sclavonia produce annually about 50,000,000 gallons; Transylvania 800,000; Styria and Dalmatia each nearly as much; the wines of Moravia, Bohemia, Carniola, Istria, and the Tyrol, are unimportant both in quantity and value. Of the portion exported from Austria, little or none reaches England. According to an official report laid before Parliament in 1860, about one-third goes to Switzerland, a third to Poland, Russia, and Turkey, and the remainder to Prussia, and *via* Trieste to other countries.

Italy.—The Austrian statistical returns show that the wines of Lombardy and Venice in 1855 were upwards of 70,000,000 gallons, chiefly from the Friuli, Brescia, Bergamo, the Milanese, and Valteline; but no one of these can be ranked in a superior class. Notwithstanding its soil and climate, and the other local advantages which rendered Italy the home of the vine, and vindicated for it the title of *Œnotria*, the ancient renown of Setinian and Falernian has not descended as an inheritance to the vineyards of Latium and Campania. Piedmont produces the light wine of Asti, and Tuscany the palatable Monte-Pulciano; Monte-Fiascone and Orvieto, are aromatic and agreeable; Naples has her Lacrymæ Christi, and the islands of Ischia and Capri are prolific in a refreshing and exhilarating wine; but none of the vineyards of modern Italy can bear comparison with those of France or the Peninsula. Besides, although the gross produce is considerable, scarcely any of it is susceptible of carriage by land or sea without the risk of deterioration.

Sicily possesses numerous advantages for the cultivation of the vine, but hitherto its wines have not attained to any degree of excellence. The vicinity of Etna produces some red wines, such as *Mascoli*, *Schiarra*, and *San Giovanni*; but of all, the most important are the vineyards of Marsala, near the western extremity of the island, which produce a white wine possessed of qualities so nearly allied to those of ordinary sherry as to be in considerable demand wherever the English have established themselves in the Mediterranean, and to be largely imported into the United Kingdom. Of late years, however, its consumption in these countries has not been increasing; it amounted to 323,681 gallons in 1854, but has gradually declined to 224,409 in 1859.

Switzerland.—Almost every Swiss canton produces wine more or less, but none above third-rate in merit or value. The best are probably the red wines of Faverge and Cortaillod, in the principality of Neuchatel; those of Thayengen in Fribourg; Rhintal, Bouchberg, and Bernang in Saint Gall; Winterthur in Zurich; Erlach, in Berne; and Frangy and Monnetier, in the canton of Geneva, are the most known. Both the Canton de Vaud and the Valais produce palatable wine. The former furnishes a considerable quantity to the Federation, but none for foreign export.

Russia.—The southern possessions of Russia in Europe are favourable to the vine; and in some of the provinces, Bessarabia, Kherson, Taurida, and the Don, wine is made with no inconsiderable success. Of these the best is produced in the Crimea, where the vine has been cultivated from time immemorial; but the processes are of the rudest kind, and the manufacture is still in its infancy. On the southern coast of the Crimea, Sudah, to the west of Theodosia, produces a sparkling wine with some of the characteristics of champagne; and amongst the mountains towards Sebastopol the peasants make a red wine, which Jullien says resembles that of Roquemaure, in the department du Gard. Wine is also grown at Kislar in Circassia; at Dimi in Imeritia; at Odeschi in Mingrelia; and at Derbend in Daghestan.

Wine and Wine-Making.

Turkey and Greece.—Although the whole area of Turkey, both European and Asiatic, may be said to be congenial to the vine, the unsettled condition of the country, coupled with the Mohammedan prohibition against its use, have contributed to discourage the production. Christians, however, are permitted, under certain restrictions, to make wine for themselves. Moldavia and Wallachia each produce a little, the latter some resembling Tokay. Albania, Macedonia, and Thessaly have likewise their vineyards, but their produce is of no esteem. In Greece, on the contrary, the cultivation of the vine is one of the most extended and important branches of national industry; but the wine, both of the Morea and of Livadia, is so impregnated with resin as to be unpalatable to one unaccustomed to this peculiarity. The monks of Megaspelion, south of the Gulf of Lepanto, have the reputation of making the best wine in the Peloponessus, and in the same peninsula the wines of Pyrgos, Tripolizza, and Modon, have a certain celebrity. Napoli de Malvasia, on the shore of the ancient Sparta, gave its own name to the *Malmsey* which, in the middle ages, graced the desserts of the luxurious; but it has almost disappeared from the place of its birth. The islands of Greece and the Archipelago sustain their reputation for wine. Ithaca, Zante, and Cephalonia have each vintages of a quality somewhat higher than those of Cerigo and Corfu. At the foot of Ida the Cretans still cultivate, but on a greatly reduced scale, the vines that yield the rich muscadine, of which the Venetians were at one time the purveyors of Europe. In Samos and Tenedos the prosperity of the islanders is mainly dependent on their vineyards; and Scio maintains her ancient renown for that luscious "nectar" which Virgil extolled and Horace pronounced to be beyond all price.

> "Quo Chium pretio cadum
> Mercemur!"

Of all the wine-growing islands of the Archipelago, however, Cyprus is, in modern times, the most distinguished. Early in the seventeenth century the production exceeded 1,500,000 gallons, of which nearly one-half was exported; but at the present day the vintage is probably less than a sixth of this quantity. The finest description is that grown on the ancient commandery of the Knights of St John, between Paphos and Limasol. It is a *vin de liqueur* the most luscious and aromatic, which, according to the tradition of the growers, requires to be kept for a hundred years to insure the full development of its excellence. It is a universal favourite in the Levant, but is much too sweet and cloying for ordinary tastes. Large stocks are preserved for export in the cellars of Larnica and Nicosia. In Asiatic Turkey the vine grows universally, from the shores of the Mediterranean to the valleys of the Euphrates, but the finest wines produced are the muscats from the vicinity of Smyrna and the *vino d'oro*, from the slopes of the Lebanon. Palestine still yields a small quantity, and the monks of Jerusalem prepare some of tolerable quality from the vineyards of Bethlehem.

Persia, &c.—The odes of Hafiz have conferred on the wines of Shiraz, in Farsistan, a reputation which has become European as well as Oriental. But owing to the introduction of odoriferous gums, to give them the peculiar flavour prized by the Persians, they fail to realise their poetic renown in the esteem of strangers. Wine is made but in trifling quantity, and of execrable quality, in Cabul and Cashmir, and in the countries watered by the Indus; and the historic traditions of China attest its former existence there, although it has long ceased to be made in that extraordinary country.

Africa.—Whatever adaptability for the vine the southern

shores of the Mediterranean may have exhibited in the classic ages, the production of wine disappeared with the ascendency of the Mohammedan faith, and with the exception of a small quantity made by the Jews in Morocco, the remotest extremity of Africa may be said to be the only spot on that vast continent that now sustains a vintage. The Dutch were the first to encourage the grape at the Cape of Good Hope, and vines were introduced by them both from Asia and Europe, but the soil proved to be deficient in many essentials; and owing to the inexperience of the planters, imperfectly relieved by the aid of French immigrants, the cultivation was slovenly, the processes rude, and the quality of the vintage defective. The only exception was the farm of Constantia, a few miles distant from Cape Town, which has always yielded a liqueur wine of superior quality. Both red wine and white are produced in South Africa; and a compound was formerly made in imitation of Madeira, which had some sale in Europe and in India. For many years past an artificial demand has been stimulated in this country for the wines of the Cape, by means of a discriminating import duty favourable to them as British colonial produce. Thus, whilst the wines of France and the Peninsula were only admissible at excessive rates, those of the Cape were subjected to a tax of but one-fourth that imposed on all others; and when the duty on all wines was equalised in 1831, and fixed at 5s. 6d. a gallon, whatever the country of their growth, that of the Cape was admitted at 2s. 10d. But the stimulus was ineffectual; the inferior character of the wine repelled consumers; it was imported almost exclusively for fraudulent admixture with better descriptions, and even for this base use its consumption declined from year to year. It had been 670,000 gallons in 1825, it fell off in 1840 to 456,773 gallons, in 1850 to 246,132, and to 182,322 in 1853. At this crisis the appearance of the *oidium*, and the destruction of the vintages of Europe by its ravages, gave a fresh impetus to the importation of Cape. It suddenly rose to 277,494 gallons in 1854. In 1857 it was 456,214, and 781,581 in 1859.

In 1860, the Chancellor of the Exchequer adopted the wise course of abolishing the distinctive duty on colonial wine, and placing it on an equality with all others,—a measure, the effect of which will be watched with some anxiety by the colonists at the Cape, who now find themselves embarked for the first time in an unprejudiced competition with the wine-growers of Europe.

Canary Islands and Madeira.—The groups of islands in the Atlantic, lying to the west of the great African continent, Homer's "Isles of the Blessed," have in modern times been proved to possess all the conditions of soil and climate essential for maturing the grape and ensuring the choicest quality of wine. Teneriffe and Canary have acquired a high reputation for white wine and Malmsey; but the merits of both are eclipsed by the exquisite produce of Madeira, the finest of which takes incontestable rank with the choicest vintages of Europe. So congenial is this island to the vine, that plants from every quarter of the Old World have been successfully cultivated upon the slopes of its volcanic hills. Their produce embraces every variety and rank, from the ruby coloured *tinto*, and the delicious wine which bears emphatically the name of its birth-place, to the driest *sercial* and the luscious and aromatic Malmsey peculiar to the island. The cultivation of the vine was introduced into Madeira by the Portuguese in the early part of the fifteenth century; and in the height of its prosperity, the gross production was estimated at upwards of 20,000 to 25,000 pipes, of which about one-fourth, chiefly of the most exquisite quality, was annually exported to England, the East Indies, North America, and Brazil.

Of all the countries visited by that scourge of the vines, the *oidium*, none was so utterly devastated by it as Madeira. It broke out in the island in 1851, nearly a year before its appearance on the continent of Europe, and in an infinitely more virulent form. It infested every district,—it annihilated the grapes in 1852, and rapidly seized on the plants themselves. With scarcely an exception, the vines were destroyed, the few that survived were incapable of maturing fruit; for six successive years no vintage was gathered in Madeira, and the vineyards were planted with the sugar-cane. The stocks of wine in hand failed to supply the demands of other countries; the export which had been 7840 pipes in 1851, fell in 1854 to 1642, and to 1995 in 1855. By a partial recovery in 1858, the proprietors were enabled to make about 600 pipes of very inferior quality; but the produce in 1859 was *nil*. The stocks in hand are exhausted, and at the present moment (June 1860), the wine trade of Madeira may be said to be virtually extinguished. That it will ultimately revive, there are no grounds for reasonable doubt, but a problem of some interest will then arise for solution. Hitherto no attempt made to transport the vine to other countries has ever been attended with such a measure of success as to obtain in the new locality precisely the same character and quality of wine as that which it yielded in the old. Whatever care may be bestowed to select an identity of soil, aspect, and climate, the grape, after removal, loses its special and peculiar attributes; vines taken from France, Germany, and the Peninsula, to the Cape and Australia, have furnished wines totally different from what they produced before, and no European vine has hitherto succeeded when transplanted to America. The wine of one and the same plant which gave Hock upon the Rhine, became Bucellas in Portugal, and Sercial in Madeira. The question then suggests itself, when the rage of the *oidium* shall have subsided, and vines are again introduced into Madeira, whether the characteristics of the new wine, however choice its quality, will be such as to identify it with that with which we have been so long familiar under the designation of *Madeira?*

Australia.—Turning from the Old World and its vicissitudes, a fresh interest is excited by the experiments now in progress to introduce the culture of the vine and the manufacture of wine into the New. In Australia, vineyards have been scientifically tended for upwards of thirty years, and plants have been introduced with varying success from the principal wine-growing countries of Europe. Every portion of this great continent hitherto colonised has been found favourable to their growth; but though the prospect is highly encouraging in Victoria, as well as in both South and Western Australia, the success hitherto attained has been most marked in New South Wales (see AUSTRALIA), where upwards of 1100 acres of vineyards are now under cultivation, chiefly in the district of the Hunter River and its tributaries. The extent in 1859 was 547 acres in Victoria; 673 in South Australia; and 364 in Western Australia, of which 218 are in Perth and the vicinity of the Swan River, and the remainder in Wellington and York. The produce in wine is of course various; but near the Hunter River it has in some places been between 400 and 500 gallons per acre.

Of the wine hitherto made, the characteristics of the white bear a close affinity to that of Hochheim and the Rhingau, and the red has some resemblance to those of the Côte d'Or. In quality, they are so promising as to have obtained highly favourable notice at the Great Exhibition at Paris in 1854; and Liebig, in 1852, pronounced, as the result of his analysis, that the white wines of the Hunter River exhibited more of alcohol and less of free acid than the most esteemed wines of the Rhine; whilst the red had many properties in common with Burgundy. As yet this branch of industry is too recent to furnish any considerable supply, and nothing beyond a few experimental samples

Wine and Wine-Making.

have been exported from the colony. The gross produce of South Australia in 1857 was 108,174 gallons; that of Victoria was 10,936 in 1856.

United States.—The cultivation of the vine was an object of early solicitude to the first colonists of North America. Plants were introduced from France and Spain in 1620, and vineyards formed in Virginia, where French *vignerons* were induced to settle in 1630, and to undertake the preparation of wine. Vines trained on mulberry and sassafras trees were a feature in the scenery of Delaware in 1648, and in 1683 William Penn established a vineyard in the vicinity of Philadelphia. Towards the end of the last century, a palatable red wine was made from a native vine in Indiana and Missouri; and in 1769 some French settlers in Illinois made upwards of 100 hogsheads from an American wild-grape. Thenceforward attention has been uniformly given to the native grapes as the only ones suitable to wine-making, experience having demonstrated the utter failure of every attempt to make good wine in America from vines imported from Europe. The *Report of the Commissioner of Patents*, published at Washington in 1857, says, "It has been found necessary (in the northern states particularly) to discard the European varieties, as they cannot stand the sudden variations of climate; and from some cause yet unknown, even in the most favourable situations they are invariably destroyed. Sixty years ago there was scarcely a yard in the city of New York that did not possess foreign vines, producing fruit of the finest quality; now there are none—they will not thrive there. If they produce fruit for two or three years, they are apt afterwards, at the time of flowering, to split open both stem and branches, and so perish" (p. 227). Every care has consequently been bestowed on the native species, of which it has been found indispensable to have two very distinct classes of plants; one suited to the hot regions of the south, and the other to the cold districts of the northern States. The *scuppernong* grape, which is the favourite in the southern States, will not ripen perfectly north of Virginia; and the fox-grape of the north, with its varieties of the Isabella and Catawba, will scarcely grow in the lower parts of Carolina and Georgia.

Upwards of thirty varieties of native grapes are now cultivated in the United States, nearly all white, and closely resembling each other. In one important particular they have all been found to differ from the vines of Europe; that pruning appears to produce no beneficial effect on the fruit; and when left to their natural growth, they are more productive than under artificial training, however scientific. Wine is made in almost every State of the Union, from the Pacific to the Atlantic, and from the St Lawrence to the Gulf of Mexico. Looking to quantity alone, the region most productive is California, where, more than a century ago, the preparation of wine was carefully attended to by the missionaries from Spain. In character it is less pure and wholesome than the wine made in Ohio. Next in importance, as wine-producing States, are North Carolina, Pennsylvania, and Indiana.

The following return from the *Census Report* of the United States exhibits the quantity of wine produced in each State of the Union in the years 1840 and 1850 respectively:—

Table showing the production of Wine in the United States in 1840 *and* 1850.

States and Territories.	1840. Gallons.	1850. Gallons.
Alabama,	177	220
Arkansas,	...	35
California,	...	58,055
Columbia, District of,	25	863
Connecticut,	2,666	4,269
Delaware,	322	145
Florida,	...	10
Georgia,	8,647	796
Illinois,	474	2,997
Indiana,	10,265	14,055
Iowa,	...	420
Kentucky,	2,209	8,093
Louisiana,	2,884	15
Maine,	2,236	724
Maryland,	7,585	1,481
Massachusetts,	193	4,688
Michigan,	...	1,654
Mississippi,	12	407
Missouri,	22	10,563
New Hampshire,	94	344
New Jersey,	9,416	1,811
New York,	6,799	9,172
North Carolina,	28,752	11,058
Ohio,	11,524	48,207
Pennsylvania,	14,328	25,590
Rhode Island,	803	1,013
South Carolina,	643	5,880
Tennessee,	653	92
Texas,	...	99
Vermont,	94	659
Virginia,	13,911	5,408
Wisconsin,	...	113
New Mexico Territory,	...	2,363
Totals,	124,734	221,249

Since 1852, the cultivation has been extended with energy and success; in 1854 the gross produce of the United States was estimated at 500,000 gallons, and by an official report furnished by the secretary of the British Legation at Washington in 1860, it is now upwards of 2,000,000, the average value of which may be taken at one dollar and a half per gallon.

In every region of the American continent, the native vines, as compared with those of Europe, have been found defective in saccharine, the richest in this quality is the *scuppernong* of the extreme south; but wine made even from it requires to be sweetened by the admixture of a portion of syrup or honey. This, together with the infusion of whisky or peach-brandy, to correct the supposed deficiency of alcohol, imparts a disagreeable flavour to the wines of North Carolina.

The Catawba grape, which was found growing in a garden near Washington about the year 1826, is now extensively cultivated in Ohio, Kentucky, and the States of the west and south-west; and "Catawba wine," notwithstanding a muscat flavour, disagreeable to those unaccustomed to it, bids fair to become an article of importance in American commerce. It has some resemblance to Rhenish in flavour, and is of the same pale straw colour. In 1854 the vineyards in which it was grown covered more than 3000 acres, chiefly in the vicinity of Cincinnati, but spreading along both banks of the Ohio to Pittsburgh and Cairo, and thence extending southward through Kentucky and Tennessee to Alabama and Missouri. Large quantities of effervescent wine are made both at St Louis and Cincinnati, and sold as "sparkling Catawba" at about a dollar a bottle. In the process of making it undergoes a treatment in all respects similar to champagne, and with a degree of success which, in the opinion of Americans, is likely to render it a formidable rival.

Elements of Wine.—Although the component substances which form the juice of the grape have been ascertained with considerable accuracy, and observation has recorded the phenomena of those changes whilst undergoing fermentation, which ultimately convert them into wine, we are still so imperfectly acquainted with the quantitative analysis of the innumerable descriptions of wine, and with the causes which engender their endless variety, that Mulder, the latest and most enlightened writer on vinous chemistry, has frankly avowed that all we have yet learned on the

subject is so trivial in comparison with what remains to be known, that it can only be regarded as a single step in the progress of discovery.

Every species of vine (and they are so numerous that Chaptal, in 1799, caused 1400, then growing in France alone, to be collected in the garden of the Luxembourg at Paris) exhibits a different proportion in the elementary constituents of the grape; and each, during the growth of the plant and the process of manufacture, is subject to so many influences from the varieties of soil and aspect, and exposed to so many casualties, such as the mixture of ripe with unripe and decaying fruit, and even those fluctuations of temperature by which fermentation is affected, that the multiplicity of results may almost be said to be infinite.

Both black and white grapes yield colourless juice, but so sensitive is each to external influences, that the white are generally sweeter; because, although the heat of the sun more easily penetrates the purple, the colourless skin of the other being more permeable by light, a more powerful chemical action is thus engendered, and a larger formation of sugar.

Besides water, the principal components of grape-juice, according to Mulder, are sugar, gelatine or pectin, gum, fatty matter, wax, albumen, gluten, tartaric acid free and combined with potash, soda, and lime; in some cases racemic, malic, and perhaps citric acid; alumina, oxide of manganese, and oxide of iron, sulphate of potash, sulphate of soda, phosphate of lime and magnesia;—silicic acid may also exist. The skin contains tannic acid and colouring matter; and the stones a fatty oil, capable of distinct extraction. As much as 40 per cent. of solid particles, the greater portion being sugar, may be contained in the juice of very ripe grapes, but of this the majority contain much less. Mulder calculates that the saccharine matter ranges from 13 to 30 per cent.; and as the proportion of alcohol in wine is mainly dependent upon the amount of sugar in the grape, his estimate is, that 198 parts of grape-sugar (supposing there to be no loss during fermentation) would give 92 parts of alcohol, or, as nearly as possible, *two* to *one*. But as some of the sugar remains undissolved, and during fermentation more alcohol is evaporated than water, this proportion is liable to great variation.[1]

Shortly after the juice has been expressed from the grapes, the commencement of fermentation is indicated by the rise of small air-bubbles to the surface, caused by the liberation of carbonic acid gas; the liquid, never altogether clear, becomes turbid, froth collects, saccharine diminishes, alcohol is engendered, the consistency of the fluid decreases, and it rejects, by discharge or subsidence, matters which it is no longer capable of holding in solution. The process is continued for some months, the wine being drawn off from time to time into different vessels, to facilitate the removal of sediment, and when thoroughly cleared, it is finally transferred to casks for preservation or export.

Even when cellared, the chemical action, although apparently at an end, is still silently and invisibly sustained; and properties become altered or imparted, which either add to the flavour and excellence of the wine, or eventually lead to its decomposition and decay. In fine wines, colour is gradually deposited, and the bouquet is heightened by the evolution of odoriferous substances; but, on the other hand, wine with much sugar and but little tannic acid is insusceptible of improvement from age; and those with a considerable portion of albumen have a tendency to turn acid. So long as wine is in cask, the proportion of alcohol goes on increasing; but as this operation is more or less dependent on access to air, no change in this respect is discernible in bottle. The disagreeable flavour sometimes perceptible in bottled wines, which are said, when so affected, to be "corked," is ascribable to mould-plants, or extremely minute fungi, which, growing from the outside, penetrate to the moist end of the cork; hence the propriety of re-corking wines which have been a long time in bottle. Another disease, technically called "ropiness," is caused by the formation of vegetable mucus from the saccharine matter; and as this is principally occasioned by the deficiency of tannic acid, it may be checked by its addition.

Wine and Wine-Making.

The elements which go to the composition of wine may be deduced from the statement made above as to the constituents of grape-juice, and the changes which they undergo during fermentation. Of these, some entirely disappear in the process; new combinations take place in others; and alcohol, acetic acid, tartarates of potash, lime, and magnesia, are formed; and, according to Fauré, the best wines contain a viscid, ropy, and elastic substance which he designates *Œnanthine*, and to which he ascribes that "body" which is so highly prized in the wines of Medoc.

The quantity of alcohol in different wines, as well as in wines of the same kind but of different vintages, and the means of ascertaining its amount with precision, have occupied the attention of analytical chemists; but with no more satisfactory result than the conclusion that the proportion can only be estimated satisfactorily by distilling the spirit from the wine; determining its specific gravity and quality; and comparing it with the gross quantity of wine employed in the experiment.[2] Apparatus has been simplified, with a view to adapting it to this process of distillation, but the operation is affected by so many adventitious circumstances, that minute accuracy is hardly to be attained even with careful and scientific manipulation. Fontenelle, Payen, Guy Lussac, Malland, Fauré, and others, have recorded the results of their several calculations, which are almost as varied as they are numerous. The following table, furnished by Brande in 1811 and 1813, although it has since been repeatedly tested without eliciting the same precise results, has generally been accepted as exhibiting the proportion of native alcohol in the several descriptions of wine which are best known in England. It must, however, be remembered, that this analysis presents no criterion of the quantity of adventitious alcohol introduced into wine by the maker or importer.

Table of the Alcoholic Contents of Wine at 15° 5 *c* 509 *F.*

	Alcohol.
Port wine, maximum	23·92
„ minimum	19·82
Madeira, maximum	22·61
„ minimum	17·91
Constantia	18·29
Lacryma Christi	18·24
Sherry, maximum	18·37
„ minimum	17·00
Lisbon	17·45
Madeira (Tinto)	17·04
Cape Madeira	16·77
Cape Muscat	17·00
Calcavella	16·76
Hermitage, white	16·14
Malaga	15·98
Roussilon	15·96
Syracuse	14·15
Bordeaux (claret), maximum	15·11
„ „ minimum	11·95
Tinto (red French)	12·32
Burgundy, maximum	12·32
„ minimum	11·00
Graves (Bordeaux)	11·84
Champagne, white	11·84
„ red	10·64
Rhine wine, maximum	13·31
„ „ minimum	8·00

[1] Mulder's *Chemistry of Wine*, translated by H. Bence Jones, pp. 32, 50.

[2] Mulder, chap. viii. p. 145.

	Alcohol.
Tokay	10·46
Nice	13·5
Schiraz	14·4
Cote Rotie (Burgundy)	11·4
Frontignac	11·8
Marsala, maximum	15·9
„ minimum	14·7
Malmsey	15·2
Bucellas	17·1

Another analysis has been published by Christison, as follows:—

	In volume.
Port wine, weak	18
„ average of seven kinds	20
„ strong	21
„ weak	18
Sherry, weak	17
„ average of thirteen old wines	18
„ strong	20
„ average of nine kinds, East India	18
Madre de Xeres	21
Madeira, long in the East Indies, strong	21
„ „ weak	17
Teneriffe, long in Calcutta	17
Sercial (Madeira)	18
Lisbon, sec	20
Amontillado (sherry)	16
Claret, 1811	10
Chateau Latour, 1815	10
Rosau, 1825	10
Claret, ordinary, best kind	11
Rivesaltes	11
Malmsey	16
Rudesheimer (best)	10
„ (ordinary)	9
Hambacher (best)	9

Mulder thus sums up the general result of his own inquiries, sustained by the numerous minute analyses of others, especially of the wines of Germany and France. "Port," he says, "is the richest in alcohol, Madeira ranks next. *Liqueur* wines, as a rule, are stronger than red wines. Jurançon, Lacryma Christi, Benicarlo, and Sauterne, all contain from 12 to 15 per cent. alcohol and more. Red French wines contain less, from 9 to 14 *per cent.*; good Bordeaux 9, 10, and 11 *per cent.*; champagne 10 to 11; and Rhine wine from 6 to 12—generally from 9 to 10 *per cent.*"[1]

Growth and Consumption of Wine in England.—Proofs have been laboriously collected to show, that at an early period vines were grown in the south and west of England, with a view to the preparation of wine;[2] but although the fact is attested on the evidence of *Domesday-Book* and the early chronicles, it may be doubted whether, owing to the unsuitability of the climate, the quality could at any time have been palatable. The experiment was continued down to a very late period in Kent, Surrey, and Gloucestershire; but we have the testimony of Evelyn, that even some of the best specimens, submitted to him in 1655, were "good for little."

The connection between England and France, which followed the Norman Conquest, and the acquisition of territory in Anjou, Poitou, and the Duchy of Guienne, familiarised the English at an early period with the wines of the Garonne; and Froissart states, that in 1372, "a fleet of not less than 200 sail of English merchantmen coming for wines" were seen to arrive at the port of Bordeaux. By degrees the English learned to appreciate the vintages of other parts of France, especially those of Burgundy and the Rhone. In process of time, the national trade extended to the full-bodied wines of Cyprus and Canary, and, according to Hollingshed, Grecian Malmsey, Italian *Vernage*, Rhenish tent, and Spanish Malaga, "were accompted of, because of their strength and value." Champagne was drunk in the reign of Henry VIII., and under Charles II. the favourites were Bordeaux, Burgundy, and Hermitage.

Wine and Wine-Making.

Sherry and port were little in use before the close of the seventeenth century; and the origin of their later ascendency in these countries dates from the political estrangements between France and England, consequent on the Revolution of 1688, and the active part taken by Louis XIV. in behalf of the exiled family. During the wars which ensued, the financial system of Great Britain was perverted from the legitimate purposes of revenue, and framed with an avowed intention to cripple the commerce and industry of the French; and under the plea of securing a better market for British commodities in the Peninsula, to foster a preference for the wines of Portugal and Spain. The attempt was eventually successful. By the Methuen treaty in 1703, England bound herself to impose a duty on French wines not less than *one-third* higher than on Portuguese; but even this proportion was in practice far exceeded, till under the conjoint influences of inclination and necessity, the taste for the strong wines of the Peninsula became so confirmed that when the duty on French wines was lowered in 1786, the reduction was productive of no advantage, and their consumption continued to decline.

The subsequent history of the wine duties in Great Britain, and the rise and fall of consumption at different periods, as the relative rates underwent readjustment, present so many anomalies, and exhibit results so discrepant and so much at variance with the phenomena of commerce, under the ordinary influences of taxation, that they can only be regarded as the caprices of a taste artificially stimulated, and operating not on one of the necessaries of life, the increased or diminished use of which would register with sufficient precision the influence of high and low prices; but on one of its luxuries, affected, not by the uniform impulse of an habitual want, but by the changing customs of society, and the uncertain fluctuations of fashion. The use of wine by the people of England during the eighteenth century was intermittent, exhibiting at one time the largest amount of consumption and revenue under the highest range of taxation, and at others manifesting a sudden decline in both, notwithstanding large reductions of duty in periods of great national prosperity.[3]

At the close of the war in 1815, the duties had risen to 13s. 8d. per gallon on French wines, and 9s. 8¼ on those of the Peninsula; at these rates the consumption began perceptibly to decline during peace; and in 1825 they were, however, lowered to 7s. 3d. on French, and to 4s. 10d. on Spanish and Portuguese. The result was a gradual increase from an average of 4,751,106 gallons per annum to between 6,000,000 and 7,000,000, which was attained in 1830, and at, or about that average, it has been maintained to the present time.

In 1831, another important improvement was effected, by the repeal of the Methuen treaty, and the abolition of the unwise and invidious distinction formerly drawn between the wines of France and those of the rest of the world. The duty was equalised at 5s. 6d. for wines of every country except that of the British colonies, which was fixed at 2s. 10d. Under this scale, which continued down to 1860, the consumption of wine in Great Britain, and the revenue arising from it, are shown to have been as follows, by a table prepared by Mr T. G. Shaw, author of some valuable pamphlets on the wine duties:—

[1] Mulder, chap. viii. p. 187.
[2] Henderson's *Hist. of Ancient and Modern Wines*, chap. xi.
[3] Sir J. Emerson Tennent's *Wine, its Use, and Taxation*, chap. iii.

Relative Quantities of the different descriptions of Wine entered for Consumption in the years 1831, 1841, 1851, *and* 1859.

Wine and Wine-Making.

Years.	Port.	Sherry.	French, including Claret, Champagne, Masden, &c.	Marsala, including a few pipes of Canary.	Madeira.	Rhenish, including others *via* Holland.	Unenumerated, including mixed in Bond Mixtures from Hamburg.	Cape (South African), including a few pipes from Australia.	Total Gallons.	Revenue from Wine.	Population.	Rates of Duty per Gallon.	
												Cape.	Other kinds.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.		L.		s. d.	s. d.
1831.....	2,707,734	2,089,532	254,366	354,719	209,127	57,888	Not specified.	539,584	6,212,264	1,535,484	24,419,421	2 9	5 6
1841.....	2,387,017	2,412,821	353,740	427,201	107,701	55,242	do.	441,238	6,184,960	1,720,479	27,019,558	2 11	5 9
1851.....	2,524,775	2,533,389	447,566	394,225	71,025	58,957	do.	234,672	6,280,653	1,776,249	27,831,781	2 11	5 9
1859.....	2,020,561	2,876,554	695,913	227,657	29,566	125,408	501,461	785,926	7,263,046	1,982,327	Estimated. 30,000,000	2 11	5 9

Impressed by the circumstances already adverted to, of the stationary demand for wine in the United Kingdom during the last thirty years, notwithstanding the increase of wealth and population, and disquieted by the fact, that the individual consumption, which had been nearly *three* bottles per head at the beginning of the present century, has gradually fallen to less than *one and a half*, those interested in the trade, unsatisfied with the solution that the decline may be ascribable, in this country as elsewhere, to the progress of social refinement, and the subsidence of excess, eagerly attributed it to the pressure of the import-duty, and petitioned parliament for its reduction from 5s. 9d. to 1s. a gallon. It required no demonstration to show that such an alteration would not only be consistent with enlightened theories of trade, but would greatly conduce to domestic convenience and economy. The only difficulty which presented itself was one of finance, and a committee of the House of Commons was appointed in 1852, chiefly with a view to test the assurance advanced by the advocates of the measure, that its practical effect would be exhibited in such a prodigious increase in the consumption of wine in these countries, as not only to replace the revenue surrendered, but even largely to increase it. The result of the inquiry, however, did not justify this expectation; the preponderance of the evidence was opposed to it. Those of the witnesses possessed of the longest and largest experience were of opinion that no mere reduction in the cost of wine in England would induce the class who at present drink it to increase the quantity now taken; and amongst a lower class, as yet unaccustomed to wine, it was thought that a prevalent preference for ardent spirits and beer would be slow to make way for the light wines of France or other countries. Striking facts were adduced in proof of the extraordinary difficulties which have hitherto defeated every attempt to substitute a new wine for those to which public taste has so long conformed. It was the opinion of some of the best informed witnesses, that a limit having been placed by nature on the growth of wines of the first class, any greatly increased demand occasioned by a reduction in the duty, would probably be accompanied by a simultaneous increase in their cost; and that as our habits had been hitherto opposed to the substitution of inferior descriptions, it was to be apprehended that in such an event the public as well as the revenue must suffer, inasmuch as we should not be able to obtain a sufficiently augmented supply of the wines we would drink, or to drink very largely of the wines we could get. Other equally serious obstacles were made apparent during the course of the inquiry; and the committee, embarrassed by testimony so conflicting and inconclusive, declined the responsibility of making any recommendation. But the evidence which they collected led to the conviction, that whilst, apart from the question of finance, the reduction of the wine-duties would be manifestly in the interest of commerce and international trade, the alteration, when the period should arrive for attempting it, would have to be made with the conviction that the immediate effect, so far from a gain, must be at least a temporary surrender of public income.

This change has since been inaugurated, parliament, in 1860, having decided on the equalisation of the tax on colonial and foreign wines, and fixed the import-duty at 3s. per gallon to the 1st January 1861, and afterwards as follows:—

Wine containing less than the following rates of Proof Spirits, verified by Sykes's Hydrometer, viz.—

	18 Degrees.	26 Degrees.	40 Degrees.	Imported in Bottles.
	L. s. d.	L. s. d.	L. s. d.	L. s. d.
Of or from foreign countries—				
Red, the gallon	0 1 0	0 1 6	0 2 0	0 2 0
White, the gallon	0 1 0	0 1 6	0 2 0	0 2 0
Lees of such wine, the gallon	0 1 0	0 1 6	0 2 0	0 2 0
The growth and produce of any British possession—				
Red, the gallon	0 1 0	0 1 6	0 2 0	0 2 0
White, the gallon	0 1 0	0 1 6	0 2 0	0 2 0
Lees of such wine, the gallon	0 1 0	0 1 6	0 2 Q	0 2 0

The import duty on the more highly alcoholised wines is to be liable to a slight increase in the event of any increase in the excise duty on spirits, viz., *one halfpenny* per gallon on those which pay one shilling and sixpence, and not more than *twopence* on those which pay two shillings for every increase of a shilling upon distilled spirit.

Of the consequences of this measure, both commercially and financially, it is premature to speak. Great difficulty is apprehended by the wine trade in the practical application of the alcoholic test; and the experiment will necessarily require time, which is to decide on the adaptability of public taste in England to the medium class of wines of the continent which it is sought to introduce. But whatever be the financial results, the measure is one which commends itself by cheapening one of the chiefest luxuries of the rich, at the same time rendering wine more readily accessible to the middle classes, and adding a new and wholesome enjoyment to the limited comforts of the poor. (J. R. T.)

Winterthur ‖ Winton.

WINTERTHUR, a town of Switzerland, canton of Zurich, and 12 miles N.E. of the town of that name. It is a remarkably neat and elegant town, and has several very handsome buildings, among which is the Town Hall. It has a public library, collections of natural history, and manufactures of cotton, muslin, calico, &c. Population 5341. In the vicinity is Ober Winterthur, the site of the ancient *Vitodurum*, where many ancient remains have been found.

WINTON, ANDREW, prior of Lochleven, appears to have been born during the reign of David the Second, which extended from 1329 to 1370. For the few scattered notices of him that have been preserved we are chiefly indebted to the valuable work which has transmitted his name to posterity. Of his parentage and education no record has hitherto been discovered; but we learn from his prologue that he was a canon regular of St Andrews, and prior of the monastery of St Serf. The beautiful and romantic situation of this priory furnished a very suitable abode for a poet; and here Winton must chiefly have resided during a considerable part of his life. In the Chartulary of the Priory of St Andrews, which is now printed, there are several documents bearing the name of Andrew Winton as prior of Lochleven between the years 1395 and 1413; but his life must have been prolonged several years after this last date, for he mentions the death of Robert, duke of Albany, an event which happened in 1420. In the prologue to the last book of his Chronicle, he expresses his anticipation of a speedy dissolution.

His *Orygynale Cronykil* of Scotland was undertaken at the suggestion of Sir John Wemyss, ancestor of the noble family of that name.

> "This tretys sympylly
> I made at the instans of a larde
> That hade my serwys in his warde,
> Schyr Jhone of the Wemys be rycht name,
> Ane honest knycht and of gude fame."

Winton's chronicle, while it yet remained in manuscript, was not entirely neglected by the more curious inquirers; it was quoted by Selden, a writer of prodigious research, who was not, however, acquainted with the author's name; it afforded some useful information to Ruddiman for his edition of Buchanan, and to Innes for his *Critical Essay on the Ancient Inhabitants of Scotland;* nor was it completely overlooked by Lord Hailes and Mr Pinkerton. Of that portion which relates more immediately to Scottish affairs, a splendid edition was at length published by the late David Macpherson, who has added a copious glossary, a series of valuable annotations, and other useful appendages.[1] It may safely be affirmed that none of our ancient writers has yet been edited in a more faithful and judicious manner. The basis of his text is the royal MS. in the British Museum; this appears to have been transcribed for George Barclay of Achrody, and its date is supposed to be at least as early as the year 1430; but he likewise had recourse to several other manuscripts, belonging to the same institution and to the Advocates' Library.[2]

The Chronicle of Winton is valuable as a specimen of the literary taste and attainments of our ancestors at a very remote period, but it is still more valuable as a repository of historical information, and as a delineation of ancient manners. His simple pages present to our view many curious prospects of society; and with a perseverance of industry which had numerous difficulties to encounter, he has collected and preserved many anecdotes that tend to illustrate the history of his native country. He divides his work into nine books, "in honour of the orders nine of holy angels." Although he merely professes to write an original Chronicle of Scotland, yet, like other Gothic chroniclers, he presents his readers with an outline of the ancient history of the world. The adoption of such a plan is not to be considered as peculiar to the author; Winton follows the models which at that period were generally approved; and the Latin Chronicle of Fordun, who was nearly contemporary, is composed of the same heterogeneous materials.

Wire-Rope ‖ Wisconsin.

WIRE-ROPE. (See end of ROPE-MAKING.)

WIRKSWORTH, a market town of England, county Derby, and 12 miles N.N.W from the town of that name. It stands in a valley, nearly encircled by hills, and consists principally of two streets. The parish church is a handsome edifice, and there are chapels for Baptists, Independents, and Methodists. The moot and session's hall is a handsome stone building. There is also a free grammar school in the town. The lead mines of the vicinity, though not so productive as formerly, are still the chief source of employment to the inhabitants. Manufactures of cotton, hats, hosiery, &c., are also carried on to some extent. Pop. (1851) 2632.

WISBEACH, a municipal borough, market town, and river-port of England, county of Cambridge, in the Isle of Ely, on the River Nene, 10 miles from its mouth in the Wash, and 43 miles N. from Cambridge. The Nene is here crossed by a handsome stone bridge of one arch, 72 feet span, connecting the town with the suburb called New Walsoken, on the opposite bank of the river. The central and main portion of the town lies in an angle between the Nene and the Wisbeach Canal, which extends in a S.E. direction to the river Ouse. The town is irregularly laid out, but has of late been much improved, and the streets are well paved and lighted with gas. A handsome crescent was erected in 1816 in the centre of the town, on ground formerly occupied by the castle. The parish church of St Peter is a fine old structure in the Norman and decorated English styles, with two naves and a fine tower, and contains several monuments. There are also a chapel of ease, and places of worship for Independents, Methodists, Baptists, Quakers, Unitarians, and Roman Catholics. The other principal buildings of the town are the town hall, corn exchange, assembly rooms, house of correction, and theatre. There are also a free grammar school, public library, reading rooms, public baths, and several literary and scientific societies in the town. The chief branches of industry are ship and boat building, rope-making, ironfounding, brewing and malting. The trade of the port is considerable. At 31st December 1858, 75 vessels, of in all 11,700 tons, were registered as belonging to the port; and during that year there entered 610 sailing vessels of 53,180 tons, and 22 steam vessels of 7774 tons; and left 259 sailing vessels of 14,526 tons, and 3 steam vessels of 1037 tons. Pop. (1851) 10,594.

WISBY. (See GOTTLAND.)

WISCONSIN, one of the United States of North America, lying between N. Lat. 42. 30. and 46. 58., W. Long. 87. 8. and 92. 54.; bounded on the N. by Lake Superior and the State of Michigan, E. by Lake Michigan, S. by the State of Illinois, and W. by those of Iowa and Minnesota. Length, from N. to S., about 302 miles; greatest breadth, 258; area, 53,924 square miles. This extensive region may be generally described as an undulating plain, varying in elevation from 600 to 1200 feet above the level

[1] *The Orygynale Cronykil of Scotland*, be Androw of Wyntown, Priowr of Sanct Serfis Ynche in Loch Levyn, &c. Lond. 1795, 2 vols. 4to and 8vo.

[2] Of Winton's Chronicle a considerable number of MSS. are mentioned by Macpherson, but several others are known to be preserved. There is one in the Lansdowne collection, lately added to the British Museum, another in the library of the University of St Andrews, and a third in that of Captain Wemyss of Wemyss.

Wisconsin. of the sea. It is interrupted by no heights that can be called mountains; but three distinct watersheds are indicated by course of the rivers. The loftiest of these is on the extreme N. of the state, separating the affluents of Lake Superior on the N. from those of the Mississippi on the S. This range of hills is known by the name of the Wisconsin Mountains. North of them the country is wild and rugged, and the rivers, which are short and swift, descend by many rapids and cataracts to Lake Superior, the shores of which are, for the most part, lined with steep and bare rocks. The second watershed is near the southern border of the state, and separates the Wisconsin and its affluents from the Rock river, and others flowing to the south. To this belong several isolated hills called *mounds*,—the highest of which, Blue Mound, is estimated at 1770 feet above the level of the sea. The third watershed of Wisconsin is on the S.E. of the state, and separates the rivers that flow directly into Lake Michigan from those that flow into Green Bay, a large arm of that lake.

The largest river connected with Wisconsin is the Mississippi, which forms a large part of the western boundary of the state. It flows through a valley which, for the most part, is 10 or 12 miles broad, and bounded by steep cliffs from 300 to 600 feet high. The valley is occupied partly by rich meadows and partly by wooded tracts; and is interrupted here and there by isolated hills. Beyond the cliffs that bound the Mississippi valley, the country assumes the same general appearance that prevails in the greater part of the state. Numerous rivers, affluents of the Mississippi, traverse the land, and their course generally lies through deep and narrow valleys. The St Croix river issues from a lake of that name, near the extreme north of the state, and flows at first south-west and then south, forming, for a great part of its course, the western boundary of Wisconsin. It receives a large number of affluents, especially in the upper part of its course, and falls into the Mississippi. The Chippewa, farther east than the former, also waters the north of the state, and falls into the Mississippi. Its length is 200 miles. Farther down in its course, the Mississippi receives the Black River, which is about 150 miles long. But its largest tributary in the state is the river from which the state takes its name. The Wisconsin rises by two branches not far from the source of the Chippewa, in the north-east of the country, and flows in a very irregular course, at first generally south for 200 miles, and then west for 100 more. Of the rivers that fall into Lake Superior, none are of any size or importance. But there are some deserving notice in the east and south of the country. The Neenah, or Fox River, takes its rise near the point where the Wisconsin turns to the west, and flows in a very irregular course, generally north-east. After traversing several small lakes, it enters that of Winnebago on its west side, and, issuing from it on the north, flows north-east, and falls into the head of Green Bay. Its largest affluent is the Wolf river, which flows from the north, and joins it in a lake called Grande Buttes des Morts, connected with that of Winnebago. To the south of Lake Winnebago rises the Rock River, which flows south, receives several affluents from the State, and finally falls into the Mississippi in that of Illinois. The lakes of Wisconsin are very numerous, especially in the north-west; but these are of comparatively small size, varying from 2 to 10 miles in circumference. The largest in the state is that of Winnebago, which has been already mentioned. It is about 28 miles long and 10 broad. South of the Wisconsin lie the Four Lakes, in an isthmus among which stands Madison the capital, in the midst of rich and beautiful scenery. A remarkable depression extends across the south of the state from Green Bay to the Mississippi, formed by the lower valley of the Wisconsin and that of the Fox River. These approach at one point within 2 miles of each other; and the ground between is not more than 223 feet above the level of Lake Michigan. A large Wisconsin. grant has been made by the United States Congress for the construction of a canal, which will open up a new line of communication between the St Lawrence and the Mississippi, as the Wisconsin is navigable up to this point, and the Fox, which is obstructed by some falls and rapids, might, without much difficulty, be made so too.

The most prevalent geological formation in the southern part of Wisconsin is limestone, which is interrupted here and there by deposits of sandstone. North of this lie strata of Potsdam sandstone and metamorphic deposits; while, in the extreme north of the state, granitic and other primitive rocks prevail. The mineral resources of the country are very great. In the south-west there are extensive and valuable deposits of lead, forming part of the great lead region of the Upper Mississippi, which lies partly also in Illinois and Iowa. Along with the lead ore, copper, zinc, and some silver, are also found: on the banks of the Black River, and some other affluents of the Mississippi, some iron is found; and in the primitive region in the north there are mines of copper, probably the richest in the world, and, to all appearance, almost inexhaustible. Sandstone, white marble, gypsum, saltpetre, and various precious stones, are also among the valuable minerals of Wisconsin. Although the country has not been long settled, mining operations have already been carried on to a considerable extent. The soil is in general exceedingly fertile, and well suited for cultivation; and even in the best mining districts the land, as is not usual in similar regions, is good for farming, and especially for grazing. The less fertile tracts are generally covered with forests, which afford abundance of excellent timber, especially pines; but as the greater part of the country consists of open prairies, on which the exuberant vegetation is annually burned up, there is no need of the laborious process of clearing which in many other parts of America the settler has to perform. The climate resembles that of New York and New England; but the average annual temperature is not so low as in these countries. Compared with that of Europe, it is more extreme both in heat and cold, the thermometer sometimes descending below zero, which it rarely does in southern Sweden; while in summer the heat is considerably greater than in central Europe. The winters are long and severe; but the temperature rapidly rises in spring, while it falls as rapidly in autumn. Notwithstanding the number of lakes and marshes, Wisconsin is eminently a healthy country,—a benefit which it probably owes to its pure and dry atmosphere.

Agriculture is the principal branch of industry carried on here; and the nature of the country affords great facilities for it. The extent of cultivated land, in 1850, was 1,045,499 acres; and on this there were produced 4,286,131 bushels of wheat, 3,414,672 of oats, 1,988,970 of maize, 1,402,077 of potatoes, 3,633,750 lbs. of butter, 610,976 of maple sugar, and 275,662 tons of hay. Wheat, maize, oats, potatoes, and butter, are the staple productions of the country; and large numbers of live stock are also reared. Among the wild animals of the country are bears, wolves, foxes, beavers, otters, and musk rats. In the lakes and rivers both fish and water-fowl abound. An important branch of industry here is the sawing and preparing of timber. Besides pine, which is most abundant, the country contains great quantities of oak, hickory, walnut, maple, lime, ash, elm, and other trees. Vast quantities of timber are conveyed by means of the various rivers to the Mississippi; and the timber of Wisconsin has now got entire possession of the market in the whole valley of that river, to the exclusion of all from other sources. The amount annually sawn and sent down the rivers is estimated at 200,000,000 feet. This occupation, lumbering as it is called, forms, along with farming and mining, the chief

Wismar. employment of Wisconsin. Manufactures are as yet very little advanced here. They have, however, been introduced to some extent; and, in 1850, the state contained 1273 manufactories, each producing annually L.100 worth of goods or upwards. Among these were 16 ironworks, employing 288 hands, and producing goods to the value of L.50,813; 9 woollen factories, employing 25 hands, and producing stuffs to the value of L.18,330; and a number of breweries and distilleries, producing 127,000 gallons of whisky, and 3120 barrels of beer and ale. The numerous rivers of the country, many of which have rapids and falls, afford abundance of water-power for the driving of mills; and the timber and iron found here furnish materials for ship-building, which is carried on to some extent. In the year ending June 30, 1858, there were built in Wisconsin 5 vessels, with a tonnage of 951. Commerce is greatly facilitated by the rivers and lakes, by means of which every part of the state has easy access to the St Lawrence or the Mississippi. The principal articles exported are wheat, flour, hides, beef, pork, timber, bricks, and lead; and the imported articles are made up of the merchandise suitable for a newly settled country, and the household property and agricultural implements of settlers here. The former amounted, in the year ending June 30, 1858, to L.113,180; and the latter to L.22,206. The principal lake-ports in the state are Milwaukee, Green Bay, Racine, Kenosha, Sheboygan, and Ozaukee.

Wisconsin was admitted into the Union as an independent state in 1848; and its constitution, like that of all the other states, is democratic. At the head of the executive stands a governor, who, along with a lieutenant-governor and other officers of state, is elected by a popular vote for the period of two years. The legislature consists of a senate of 30, and a popular assembly of 97 members; the former elected for 2 years, and the latter annually. The judicial establishments consist of a supreme court, circuit courts, county courts, and justices of the peace. The public receipts for the year ending October 1859 were L.233,207; and the expenditure L.207,232. The public debt amounted, in January 1859, to L.20,800. The total number of places of worship in the state is 245; with 78,532 sittings. The most numerous sect here is the Roman Catholics, who have 57 churches; next to them come the Methodists, 84; Independents, 33; Baptists, 28; Presbyterians, 21; Episcopalians, 19; and Lutherans, 18. Most liberal provisions are made by the state for education. About 100,000 acres of land have been set apart for raising a school fund, the proceeds of which, as they are gradually sold, amounted, October 1, 1858, to L.647,389; bearing interest at 7 per cent. A portion of this is applied to normal school purposes, but the greater part to the erection and maintenance of common schools throughout the land. In the year ending August 31, 1858, according to returns from all the counties but 2, there were 3482 schools, attended by 167,180 children, between 4 and 20; out of a total of 264,078, between these ages in the state. There is also a large university fund, the interest of which is applied to the state university, founded at Madison in 1851. There are also in Wisconsin 3 other colleges, an Episcopalian theological seminary, and a medical school. A normal department is attached to the university. The internal resources of the country are developed by numerous roads and railways; there being of the latter, in January 1859, 702 miles in operation. The capital of Wisconsin is Madison; and the state is divided into 45 counties. Pop. (1850) 305,391; (1855) 552,451, of whom 789 were negroes.

WISMAR, a fortified seaport town of North Germany, grand-duchy of Mecklenburg-Schwerin, 18 miles N.E. of Schwerin, and connected by a branch line with the Hamburg-Rostock Railway. It stands at the Head of Wallfisch Bay, which forms one of the best harbours on the Baltic, being protected by the islands of Poel and Wallfisch at its entrance. The town is tolerably well built, and contains several good public buildings, among which are three large Gothic churches, and an elegant town-hall. It carries on an extensive trade, especially in the export of grain, besides which the inhabitants are employed in fishing, ship-building, agriculture, and the manufacture of tobacco, sailcloth, beer, spirits, &c. Wismar was formerly one of the Hanse towns. Pop. (1858) 12,875. Wissembourg ‖ Wit.

WISSEMBOURG, a town of France, capital of an arrondissement of the same name in the department of Bas-Rhin, on the right bank of the Lauter, and on the Bavarian frontier, 34 miles N.N.E. of Strasbourg. It is a fortress of some strength, being connected with a system of military works here known as the "lines of Wissembourg," protecting this portion of the French frontier. It is tolerably well built, and has several good public buildings, among which are an old collegiate church and barracks. It has also a Protestant church, communal college, court of primary instance, and some manufactures of hosiery, straw hats, soap, and earthenware. Pop. (1856) 4643.

WIT, according to the modern use of the term, is limited almost exclusively to that faculty which traces remote resemblances between dissimilar objects, with the special design of producing laughter; while humour, again, is used to express that pleasure which one experiences on the high and the low being brought into immediate and irreconcilable conjunction. It may not be uninstructive, however, to exhibit here the phenomena of those two faculties under the old and familiar name of wit.

According to Locke, wit lies in the assemblage of ideas, and in the putting of these together with quickness and variety, in which can be found any resemblance or congruity, thereby to make up pleasant pictures and agreeable visions to the fancy. Addison limited this definition considerably, by observing, that every resemblance of ideas does not constitute wit, but those only which produce delight and surprise. Pope defined wit to be a quick conception and an easy delivery; while, according to a more recent writer, it consists in an assimilation of distant ideas.

The word *wit* originally signified *wisdom*. A *witte* was anciently a *wise man;* the *wittenagemot*, or Saxon parliament, an assemblage of wise men. So late as the reign of Elizabeth, a man of pregnant *wit*, of great *wit*, was a man of vast *judgment*. We still say, *in his wits, out of his wits*, for in or out of sound mind. The word, however, is now applied in a much more limited sense.

Wit is produced, 1. by debasing things pompous or seemingly grave; 2. by aggrandizing things little or frivolous; 3. by setting ordinary objects in a particular and uncommon point of view, by means not only remote but apparently contrary. Of so much consequence are surprise and novelty, that nothing is more tasteless, and sometimes disgusting, than a joke that has become stale by frequent repetition. For the same reason, even a pun or happy illusion will appear excellent when thrown out extempore in conversation, which would be deemed execrable in print. In like manner, a witty repartee is infinitely more pleasing than a witty attack; for though in both cases the thing may be equally new to the reader or hearer, the effect on him is greatly injured, when there is reason to suppose that it may be the slow production of study and premeditation. This, however, holds most with regard to the inferior kinds of witticism, of which readiness is the best recommendation. We shall illustrate these observations by subjoining a specimen or two of each of these sorts of wit.

Of the first sort, which consists in the debasement of things great and eminent, Butler, amongst a thousand other instances, has given us the following:—

And now had Phœbus in the lap
Of Thetis taken out his nap;
And, like a lobster boil'd, the morn
From black to red began to turn.
Butler's *Hudibras*, part ii. canto ii.

Here the low allegorical style of the first couplet, and the simile used in the second, afford us a just notion of this lowest species, which is distinguished by the name of the *ludicrous*. Another specimen from the same author we have in these lines:

Great on the bench, great in the saddle,
That could as well bind o'er as swaddle,
Mighty he was at both of these,
And styl'd of *war*, as well as *peace*:
So some rats of amphibious nature,
Are either for the *land* or *water*.
Ibid. part i. canto i.

In this coarse kind of drollery, those laughable translations or paraphrases of heroic and other serious poems, in which the authors are said to be travestied, chiefly abound.

The second kind, consisting in the aggrandizement of little things, which is by far the most splendid, and displays a soaring imagination, these lines of Pope will serve to illustrate:—

As Berecynthia, while her offspring vie
In homage to the mother of the sky,
Surveys around her in the blest abode,
An hundred sons, and every son a god:
Not with less glory, mighty dulness crown'd,
Shall take thro' Grubstreet her triumphant round;
And her Parnassus glancing o'er at once,
Behold a hundred sons, and each a dunce.

This whole similitude is spirited. The parent of the celestials is contrasted with the daughter of night and chaos; heaven by Grubstreet; gods by dunces. Besides, the parody it contains on a beautiful passage in Virgil adds a particular lustre to it. This species we may term thrasonical, or the mock majestic. It affects the most pompous language and sonorous phraseology, as much as the other affects the reverse, the vilest and most grovelling dialect.

To this class also we must refer the application of grave reflections to mere trifles. For that *great* and *serious* are naturally associated by the mind, and likewise little and trifling, is sufficiently evinced by the common modes of expression on these subjects used in every tongue. An apposite instance of such an application we have from Philips:

My galligaskins, that have long withstood
The winter's fury and encroaching frosts,
By Time subdued (*what will not time subdue?*)
An horrid chasm disclose.
Splendid Shilling.

Of the third species of wit, which is by far the most multifarious, and which results from what may be called the queerness or singularity of the imagery, we shall give a few specimens that will serve to mark some of its principal varieties. To illustrate all would be impossible. The first shall be where there is an apparent contrariety in the things exhibited in connection. This kind of contrast we have in these lines of Garth:

Then Hydrops next appears amongst the throng;
Bloated and big she slowly sails along:
But like a miser in excess she's poor,
And pines for thirst amidst her wat'ry store.
Dispensary.

A second sort is, where the things compared are what with dialecticians would come under the denomination of *disparates*, being such as can be ranked under no common genus. Of this we shall subjoin an example from Young:

Health chiefly keeps an Atheist in the dark;
A fever argues better than a Clarke:
Let but the logic in his pulse decay,
The Grecian he'll renounce, and learn to pray.
Universal Passion.

A third variety in this species springs from confounding artfully the proper and the metaphorical sense of an expression. In this way, one will assign as a motive what is discovered to be perfectly absurd when but ever so little attended to; and yet, from the ordinary meaning of the words, has a specious appearance on a single glance. Of this kind we have an instance in the subsequent lines:

While thus the lady talk'd, the knight
Turn'd th' outside of his eyes to white,
As men of inward light are wont
To turn their optics in upon't.
Hudibras, part iii. canto i.

A fourth variety, much resembling the former, is when the argument or comparison is founded on the supposal of corporeal or personal attributes in what is strictly not susceptible of them, as in the following passage:

But Hudibras gave him a twitch
As quick as lightning in the breech,
Just in the place where honour's lodg'd,
As wise philosophers have judg'd;
Because a kick in that place more
Hurts honour than deep wounds before.
Ibid. part ii. canto iii.

The fifth and only other variety which we shall mention, is that which arises from a relation, not in the things signified, but in the signs, of all relations no doubt the slightest. Identity here gives rise to puns and clinches; resemblance to quibbles, cranks, and rhymes. Of these it is quite unnecessary to exhibit specimens.

WITHAM. See LINCOLNSHIRE.

WITHER, GEORGE, an English poet of the minor order, was born at Bentworth near Alton, in Hampshire, on the 11th of June 1588. Passing from the charge of John Greaves, the eminent master of Colemore grammar school, he entered in 1604 Magdalen College, Oxford. For some reason or other (Anthony Wood says, that it was "his geny being addicted to things more trivial"), he went home without taking his degree, after a three years' residence in the university, "to hold the plough," as he says himself in his *Abuses Stript and Whipt*. Having held the plough long enough, he afterwards went to London, and entered himself at one of the inns of Chancery. In 1613 he published his poetical satire on the manners of the time, entitled *Abuses Stript and Whipt*, which brought him into straits; for the government, not relishing the freedom of his exposures, laid him up in the Marshalsea prison. Here he might have lain long enough, had not his *Satire to the King* in 1614 led to his liberation. When Wither was released, his violent passions and his unsteady judgment, coupled with his recent treatment in prison, and the sympathy which he met with from the puritanical party, made him yet more reckless than he had been before. He was loud in his denunciation of abuses, both in sober prose, and in more flowing verse. Characteristically enough, he served as captain of the horse under Charles I.; in the spring of 1639, three years after, he was made a major for converting his estate into a troop of horse for the parliamentary army. Enthusiastic Wither was taken prisoner, however, by the royalists, and he is said to have owed his life to Sir John Denham. Regaining his liberty, he was made a justice of the peace for three counties by the Long Parliament, and major-general for the county of Surrey by Oliver Cromwell. At the Restoration he lost his liberty, being confined to Newgate, on the charge of being the author of a pamphlet called *Vox Vulgi*. It is doubtful how long he remained in prison, but it is certain enough that his death took place not long after his release, on the 2d of May 1667.

The list of Wither's writings, good, bad, and indifferent, fills thirteen columns of Bliss's *Fasti Oxonienses*. The

Witney ‖ Witsius.

most complete list of them, however, in existence, is that by Thomas Park, in the *British Bibliographer*. From the "wretched Withers" of the *Dunciad*, up to the "melodious Wither" of Dr William King, there is room enough for the play of a good deal of fancy, and of a fair share of taste. Wither, in truth, possessed both taste and fancy, but his pen was much too facile, particularly in his later years. He has been long neglected, and perhaps justly. While Ellis and Campbell, and Hazlitt, have done their best to bring him into notice again, it is to be feared that he had not sufficient of "the diviner mind" to hold him in the perpetual recollection of men. Carlyle's odd characterization of this stepson of the muses, who was befriended by Thomas Westrow, one of the parliamentarians, and who has left on record in rather poor verse the kind offices of his friend, is as true as it is amusing. "Poor splayfooted doggrel," the historian of Cromwell calls it, "very poor, but very grateful, pious, true, and on the whole noble."

WITNEY, a market-town of England, Oxfordshire, on the Windrush, a tributary of the Thames, 10 miles W.N.W. of Oxford, and 65 from London. It is a neat and well built town, consisting principally of two streets. Among the principal public buildings are the parish church, a handsome cruciform edifice, in the early English decorated and perpendicular styles, with a tower and lofty spire. The town-hall, with a piazza underneath for a market-house; a blanket-hall, and a market-cross. It has also a free grammar and other schools, and places of worship for Independents, Methodists, and Quakers. Witney has long been famous for its manufacture of blankets, which, though not so great as formerly, is still considerable. Pilot-cloths, tiltings for waggons and barges, felting for paper-makers, gloves and malt, are also manufactured to some extent in the town. Pop. (1851) 3099.

WITSIUS, HERMANN, a learned divine, was born on the 12th of February 1636, at Enckhuysen, in North Holland. His father, a member of the municipal council of that place, was the author of some pious meditations, written in his native tongue. In 1650 he became a student in the university of Utrecht, where he distinguished himself by his rapid progress in different branches of learning. At the age of eighteen, he publicly recited a Hebrew discourse on "the Messiah of the Jews and the Christians." He afterwards removed to Groningen, in order to attend the lectures of Desmarets. He was ordained a minister in 1657, and exercised his functions in different places till 1675, when he was appointed professor of divinity at Franeker. In 1680 he was nominated to a similar chair at Utrecht; and in 1685 he proceeded to London as chaplain of the Dutch embassy sent to congratulate the king on his accession to the throne. In 1698 he succeeded Spanheim as professor of divinity at Leyden; but this office he afterwards exchanged for the rectorship of the Theological College. He died on the 22d of October 1708, in the seventy-third year of his age.

Witsius was a judicious, as well as a learned and pious writer; and some of his works continue to be held in much estimation. Of his more important publications we subjoin a notice.

Judæus Christianizans circa Principia Fidei et SS, Trinitatem; sive, Dissertatio de Principiis Fidei Judæorum, &c. Traj. ad Rhen. 1661, 12mo. *De Œconomia Fœderum Dei cum Hominibus*, libri iv. Leovard. 1677, 8vo. This treatise has frequently been printed. It was translated into English, and in that form has likewise passed through many editions. In Hervey's *Theron and Aspasia*, it receives very high commendation. "The *Œconomy of the Covenants* is a body of divinity, in its method so well digested, in its doctrine so truly evangelical, and, what is not very usual with our systematic writers, in its language so refined and elegant, in its manner so affectionate and animating, that I would recommend it to every student of divinity." *Diatribe de septem Epistolarum Apocalypticarum Sensu historico ac prophetico*, Franeq. 1678, 12mo. *Exercitationes Sacræ in Symbolum quod Apostolorum dicitur; et in Orationem Dominicam*, Franeq. 1681, 4to. *Egyptiaca et Ἀσκάφυλον: sive de Ægyptiorum Sacrorum cum Hebraicis Collatione libri tres; et de decem Tribubus Israelis liber singularis. Accessit Diatribe de Legione Fulminatrice Christianorum sub imperatore M. Aurelio Antonino*, Amst. 1683, 4to. In this valuable work, Witsius maintains, against Sir John Marsham and Dr Spencer, that the Jews did not borrow from the Egyptians any part of their religious rites and ceremonies. The *Ægyptiaca* are reprinted in the great collection of Ugolini, *Thesaurus Antiquitatum Sacrarum*, tom. i. The dissertation on the thundering legion was attacked by Larroque. *Miscellanea Sacra*, Traj. ad Rhen. 1692–1700, 2 tom. 4to. The first volume, including thirty additional dissertations, was reprinted at Leyden in 1695. *Exercitationum Academicarum, maxima ex parte historico-critico-theologicarum, decas*, Traj. ad Rhen. 1694, 12mo. *Meletemata Leidensia*, Lugd. Bat. 1703, 4to. A collective edition of his works appeared at Herborn, 1712–17, 6 tom. 4to. Besides his Latin treatises, he published several practical works in Dutch. He was the editor of a Latin version of Godwin's Moses and Aaron, printed at Utrecht in 1690, and of Gataker's *Opera Critica*, printed at the same place in 1698. (D. I.)

Witt ‖ Woburn.

WITT, JOHN DE, a celebrated Dutch statesman, was the son of Jacob de Witt, burgomaster of Dort, and was born in 1625. He became well skilled in the civil law, politics, mathematics, and other sciences, and wrote a treatise on the *Elements of Curved Lines*, published by Francis Schooten. Having taken the degree of doctor of laws, he travelled into foreign courts, where he became esteemed for his genius and prudence. On his return to his native country in 1650, he became pensionary of Dort, then counsellor-pensionary of Holland and West Friesland, intendant and registrar of the fiefs, and keeper of the great seal. He was thus at the head of affairs in Holland; but his opposition to the re-establishment of the office of stadtholder, which he thought a violation of the freedom and independence of the republic, cost him his life when the prince of Orange's party prevailed. He and his brother Cornelius were assassinated by the populace at the Hague in 1674. He was only forty-seven years of age at his death.

WITTENBERG, a fortified town of Prussian Saxony, capital of a circle of the same name in the government of Merseburg, on the Elbe, here crossed by a wooden bridge 1000 feet long, 40 miles N.N.E. of Leipsic. This was formerly the capital of Electoral Saxony, but it is chiefly noted for its connection with Luther, Malancthon, and other early reformers, whence it has been termed the cradle of the Reformation. Both of these held professorships in the university founded here in 1502, but removed to Halle in 1817 and they are both interred in the *Schloss Kirche* here. It was to one of the doors of this church that Luther affixed his ninety-five theses or arguments against the doctrine of papal indulgences to defend them, as was the fashion of the times, against all comers. His house or lodging in the old university buildings still remains almost unaltered. A colossal statue of the great reformer was erected in the market-place in 1821. Wittenberg has a gymnasium, ecclesiastical seminary, school of midwifery, and manufactures of woollen and linen stuffs, beer and spirits. It has several times suffered from sieges, particularly in 1756 and 1814, having on the latter occasion been taken by storm from the French after a siege of ten months. Pop. 10,842.

WITTSTOCK, a walled town of Prussia, province of Brandenburg and government of Potsdam, on the Dosse, 60 miles N.W. of Berlin. It has a handsome church and town-house, and a large invalid hospital; and carries on extensive manufactures of woollen and linen stuffs and tobacco. Pop. 6824.

WOBURN, a market-town of England, Bedfordshire, 16 miles S.S.W. of Bedford and 41 from London. It owes its origin to a Cistercian abbey founded here in 1145, the site of which was subsequently granted by Edward VI. to John, Lord Russell, afterwards Duke of Bedford. The town was destroyed by fire in 1724, and since that time it has been rebuilt in a regular manner. The market-house

Wodrow. is a handsome edifice, rebuilt in 1830 in the Tudor style. The parish church, an ancient structure erected by the last Abbot of Woburn and recently restored, has a pinnacled campanile tower. There are also places of worship for Independents and Methodists, a free school, and several almshouses. In the neighbourhood of the town is Woburn Abbey, the principal seat of the Duke of Bedford. It is a magnificent quadrangular pile of building, upwards of 200 feet square, with an Ionic front, and is splendidly fitted up internally, and enriched with valuable paintings, sculptures, &c. The park in which it stands is 12 miles in circuit, beautifully diversified with wood and water, and well stocked with deer. Pop. of parish (1851) 2049.

WODROW, ROBERT, a well-known ecclesiastical historian, was born at Glasgow in the year 1679. He entered the University of Glasgow in 1691; and after passing through the usual academical course, with the view of qualifying himself for the sacred ministry, he became a student of divinity under his father, who was professor in that university. In 1698 he was chosen librarian to the university, an office which he held for four years. On leaving the university, he resided for a short time in the family of Sir John Maxwell of Nether Pollock, one of the senators of the College of Justice; and having offered himself as a probationer to the presbytery of Paisley, he was licensed to preach the gospel in March 1703. He was ordained minister of the parish of Eastwood on the 28th of October 1703. Soon after his settlement at Eastwood, we find him busy collecting memorials which are treasured up in his MS. volumes of *Analecta*. He likewise availed himself of his periodical visits to Edinburgh during the meetings of the General Assembly to prosecute his historical researches. As might have been expected from a person of his habits, pursuits, and education, he took a lively interest in all ecclesiastical proceedings; and in questions involving matters either of sound doctrine or of discipline and church government, he was invariably found on the popular side.

The work by which Wodrow is best known is *The History of the Sufferings of the Church of Scotland, from the Restoration to the Revolution*, Edinb. 1721–22, 2 vols. fol. It was the labour of many years. In 1717, having prepared the first portion of it, the manuscript was submitted to George Ridpath and other literary friends, and he profited by their suggestions. Two years later, the plan was laid before the General Assembly, when it was cordially approved of, and an act was passed recommending the members of assembly and the several ministers of the church to subscribe for copies, and "to deal" with such in their bounds as were well disposed to encourage the work, "now ready for the press." He obtained by those means a most respectable list of subscribers; and on its publication, the work being dedicated to George I., copies of it were presented, through Dr Fraser, to the king, the queen, the prince and princess of Wales, by all of whom it was most graciously received. In fact, the reception of the work by the public must have been gratifying to the author; and he appears from his correspondence to have received with comparative indifference some scurrilous attempts to depreciate his labours by the nonjuring Episcopalians, or rather by one of their adherents, Alexander Bruce, advocate, first in an anonymous tract, "The Scottish Behemoth dissected, in a Letter to Mr Robert Wodrow, &c," Edinb. 1722, folio; and then in the preface to a Life of Archbishop Sharp, 1723, 8vo. Bruce next announced, in 1724, a great work, an *Impartial History of the Affairs in Church and State in Scotland, from the Reformation to the Revolution*, in 2 vols. fol. He did not survive long enough to make much progress in this work, which was taken up by Bishop Keith, who published only the first volume in 1734, bringing the history down to the year 1568. Keith's history is only important as a collection of materials, for the author was equally destitute of acuteness and liberality. To what extent he may have profited by Bruce's labours is nowhere stated. Wodrow.

It does not appear in what manner Wodrow's History was again brought under the notice of George the First; but his majesty, "to certify our esteem of the said author and his works, by bestowing on him some mark of our bounty," ordered the sum of one hundred guineas to be paid to the Rev. Robert Wodrow by the Treasury. This grant is dated the 26th of April 1725; and such a mark of royal favour, wholly unexpected on Wodrow's part, was well bestowed on one whose labours served by contrast to exhibit in lively colours the advantages which were secured to Great Britain by the Hanoverian succession. In more recent times public attention was directed to the work by the high eulogium of Mr Fox on its fidelity and impartiality; and the demand having increased its price beyond the means of ordinary purchasers, a new edition in a more commodious form was published at Glasgow in 1830, 4 vols. 8vo, with a memoir of the author prefixed, by Robert Burns, D.D., one of the ministers of Paisley.

The original publication of this work had not the effect of relaxing Wodrow's literary ardour. It had always been with him a cherished plan to form a series of biographical memoirs of the more eminent ministers in the Church of Scotland; and he took every opportunity of collecting materials for that design. Before proceeding with this task, he, in 1724, wrote a *Life of James Wodrow, A.M., Professor of Divinity in the University of Glasgow*, which was not published till 1828. The series of lives, chiefly compiled between 1726 and 1733, forms ten volumes in folio, with four quarto volumes of appendix. These volumes are preserved in the library of the University of Glasgow; and a selection was commenced in 1834 for the members of the Maitland Club, under the title of *Collections upon the Lives of the Reformers and most eminent Ministers of the Church of Scotland*. This work is certainly not the most important of Wodrow's labours. The lives are compiled and filled with extracts from works now much better known and more accessible than in his days, and being in most instances only first draughts hastily put together, the style is remarkably careless and slovenly.

Wodrow's studious habits appear to have injured his health; and during the latter years of his life his usual pursuits were often interrupted by sickness, and he at length sank under a gradual decline on the 21st of March 1734, in the 55th year of his age. In the year 1708 he was married to Margaret, daughter of Patrick Warner, minister of Irvine, and grand-daughter of William Guthrie, minister of Fenwick, author of a well known practical treatise, *The Trial of a Saving Interest in Christ*. Of a family of sixteen children, nine, with their mother, survived him.

In the course of his researches Mr Wodrow had industriously formed an extensive and important collection of manuscripts, chiefly relating to ecclesiastical affairs in Scotland. Some years after his death, the collection was offered for sale by his family. In May 1742, a portion of the MSS. was purchased by direction of the General Assembly, and this portion now remains the property of the Church. Fifty years later (in 1792) the great mass of his other MSS. and printed tracts was sold to the Faculty of Advocates, with the exception of his Biographical Collections (already mentioned), which were obtained about the same time by the University of Glasgow. In June 1828, the Faculty of Advocates likewise secured, what cannot fail to be esteemed an important accession to the Wodrow Manuscripts, 1st, his *Analecta*, in six volumes, closely written, being a kind of note-book or diary, in which he has preserved a valuable and amusing record of literary intelli-

Wokingham || Wolf.

gence, as well as remarkable occurrences, and the news of the day; 2d, a collection of his own letters, in three volumes, closely written (the first volume not being discovered), from March 1709 to December 1731, comprising copies of nearly 600 letters, which are well worthy of publication; and, 3d, the regular series of letters addressed to him by literary persons, or by friends and relations, arranged by himself in chronological order, in twenty-two volumes 4to, and containing upwards of 3880 letters, between the years 1694 and 1733. In mentioning these collections, it may be proper to add, that, for illustrating the literary and ecclesiastical history of the period which they embrace, the publication of no similar works would be of greater importance than that of Wodrow's *Analecta*, with an extensive but judicious selection from his correspondence.

WOKINGHAM, a market-town of England, Berkshire, near the right bank of an affluent of the Loddon, 7 miles S.E. of Reading, and 32 W. by S. of London. It is for the most part built of brick, and consists of several streets meeting in a spacious market-place, in which stands an ancient timber-framed market-house. The parish church is a fine old edifice, and there are also places of worship for Methodists and Baptists, national schools, an hospital, almshouses, and other parochial charities. Wokingham was formerly a chief seat of the woollen manufacture; but this has declined, and the inhabitants are now chiefly employed in the malt and flour trade, in the throwing of silk, and in making boots and shoes. Pop. (1851) 2272.

WOLCOT, JOHN, better known as *Peter Pindar*, was born at Dodbrooke, a small village of Devonshire, in 1738. He was educated for the medical profession, at the charge of his uncle, a surgeon in a neighbouring town; and after the usual course of study in the London hospitals, he proceeded to Jamaica, as the medical attendant of the governor, Sir William Trelawney. Finding his time hang heavy on his hands, he, as a means of beguiling his superabundant leisure, solicited the gift of a vacant living, which the governor bestowed on him, and the Bishop of London having ordained him, he entered on the duties of his new calling. It is unnecessary to add that he performed them in a very perfunctory manner. His flock consisted chiefly of negroes, who seldom came to church; and it is said, that on more than one occasion, after waiting in vain for his congregation to appear, he adjourned with the clerk to the shore, where they joined in the more congenial occupation of pigeon-shooting. On the death of the governor, Wolcot returned to England, and established himself as a physician in Truro. He was conscious, however, of poetical powers which required a wider field than could be afforded by a small, remote county town; and he accordingly removed, in 1780, to the metropolis, and entered on his career as a satirical poet. The chief objects of his ridicule were the Royal Academicians, whose ignorance of art he satirized in his *Lyric Odes;* for he was a connoisseur in painting, and was the first to discover the talents of Opie. But his muse spared none. Even royalty was not exempt from the attacks of his ridicule; and the many whimsical peculiarities of George III. offered too tempting a theme for satire for a poet so daring as Wolcot to omit them. Of the poems directed against royalty, the chief are, "Peeps at St James's," "Royal Visits," and, above all, the "Lousiad," an exquisitely ludicrous poem, founded upon the fact that the disagreeable insect from which the poem derives its name was discovered among some green pease on the king's plate. His poetical effusions, amounting to upwards of sixty, were collected in 4 vols. in 1796, and have been reprinted since. Wolcot died in 1819, and his works, which had even then lost much of their fame, are now known mainly by reputation.

WOLF, FRIEDRICH AUGUST, one of the greatest of modern German scholars, was the son of an organist, and was born at Hainrode, near Nordhausen, on the 15th February 1759. His father meant him to follow his own occupation of a musician; but as Friedrich August could only regard this profession as an elegant amusement, he resolved to pursue his own course of study at the University of Göttingen. Hake had already influenced him deeply, and taught him, or rather evolved into distinct consciousness, that maxim of self-reliance of "one thing at a time, and in disputed questions call no man master," which characterized Wolf so much during the rest of his life. He sought the presence of Heyne in 1777; but that crotchety scholar was lording it, as a capricious sovereign, over his pupils at that time; and Wolf, who was fond of private study, and attended the lecture-rooms very irregularly, was not at all disposed to humour the master so much as he wished. The consequence was, a rupture took place between the professor and the pupil, which time only made wider. In 1779 Wolf was made teacher in the Pædagogium at Ilfeld, and during his residence here he made himself known to the learned by an edition of Plato's *Symposium* in 1782. The same year he was elected rector of the public school of Osterode, at the foot of the Hartz mountains. Next year he was chosen professor of philosophy in the University of Halle, and rector of the Pædagogical Institute connected with the university. In time Wolf became one of the most popular teachers in all Germany; he gave his whole soul to the work, and was amply rewarded by seeing his lecture-rooms filled by eager listeners from all parts of Europe. An edition of Hesiod's *Theogony*, in 1784, made way for his great critical work on Homer, entitled *Prolegomena ad Homerum*, in 1795. The theory which Wolf advanced regarding the Homeric poems was, that they were not the work of Homer, but of several rhapsodists, whose labours were subsequently combined into the present form of the *Iliad* and *Odyssey*. All the scholars in Europe were up in arms, either in defence or assault, of the "father of verse." The method which Wolf had brought to bear upon his inquiry was unquestionably just; but this method was unfortunately carried too far. So the majority of scholars are inclined to think at the present day. While the literary storm raged over Europe, Wolf quietly pursued his studies, and brought out, in 1801 and 1802, five orations of Cicero, an edition of Suetonius, in 4 vols. 8vo, a collection of his smaller essays and occasional orations, and had engaged in an edition of the text of Homer, in 4 vols., when, after the political disasters of 1806, the University of Halle was closed. Removing to Berlin, he engaged in editing the *Museum der Alterthumswissenschaft*, with Buttman as his colleague. In 1812 he took up his old favourite, Plato, and edited the *Euthyphro*, the *Apologia Socratis*, and *Crito*. He next engaged in editing the *Literarische Analekten*, 4 vols. 8vo, 1817–20, which is acknowledged on all hands to be the best philological journal that has ever been published. Wolf died at Marseilles, whither he had gone in quest of health, on the 18th of August 1824. A number of his more important educational papers were published in an interesting volume, in 1835, by Körte, his son-in-law. Stockmann, Gürtler, and Usteri, old pupils of Wolf's, brought out a number of his more important lectures; but they were much too carelessly edited. (See Körte's *Leben u. Studien, Fr. A. Wolf's des Philologen*, 2 vols. 1833.)

Wolfe.

WOLFE, CHARLES, author of the poem called the *Burial of Sir John Moore*, was a clergyman of the English Church at Donaghmore, in Ireland, and was born at Dublin, of a family that counted kindred with that which produced General Wolfe, on the 14th of December 1791. He was educated at the University of Dublin, and afterwards took holy orders in 1817. But his career was short, for he had hardly set his restless mind to its appointed work, when a consumptive tendency was brought to a height, and his

Wolfe. useful labours were closed for ever on the 21st February 1823, in his thirty-first year. A volume of Wolfe's *Remains* were published in 1825. The grand, simple pathos of his poem on General Moore has hardly ever been surpassed. It was written in 1817, and appeared first of all with his initials, but without his knowledge, in the *Newry Telegraph*. Various parties were so mean as to claim the authorship of this much admired poem. The history of the poem and its real authorship will be found given in detail in the *Proceedings of the Royal Irish Academy* for 1844.

WOLFE, *James*, was born at Westerham, in Kent, on the 2d January 1727. He was the only child of Lieutenant-general Edward Wolfe. He went into the army when very young, and, applying himself with unwearied assiduity to his profession, soon became remarkable for his knowledge and his genius. He distinguished himself at the battle of Lafelt when little more than twenty, and received the highest encomiums from the commander-in-chief. After the peace he still continued to cultivate the art of war. He contrived to introduce the greatest regularity and the exactest discipline into his corps, and at the same time to preserve the affection of every soldier. In 1758 he was present as a brigadier-general at the siege of Louisbourg. He landed first on the island at the head of a division; and in spite of the violence of the surf, and the force and well-directed fire of the enemy, drove them from their post with great precipitation. The surrender of the town, which happened soon after, was in a great measure owing to his activity, bravery, and skill. The fame which he acquired during this siege pointed him out to Mr Pitt, who was then minister, as the most proper person to command the army destined to attack Quebec. This was the most difficult and the most arduous undertaking of the whole war. Quebec was the capital of the French dominions in North America; it was well fortified, situated in the midst of a hostile country, and defended by an army of 20,000 men, regulars and militia, besides a considerable number of Indian allies. The troops selected for this expedition consisted of ten battalions, making up altogether about 7000 men. Such was the army destined to oppose three times their own number, defended by fortifications, in a country altogether unknown, and in a late season in that climate for military operations. But this little army was always sanguine of success; for they were commanded by an officer who, by a very uncommon magnanimity and nobleness of behaviour, had attached the troops so much to his person, and inspired them with such resolution and steadiness in the execution of their duty, that nothing seemed too difficult for them to accomplish. The admirable skill with which his measures were planned, and the prudence and vigour with which they were executed, are well known. He landed his army on the northern shore of the river St Lawrence, in spite of the enemy, and forced them to a battle, in which they were completely defeated. The consequence of this battle was the reduction of Quebec and the conquest of Canada. In the beginning of the battle General Wolfe was wounded in the wrist by a musket-ball; he wrapt his handkerchief round it, continued to give his orders with his usual calmness and decision, and informed the soldiers that the advanced parties on the front had his orders to retire, and that they need not be surprised when it happened. Towards the end of the battle he received a new wound in the breast; he immediately retired behind the rear rank, supported by a grenadier, and laid himself down on the ground. Soon after a shout was heard, and one of the officers who stood by him exclaimed, "See how they run!" The dying hero asked with some emotion, "Who run?" "The enemy," replied the officer; "they give way everywhere." The general then said, "Pray, do one of you run to Colonel Burton, and tell him to march Webb's regiment with all speed down to Charles' river, to cut off the retreat of the fugitives from the bridge. Now, God be praised, I shall die happy!" He then turned on his side, closed his eyes, and expired. This occurred on the 13th September 1759. Wolfenbüttel ‖ Wolff.

The death of General Wolfe was a national loss universally lamented. He inherited from nature an animating fervour of sentiment, an intuitive perception, an extensive capacity, and a passion for glory, which stimulated him to acquire every species of military knowledge that study could comprehend, or that actual service could illustrate and confirm. This noble warmth of disposition seldom fails to call forth and unfold all the liberal virtues of the soul. Brave above all estimation of danger; generous, gentle, complacent, and humane, he was the pattern of the officer, and the darling of the soldier. There was a sublimity in his genius which soared above the pitch of ordinary minds; and had his faculties been exercised to their full extent by opportunity and action, had his judgment been fully matured by age and experience, he would in all probability have rivalled in reputation the most celebrated captains of antiquity. His body was brought to England and interred at Greenwich, and a monument was erected to his memory in Westminster Abbey. Curious to say, the life of General Wolfe requires yet to be written. A good deal of valuable information regarding him will be obtained from *Notes and Queries*, vols. iv. to xii. inclusive.

WOLFENBÜTTEL, a town of the duchy of Brunswick, capital of a circle of the same name, on the Oeker, 8 miles S. of Brunswick, with which it is connected by a railway. It consists of the town proper, which was formerly fortified, and two suburbs; and has broad regular streets and spacious squares. The principal buildings are the palace, which was from 1283 to 1754 the residence of the dukes of Brunswick; an edifice after the model of the Pantheon at Rome, containing the public library of 220,000 volumes and 10,000 MSS.; the church of the Virgin, containing the ducal vaults; and several other churches. There are here too a gymnasium, normal school, theological seminary, poor-house, hospital, barracks, &c. Leather, linen, silk, paper-hangings, japanned wares, and tobacco, are made here; and there is an active trade in corn and yarn. Wolfenbüttel is the seat of government offices and courts of law. Pop. 9000.

WOLFF, JOHANN CARISTIAN VON, a celebrated German mathematician and philosopher, was born at Breslau, on the 24th of January 1679. After having been well instructed in the rudiments of learning and science in his own country, Wolff prosecuted his studies successively in the universities of Jena and Leipzig. At the age of twenty-six he had acquired so much distinction that he was appointed professor of mathematics, and soon afterwards of philosophy, in the university of Halle. After Leibnitz had published his *Theodicé*, Wolff, struck with the novelty of the edifice which that philosopher had raised, assiduously laboured in the investigation of new metaphysical truths. He also digested the elements of mathematics in a new method, and attempted an improvement of the art of reasoning, in a treatise on the powers of the human understanding. Upon the foundation of Leibnitz's doctrine of monads, he formed a new system of cosmology and pneumatology, digested and demonstrated in a mathematical method. His work, entitled *Thoughts on God, the World, and the Human Soul*, was published in the year 1719; to which were added, in a subsequent edition, *Heads of Ethics and Policy*. Wolff was now rising towards the summit of philosophical reputation, when the opinion which he entertained on the doctrine of necessity being deemed by his colleagues inimical to religion, and an oration which he delivered in praise of the morality of the Chinese having given much offence, an accusation of heresy was publicly brought against him; and though he attempted to justify himself in a treatise which

Wolgast ‖ Wollaston.

he wrote on the subject of fatality, a royal mandate was issued in November 1723, requiring him to leave the Prussian dominions. Having been formerly invited by the landgrave of Hesse-Cassel to fill a professorship of mathematics and philosophy in the university of Marburg, Wolff now put himself under the patronage of that prince, who had the liberality to afford him a secure asylum. The question concerning the grounds of the censure which had been passed upon him was now everywhere freely canvassed; almost every German university was inflamed with disputes on the subject of liberty and necessity, and the names of Wolffians and Anti-Wolffians were everywhere heard. It was while residing at Cassel that the greater portion of his philosophical works were written. Philosophy was, according to Wolff, "the science of things possible, inasmuch as they are possible." He maintained the Leibnitzian doctrine of "pre-established harmony," and laboured to demonstrate the metaphysical law of sufficient reason from the logical law of contradiction, and as he commenced by begging the question under dispute, he ended, after reasoning laboriously in a circle, where the argument had begun. His philosophical works are *Philosophia Rationalis*, 4to, 1728; *Psychologia Empirica*, 4to, 1728; *Philosophia Prima, sive Ontologia*, 4to, 1730; *Cosmologia Generalis*, 4to, 1731; *Psychologia Rationalis*, 4to, 1734; *Theologia Naturalis*, 4to, 1737; *Philosophia Practica Universalis* 4to, 1738–39; and *Philosophia Moralis, sive Ethica*, 4to, 1732. After an interval of nine years, the King of Prussia reversed his sentence of exile, and appointed him professor of the law of nature and of nations, and vice-chancellor of the university of Halle; where his return, some nine years afterwards, was welcomed with every expression of triumph. From this time he was employed in completing his Institutes of Philosophy, which he lived to accomplish in every branch except Policy. In 1745 he was created a baron by the Elector of Bavaria, and succeeded Ludwig in the office of chancellor of the university. He continued to enjoy these honours till the year 1754, when he expired on the 9th of April. He possessed a clear and methodical understanding, which, by long exercise in mathematical investigations, was particularly fitted for the employment of digesting the several branches of knowledge into regular systems; and his fertile powers of invention enabled him to enrich almost every field of science in which he laboured, with some valuable additions. The lucid order which appears in all his writings enables his readers to follow his conceptions with ease and certainty. His works are partly in German and partly in Latin. His political works consist of *Jus Naturæ*, published from 1740 to 1748, and extend to no fewer than eight quarto volumes, and *Jus Gentium*, Halle, 1752.

WOLGAST, a seaport town of the Prussian dominions, Pomerania, in the government and 32 miles S.E. of Stralsund, at the mouth of the Peene in the Baltic. It is a very ancient town, and was strongly fortified. Here are shipbuilding yards, manufactures of soap and tobacco, and some trade. Pop. 5744.

WOLLASTON, WILLIAM, descended of an ancient family in Staffordshire, was born at Cotton Clanford on the 26th of March 1659. His father was a private gentleman of small fortune. In 1674, his son was admitted a pensioner of Sidney College, Cambridge, where, notwithstanding several disadvantages, he acquired a great degree of reputation. In 1681, he commenced A.M., having previously been an unsuccessful candidate for a fellowship. In 1682, seeing no prospect of preferment, he became assistant to the head-master of Birmingham school. Some time after he obtained a small lecture about two miles distant, but did the duty the whole Sunday; which, together with the business of a great free school for about four years, began to break his constitution. During this space he likewise underwent a great deal of trouble and uneasiness, in order to extricate two of his brothers from some inconveniences to which their own imprudence had subjected them. In 1688 affairs took a new turn. He found himself, by a cousin's will, entitled to a very ample estate, and came to London that same year, where he settled, choosing a retired and studious life. In 1722, he printed a few copies of his celebrated work, entitled *The Religion of Nature delineated*. It was printed for sale in 1725, and so great was its success, that more than 10,000 were sold in a very few years. He likewise wrote a great many other works, which have not been published. He had scarcely completed his treatise when he unfortunately broke his arm; and this accident adding strength to distempers that had been growing upon him for some time, accelerated his death, which happened upon the 29th of October 1724. He was a tender, humane, and in all respects worthy man, but is represented to have had something of the irascible in his constitution and temperament. His *Religion of Nature delineated* exposed him to some censure, as if he had disparaged Christianity by laying so much stress, as he does in this work, upon the obligations of truth, reason, and virtue, and by making no mention of revealed religion. But this censure must have been the offspring of ignorance or envy, since it appears from the introduction to the work that he intended to treat of revealed religion in a second part, which he lived not to finish.

Wollaston.

WOLLASTON, *William Hyde*, was great-grandson of the preceding, and son of the Rev. Francis Wollaston, rector of Chishelhurst, and of St Vedas, Foster-lane, and precentor of St David's, who died in 1815. His father had seventeen children. William, his second son, was born on the 6th of August 1766, and received his academical education at Caius College, Cambridge, where he took his degree of M.D. in 1793.

He first settled as a medical practitioner at Bury St Edmund's; but meeting with little success, he removed to London, where, however, he was not more fortunate in his profession. The office of physician to St George's Hospital falling vacant, he was one of the candidates for the appointment; and on the election of his rival, Dr Pemberton, he was so much chagrined by his defeat, that he resolved to abandon the profession of medicine, and expressed his determination never again to write a prescription, were it even for his own father; and from this time his attention was wholly directed to natural science. Although almost every branch of science at different times engaged the attention of Dr Wollaston, chemistry was that to which he was most ardently devoted; and it is on his important discoveries in this department of natural philosophy that his reputation will chiefly rest. In pursuing his inquiries, he usually made his experiments on very small specimens of the substance which he wished to analyze. He possessed an uncommon neatness of hand, and invented the most ingenious methods of determining the properties and constituents of very minute quantities of matter. Among the delicate instruments which he was accustomed to make, was a sliding rule of chemical equivalents, and a galvanic battery of such small dimensions that it was contained in a thimble. He produced wire of platina so extremely fine as to be almost imperceptible to the naked eye. To him we are indebted for the discovery of the malleability of platinum, a discovery which is supposed to have yielded him above L.30,000; and he is likewise said to have derived great pecuniary advantages from several of his other discoveries and inventions, which, as they were generally of a practically useful nature, were calculated to produce a lucrative return.

Dr Wollaston was elected a fellow of the Royal Society in 1793, and second secretary on the 30th November 1806. His communications to the *Philosophical Transactions* were numerous and important. On the 30th November

Wolsey || Wolsingham.

1828, the Royal Society awarded to him one of the royal medals for his essay "On a method of rendering Platina malleable." Towards the end of 1828 he was seized with the disorder of which he died, and which was afterwards ascertained to be an effusion of blood in the ventricles of the brain. Feeling that his end was approaching, and being anxious that the knowledge of his discoveries and inventions should be preserved for the benefit of his fellow-creatures, he devoted his numbered hours, in the midst of pain and disease, to dictate such information as he thought worthy of being preserved.

At the time of his death, which occurred on the 22d December 1828, Dr Wollaston was senior fellow of Caius College. In February 1829, Dr Fitton, as president of the Geological Society, of which Dr Wollaston was for some time one of the vice-presidents, concluded his annual address with the following encomium on this eminent individual: "It would be difficult to name a man who so well combined the qualities of an English gentleman and a philosopher, or whose life better deserves the eulogium given by the first of our orators to one of our most distinguished public characters; for it was marked by a constant wish and endeavour to be useful to mankind."

WOLSEY, THOMAS, is said to have been the son of a butcher at Ipswich, where he was born in 1471. He studied at Magdalen College, Oxford, where he formed an acquaintance with the learned Erasmus; and in the year 1500 he became rector of Lymington, in Somersetshire. He was afterwards made chaplain to King Henry VIII., and obtained several preferments. Having gradually acquired an ascendency over the mind of the king, he successively obtained several bishoprics, and at length was made archbishop of York, lord high chancellor of England, and prime minister, and was for several years the arbiter of Europe. Pope Leo X. created him cardinal in 1515, and made him legate *a latere;* and the Emperor Charles V. and the French king, Francis I. loaded him with favours, in order to gain him over to their interest; but after having first sided with the emperor, he deserted him to espouse the interest of France. As his revenues were immense, his pride and ostentation were carried to the greatest height. He had 500 servants, among whom were nine or ten lords, fifteen knights, and forty esquires. His ambition to be pope, his pride, his exactions, and his political delay of Henry's divorce, occasioned his disgrace. In the earlier part of his life he seems to have been licentious in his manners. It was reported, that soon after his preferment to the living of Lymington in Somersetshire, he was put into the stocks by Sir Amias Paulet, a neighbouring justice of the peace, for getting drunk and making a riot at a fair. This treatment Wolsey did not forget when he arrived at the high station of lord chancellor of England, but summoned his corrector up to London, and, after a severe reprimand, enjoined him six years close confinement in the Temple. Whatever may have been his faults, there can be no doubt of their having been aggravated both by the zealous reformers and by the creatures of Henry VIII. Wolsey was the patron of learned men, a judge and munificent encourager of the polite arts, a highly sagacious minister, and ought to be considered as the founder of Christ Church College, Oxford, where, as well as in other places, many remains of his magnificent ideas in architecture still exist. He died at Leicester, when on his way to London to be tried for high treason, on the 28th of November 1530. (See, in particular, Froude's *History of England.*)

WOLSINGHAM, or WALSINGHAM, a market town of England, county of Durham, on the left bank of the Wear, where it is joined by the Wescrow, 13 miles W.S.W. of Durham. It is pleasantly situated, and has an ancient parish church, a townhall, and a free grammar school. The inhabitants are chiefly employed in the manufacture of woollen cloths and hardware goods, or in the coal, lead, and limestone works in the vicinity. Pop. of parish (1851), 4585.

Wolverhampton.

WOLVERHAMPTON, the largest town in Staffordshire, is in the northern division of Seisdon hundred, 122 miles N.W. by W. of London, and 14 miles N.W. by W. of Birmingham. The population of the township in 1851 was 49,989, having increased to that number from 12,566 in 1801, and 18,380 in 1821. The ancient parish is very extensive. Wolverhampton occupies the north-western extremity of a range of hills, which form the south-western boundary of the South Staffordshire coal-basin, and which separate the streams flowing into the Severn and the Trent, into which two rivers different parts of Wolverhampton drain. The town rests upon what is now known as the Permian formation, which was formerly regarded as part of the New Red Sandstone, but is now considered to belong to an earlier stratum lying immediately above the coal measures, which are worked close to the town. From experiments recently made, it is found that coal lies within a practicable distance of the surface under this formation, and a considerable extension of the coal-producing area is likely to be the result.

Wolverhampton was incorporated by royal charter in 1847, under the Act of 1835, has a separate commission of the peace, and a police force distinct from that of the county, consisting of a chief constable and sixty-one men, which cost for the year 1859–60 L.4366. There is also a fire-brigade. The streets are admirably lighted, at an annual cost of upwards of L.3000; and it may afford some idea of the populous character of the district to state that the road from Birmingham to Tettenhall, a village two miles from Wolverhampton, is lighted with gas along its whole length of 16 miles. There is a large covered general market, an extensive cattle and fat pig market, a townhall, and police station. Very great improvements have been made within the last dozen years by widening and flagging important thoroughfares, whilst all new streets are wide. As yet sewerage works have not been commenced, but they are in contemplation. The town is supplied with water by a company, and also from wells sunk into the rock on which it is built. On the southern and western sides, Wolverhampton is bounded by a verdant district; on the other sides the smoke and desolation of the "black country" extend. Considering its elevation—the highest and central part being 484 feet above the level of the sea—Wolverhampton ought to be a healthy town; but the crowded dwellings of a portion of the population, chiefly Irish, and the want of proper sewage, keeps the death-rate high. Under the Reform Act of 1832 two members were given to Wolverhampton; but the parliamentary borough includes Bilston, Sedgley, Willerhall, and Wednesfield; and the population in 1851 was 119,748.

Wolverhampton depends mainly upon the manufacture of iron and hardwares. As noticed under Staffordshire, the former branch of industry has probably reached its climax in this part of the kingdom, but the hardware trades are rapidly increasing. The lock manufacture is one of the oldest in the town. Plot, who wrote in the seventeenth century, describes the lockmakers of Wolverhampton as having then attained remarkable skill. This branch is still very largely carried on here and at Willenhall, but it yields in importance and extent to the manufacture of tin and japanned ware, the latter including papier maché goods. The manufacture of cast iron culinary vessels, known as hollow ware, is another important branch; and iron braziery, iron and brass founding, gun-locks, safes, cut nails, tools and implements, &c., employ large numbers of hands. Many articles are still made by the workmen at their houses, and purchased by the factors and merchants; but there is a growing tendency for the work to be done in

Wood manufactories where the advantages of a greater division of labour and the assistance of machinery can be better secured. Formerly wool-stapling was a most important branch of trade in Wolverhampton. The Levesons, a branch of the ancestors of the family of the Duke of Sutherland, and the Goughs, of whom Lord Calthorpe is now the representative, were engaged in this trade in Wolverhampton. The town is admirably supplied with the means of transit by railways and canals.

Until the year 1828 Wolverhampton only contained two churches; it has now ten, including one nearly finished, and another in a rising suburb. St Peter's stands on the summit of the hill on which the town is built, and has a very handsome, lofty tower 120 feet high. The original church was built on this site about 996, by Wulfrune or Wulfruna, sister of King Edgar, from whom the place was called Wulfrune's Hampton, which, by abbreviation, has changed to its present name. It was a collegiate church, with a dean and prebendaries. Edward IV. annexed "the College or Free Chapel of Wolverhampton" to the deanery of Windsor. In 1846 an act was obtained for abolishing the deanery, prebends, and peculiar jurisdiction of Wolverhampton. The greater part of the church has been recently restored in stone by English. In the churchyard there is a round stone column of Saxon or Danish origin, twenty feet high, and grotesquely carved. St John's church was built in 1755, St George's in 1830, and the rest since that date. All have day and Sunday schools attached to them. Various denominations of dissenters have chapels, and the Congregational and New Roman Catholic churches are handsome stone edifices. The Free Grammar School was founded by Sir Stephen Jenyns, knight, in 1513. It has an income derived from endowment of upwards of L.1000 a-year. In the Blue Coat School, originated about 1710, about 150 poor children of both sexes are educated and partially clothed gratuitously, a portion being also boarded and lodged without charge. The Orphan Asylum on Goldthorn Hill is a very handsome building, which was erected about 1854, and has cost L.9000. It is capable of accommodating 100 children, and is more than half occupied, and may readily be enlarged to hold twice that number. Its annual expenditure is about L.800, and it is now endowed to the extent of nearly L.7000. This institution owes its origin to the benevolence and persevering efforts of a single individual, Mr John Lees, a local merchant, who in 1850 took charge of a number of orphans deprived of their parents by cholera, and has since expended a large portion of his income in promoting this noble charity. The South Staffordshire Hospital was built in 1848 at a cost of L.18,000, including the site. There is an excellent cemetery, occupying twenty acres of land, opened in 1851, which belongs to a company. The Wolverhampton Exchange, a lofty stone and brick building surmounted by a dome, is most unfortunately built close to the fine church of St Peter, which it does much to hide. The Wolverhampton Library is a handsome classical stone building. There are several literary institutes, a large and well supported ragged school, a law library, chamber of commerce, &c. A troop of yeomanry and three companies of rifle volunteers are supported by the town.

WOOD, or À WOOD, ANTHONY, a well known literary historian, was the son of Thomas Wood, bachelor of arts and of the civil law, and was born at Oxford on the 17th of December 1632. He studied at Merton College, and in 1655 took the degree of master of arts. He wrote *The History and Antiquities of the University of Oxford*; which was afterwards dully translated into Latin, under the eye of Dr Fell, by Wase and Peers, under the title of *Historia et Antiquitates Universitatis Oxoniensis*, 2 vols. folio; *Athenæ Oxoniensis*; or an exact Account of all the Writers and Bishops who have had their education in the University of Oxford, from the year 1500 to 1600, 2 vols. folio; which was enlarged in a second edition published in 1721 by Bishop Tanner. This work, which is highly valuable as a collection of materials, has been greatly improved by Dr Bliss in 1800 and in 1817. His MSS. in the Bodleian Library were published in the *History and Antiquities of Oxford*, by John Gutch, 3 vols. 1786–94. The first volume of a new edition of the *Athenæ Oxonienses*, with a life of Wood, was begun by the Ecclesiastical History Society in 1848. This edition only reached the first volume. Upon the publication of the *Athenæ Oxon.*, the author was attacked by the university in defence of Edward, earl of Clarendon, lord high chancellor of England, and chancellor of the university, and was likewise animadverted upon by Bishop Burnet; upon which he published a *Vindication of the Historiographer of the University of Oxford.* He died at Oxford on the 29th of November 1695.

Woodbridge || Wood-Engraving.

WOOD. See PLANTING and TIMBER.

WOODBRIDGE, a market town and river port of England, county of Suffolk, on the right bank of the Deben, 8 miles from the sea, and the same distance E.N.E. of Ipswich. The town is tolerably well built, and consists principally of two streets and a market-place, in which stands the shire or session's hall. The parish church is a fine old edifice, built chiefly of black flints, with a large square tower 180 feet high. Another church was built here in 1845, besides which there are places of worship for Independents, Methodists, Baptists, and Quakers. There are also a free grammar and other schools, several almshouses, custom-house, a lecture-hall, theatre, and barracks. The river here expands into an estuary, and vessels of 120 tons can come up to the town. There is some shipbuilding, and an active coasting-trade is carried on, particularly in the export of corn, flour, and malt. On 31st December 1858, 68 vessels, of in all 3597 tons, were registered as belonging to the port; and during that year 637 vessels, of in all 34,328 tons, entered, and 385 vessels, of 18,722 tons, left in the coasting trade; and 10 vessels, of 1219 tons, entered, and 11 vessels, of 1089 tons, left in the foreign and colonial trade. Pop. (1851) 5161.

WOOD-ENGRAVING is the art of representing objects on wood, by lines and points, in order to their being impressed on paper. This art is of very ancient date, having been practised by the Egyptians. Some bricks found on the site of ancient Babylon are preserved in the British Museum, with characters upon them which have plainly been indented from engraved blocks of wood. It appears also, from specimens that are extant, that the Greeks and Romans were acquainted with methods of wood-cutting for impressing letters and characters on various substances. The probability of the art being known to the Chinese, or actually having been carried to the extent of delineating figures, in the thirteenth century, has been successfully disproved by Mr Jackson, in his able and learned *Treatise on Wood-Engraving*. The art was however used in the thirteenth and fourteenth centuries for attesting documents, and about the commencement of the fifteenth century, by the Germans, for marking figures on playing-cards.

The most ancient wood-cut of which there is any authentic account, is that of *St Christopher* carrying an infant Christ through the water, now in the possesssion of Earl Spencer. It is eleven and a quarter inches high, and eight and one-eighth inches wide. The impression is dated in 1423; and the figures of the saint and the youthful Saviour are executed with very considerable spirit and feeling. Wood-cuts of the *Annunciation* and of *St Bridget of Sweden* appear to belong to this period, when the art began to be much encouraged by the Church. Heineken, in allusion to this, tells us, that "having visited in my last tour a great many convents in Franconia, Suabia, Bavaria,

Wood-Engraving.

and in the Austrian states, I everywhere discovered in their libraries many of those kinds of figures, engraved on wood, and pasted either at the beginning or the end of old volumes of the fifteenth century. I have indeed obtained several of them. These facts, taken altogether, have confirmed me in my opinion, that the next step of the engraver in wood, after playing-cards, was to engrave figures of saints, which, being distributed and lost among the laity, were in part preserved by the monks, who pasted them in the earliest printed books with which they furnished their libraries."

Between 1430 and 1450, several works technically called block-books, chiefly illustrative of the Scriptures, appeared. The most remarkable among these is the *Apocalypse, or History of St John*, which was probably engraved in 1434, and is reputed to have been the production of Laurence Coster, a Dutchman. According to Heineken, there have been six editions of this book. "Though some of the designs," Jackson observes, "are very indifferent, yet there are others which display considerable ability, and several of the single figures are decidedly superior to any that are contained in the other block-books. They are drawn with greater vigour and feeling." The figures in another of these block-books, called the *History of the Virgin*, are also very gracefully delineated, and the style in which the cuts are engraved exhibits a more advanced stage of the art than we find in the *Apocalypse*. Another specimen of block-books is called the *Biblia Pauperum* (see Plate II. art. PRINTING, vol. xviii.), the figures it contains having, it is conjectured, been executed for the purpose of imparting a knowledge of sacred history to those who could not afford to purchase a manuscript copy of the Scriptures. Several of the cuts in this work, though rude, are not inexpressive of the scenes which they represent. The *Alphabet*, composed of grotesque figures from wood-engravings, was probably executed about the middle of the fifteenth century; and Jackson, judging from their style, thinks that they are the work of a native of France.

Wood-engraving began to be combined with printing after the invention of the latter art in the fifteenth century. In the *Psalter*, printed by Faust and Schœffer at Mentz in 1457, the large initial letters engraved in wood are so beautiful that they have never been excelled. (See Plate III. Art. PRINTING, vol. xviii.) From the perfection which these letters exhibit, it is evident that the workmen were trained to the art. The practice of introducing wood-cuts became general in Germany, and was known in Italy towards the end of the fifteenth century. The first books in the English language containing wood-engravings were those printed by Caxton about 1476. The use of cross hatchings (which are black lines crossing each other generally diagonally) produced a great change in the art, giving colour and shadow to the subjects.

The next attempt at improvement in this art was by Hugo da Carpi, to whom is attributed the invention of *chiaroscuro*. Carpi was an Italian; but the Germans also claim the invention, and produce in evidence several engravings by Mair, a disciple of Martin Schoen. His mode of performing this was very simple. He first engraved the subject upon copper, and finished it as much as the artists of his time usually did. He next prepared a block of wood, upon which he cut out the extreme lights, and then impressed it upon the print; by which means a faint tint was added to all the rest of the piece, excepting only in those parts where the lights were meant to predominate, which appear on the specimens extant to be coloured with white paint. The drawings for this species of engraving were made with a pen on tinted paper, and the lights were drawn upon the paper with white paint.

But there is a material difference between the chiaroscuro of the old German masters and that of the Italians. Mair and Cranach engraved the outlines and deep shadows upon copper. The impression taken in this state was tinted over by means of a single block of wood, with those parts hollowed out which were designed to be left white upon the print. On the contrary, the mode of engraving by Hugo da Carpi was, to cut the outline on one block of wood, the dark shadows upon a second, and the light shadows, or half-tint, upon a third. The first being impressed upon the paper, the outlines only appeared. This block being taken away, the second was put in its place, and being also impressed on the paper, the dark shadows were added to the outlines; and the third block being put in the same place upon the removal of the second, and also impressed upon the paper, made the dim tints, when the print was completed. In some instances the number of blocks was increased, but the operation was still the same, the print receiving an impression from every block.

Wood-Engraving.

Albert Durer, towards the end of the fifteenth and commencement of the sixteenth century, was the great promoter of wood-engraving. It is supposed that many of the wood-cuts, though bearing his name, were only engraved from drawings made on the block by him. "One of the peculiar advantages of wood-engraving," Mr Jackson observes, "is the effect with which strong shades can be represented; and of this Durer has generally availed himself with the greatest skill. On comparing his works engraved on wood with all those previously executed in the same manner, we shall find that his figures are not only much better drawn and more skilfully grouped, but that, instead of sticking in hard outline against the background, they stand out with the natural appearance of rotundity. The rules of perspective are more attentively observed, the backgrounds better filled, and a number of subordinate objects introduced, such as trees, herbage, flowers, animals, and children, which at once give a pleasing variety to the subject, and impart to it the stamp of truth. Though the figures in many of his designs may not indeed be correct in point of costume—for though he diligently studied nature, it was only in her German dress; yet their character and expression are generally appropriate and natural. Though incapable of imparting to sacred subjects the elevated character which is given to them by Raffaelle, his representations are perhaps no less like the originals than those of the great Italian master."

Besides Durer, there were Burgmair, Cranach, Schauffelein, and other German artists of celebrity, who engraved on wood. At this period the best wood-engravings were of considerable size, and designed in a bold and free manner; and at no time was the art more encouraged and esteemed. Hans Holbein, in 1538, produced the *Dance of Death*, in a series of wood-cuts, which for truth and freedom of execution have never been surpassed. "The manner," Mr Jackson remarks, "in which they are engraved is comparatively simple; there is no laboured and unnecessary cross-hatching where the same effect might be obtained by simpler means; no display of fine work merely to show the artist's talent in cutting delicate lines. Every line is expressive, and the end is always obtained by the simplest means. In this the talent and feeling of the engraver are chiefly displayed. He wastes not his time in mere mechanical execution, which in the present day is often mistaken for excellence; he endeavours to give to each character its appropriate expression; and in this he appears to have succeeded better, considering the small size of the cuts, than any other wood-engraver, either of times past or present."

Wood-engraving now made considerable progress in Italy, particularly in Venice; and the engravings of this period in that country were little inferior to the German works. The art rather declined on the continent about the end of the sixteenth century, when copperplate engraving

Wood-Engraving.

came into use. In England, it continued to flourish, as several works of the time show. Jegher of Antwerp, who was born in 1578, was so eminent in the art, that he was employed by Rubens to work under his inspection; and he executed several pieces which are held in much estimation. They are particularly distinguished for boldness and spirit. Towards the end of the seventeenth century, wood-engraving was greatly neglected, and was employed only for common decorations, and never almost to delineate any subject of interest.

About the year 1723, John Michael Papillon produced many successful works in wood-engraving, particularly ornamental foliage, flowers, and shells. In 1766, he published his *History of Wood-Engraving*, the cuts in which are his own workmanship. The book, although deficient in many respects, evinces a laudable diligence in bringing the art into more extended employment.

Wood-engraving was for many years in a very degenerate state, and almost wholly lost, till it was revived in England by the celebrated Thomas Bewick. This artist was born in the parish of Ovingham, in Northumberland, in 1753. Having shown a taste for drawing, he was entered apprentice with Mr Ralph Beilby, engraver, at Newcastle-upon-Tyne; and in 1775 he had made such progress as to obtain a premium from the Society of Arts for his wood-engraving of the "Old Hound." He afterwards produced his well-known *History of Quadrupeds*, which was succeeded by his *History of British Birds*, and other standard works, which brought him so much celebrity, that he was universally hailed as the reviver as well as improver of the art. His great excellence was the singular fidelity of his designs.

John Bewick, brother to Thomas, acquired the art from him, and practised it in London for several years. His abilities, though respectable, were not so brilliant as those of his brother. His cuts have not the same interest, and his style of engraving is not considered very good. He died in 1795, aged thirty-five. His more illustrious brother Thomas lived till 1828, and continued to ply his art till within a short time of his death. Wood-engraving is much indebted to this famous artist, not only for the excellence to which he brought it, but for the taste he created for such productions; a taste which has been maintained by the many admirable works of his pupils, and other artists of the present day. Of late, wood-engraving has made considerable progress in Germany and France.

The wood generally used by wood-engravers is box, which from its hardness and toughness bears the action of the press better than any other; and the smallest kinds, being the most compact, are preferred. The blocks are cut directly across the grain. Before the drawing is made, the block is rubbed over with white chalk and a little water. If the drawing is a delicate one, the block, except the place where the artist commences, is covered with paper.

There are various kinds of cutting-tools used in wood-engraving, *gravers*, *tint-tools*, *gouges* or *scoopers*, and *flat tools* or *chisels*. The *gravers* are of various sizes, and are employed for the principal part of the work. What are called *tint-tools* are chiefly for cutting parallel lines. *Gouges* are for scooping out the wood towards the centre of the block, and *chisels* for cutting away the wood towards the edges.

Wood-engraving is now generally used in illustrating publications of all kinds; and, within these few years, it has attained a very high degree of perfection. Every day, works are issuing from the press, adorned with the most varied specimens of this valuable art. (See PRINTING.) (A. H.)

Woodstock ‖ Woodward.

WOODSTOCK, a municipal and parliamentary borough and market town of England, county of Oxford, on the left bank of the small river Glym, 8 miles N.N.W. of Oxford, and 62 miles from London. It is a neat, clean, and well built country town, and contains many houses of a superior description. The town-hall is a neat stone edifice, erected in 1766, with a piazza in the lower part, forming the market-place. The parish church is a handsome structure, partly rebuilt in 1785, with a tower at its W. extremity. It has also places of worship for Methodists and Baptists, a free grammar school, and several charities. The chief manufacture of the town is that of doeskin gloves, that of polished steel articles, for which it was formerly famous, being now almost extinct. Woodstock, however, derives its chief importance from being in the immediate vicinity of Blenheim House, the seat of the Duke of Marlborough. (See BLENHEIM HOUSE.) The borough is governed by a mayor, six aldermen, and eighteen councillors, and returns one member to parliament. Old Woodstock, a little to the N. of the present town, was long a royal residence, but no remains of the ancient palace now exist. Here King Alfred executed his translation of Boethius, and here Chaucer frequently resided. Pop. of borough, which includes several adjacent villages and hamlets, and comprises 21,640 acres (1851), 7983.

WOODWARD, JOHN, was born in Derbyshire on the 1st of May 1665. He was educated at a country school, where he learned the Latin and Greek languages, and was afterwards sent to London, where he is said to have been put apprentice to a linen-draper. He was not long in that station till he became acquainted with Dr Barwick, an eminent physician, who took him under his tuition and into his family. Here he prosecuted with great vigour and success the study of philosophy, anatomy, and physic. In 1692, Dr Stillingfleet quitting the place of professor of physic in Gresham College, Woodward was chosen to succeed him, and the year following he was elected F.R.S. In 1695 he was created M.D. by Archbishop Tenison, and in the following year he was admitted to the same degree at Cambridge. His principal work is entitled *An Essay towards a Natural History of the Earth and Terrestrial Bodies, especially Minerals.* Lond. 1695, 8vo. A Latin translation of it appeared at Zürich in 1704; and in 1714 he published *Naturalis Historia Telluris illustrata et aucta.* He wrote many other pieces, which were well received by the learned world. He founded and endowed a professorship of natural history in the university of Cambridge; and this chair was first occupied by the celebrated Dr Middleton. Dr Woodward died in Gresham College on the 25th of April 1728.

WOOL AND WOOL TRADE.

Characteristics and Value of Wool.

THERE are few words which it is at once so easy to understand, and so hard to define, as the word WOOL. To say, with Johnson, that wool is "the fleece of the sheep," is to say too little; but to assert, with one of his latest editors, that wool is "any short thick hair," is to assert a great deal too much. The differences which demarcate nearly all varieties of *wool* from nearly all varieties of *hair*, as those terms are respectively used in commerce and in ordinary speech, are palpable enough; but to discriminate with nice accuracy between the hairy wool of some sheep, and the wool-like hair of some goats, might puzzle a physiologist as well as a philologer.

Wool, how defined.

For our present purpose, Professor Owen's definition may suffice. "Wool," he says, "is a peculiar modification of hair, characterised by fine transverse or oblique lines, from 2000 to 4000 in the extent of an inch, indicative of a minutely imbricated scaly surface—when viewed under the microscope—on which, and on its curved or twisted form, depends its remarkable felting property." Many animals have, in a state of nature, both wool and hair; the short and soft covering underlying the long and harsh one. Beaver's wool, for example, is well known in commerce; and "wool of bat," though it does not figure in the prices current, is, perhaps, more widely known still. But in this article we are concerned only with the wool of the sheep, and with those analogous products of the llama and the goat, which, like it, are employed in textile manufactures.

SECT. I.—THE CHARACTERISTICS AND VARIOUS QUALITIES OF WOOL.

Varieties of wool in a single fleece.

A single fleece, whatever its character, yields many varieties of wool. The finest grows on the shoulders and along the back; the next in fineness under the shoulders and along the ribs. The coarsest is on the haunches and below the belly. These may be called the main divisions of ordinary wool, but the classification of the wool-sorters is much more minute—"prime lock, choice lock, picked lock, superhead, head, downrights, second abb, livery, breech," are the usual commercial designations of the various sorts. The relative fineness of the fleece depends on that of the animal's skin, and on all the causes which induce or check the secretion from the glands of the skin of that "yolk" or natural soap, which at once nourishes the wool and protects it from external injury by matting it together. Raspail examined the skin of the fœtus of a sheep, and found it studded with globules of uniform size arranged round groups of white spots in quincunxes, indicating the places whence the woolly fibres were to grow. On the cuticle of the temple he found, instead of the white spots, vesicles projecting like urns, the sides of which were granulated in a similar way. These vesicles were the rudiments of hairs.

The yolk of the fleece, and its effects.

Vauquelin analysed the glandular secretion or "yolk," and found it to consist of (1.) a soapy matter with a basis of potash; (2.) a small quantity of carbonate of potash; (3.) traces of acetate of potash; (4.) traces of lime; (5.) an atom of muriate of potash; and (6.) an animal oil. All these constituents he found in a number of samples of various origin. The coarsest wools rarely contain less than 20 per cent. of yolk. South Down wools average from 45 to 50 per cent. The finest wools of La Brie are said to contain from 60 to 75, and those of Electoral Saxony as much as 80 per cent.

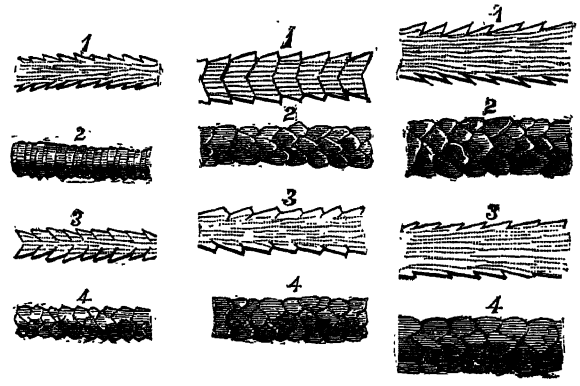
The qualities which mainly govern the classification and commercial value of wools are—(1.) the fineness of the fibre; (2.) its softness and elasticity; (3.) soundness of staple; (4.) colour; (5.) cleanness; (6.) length of staple. The old classification of wools into carding or clothing wools (short stapled) and combing or worsted wools (long stapled), has now less significance than it used to have; recent improvements in machinery having enabled the wool-comber to work upon wools of much shorter staple than formerly.

Experiments of Parry and others on the relative fineness of wools.

(1.) The well known experiments of Dr Parry on the relative *fineness* of wools were made on fleeces of nineteen sorts. The finest fibre of all was that of a Spanish ewe, and its mean diameter was $\frac{1}{1370}$ of an inch. The mean diameter of the wool of a Merino ram was $\frac{1}{1234}$ of an inch; that of a Rambouillet ewe, $\frac{1}{1137}$; that of a South Down $\frac{1}{1110}$; that of an Anglo-Negrette ram, $\frac{1}{1057}$; that of a Wiltshire ewe, $\frac{1}{858}$ of an inch. The average diameter of the coarsest of the combing wools is about $\frac{1}{420}$ of a inch. Dr Ure's experiments give results nearly similar to those of Dr Parry. The filaments of the fine sorts of wool measured by Dr Ure ranged from $\frac{1}{1100}$ to $\frac{1}{1300}$ of an inch in diameter. By means of a most ingenious instrument of recent invention, one hundred hairs, selected from different parts of the fleece, may be subjected to a prescribed pressure, which is registered on a minute index. Twelve fibres of a very fine Austrian fleece, thus measured, only equalled in thickness a single fibre from a Leicester sheep.[1]

Youatt's microscopic examination of wools of various sorts.

(2.) The demonstration of the peculiar structure of the woolly fibre, by the use of powerful magnifiers, is due to the late Mr Youatt, who carried on a long series of experiments with great care and patience. If a lock of wool be held up to the light, it will be perceived that all its fibres are twisted into corkscrew-like ringlets. All varieties of wool present something of this appearance, although in very different degrees. But if these fibres be subjected to a powerful microscope, they will be seen to consist of central stems from which spring circlets of tiny leaf-shaped projections. In the finer sorts of wool these projections present at first the appearance of minute serrations, like the teeth of a fine saw, but on closer inspection they resolve themselves into leaves or scales. In the coarser sorts the scaly or leaf-like form is recognisable at once. In the long merino and Saxon wools these projections or imbrications are acutely pointed. In the South Down they are also pointed, but less acutely. In the Leicester they are rounded off. These peculiarities, as the microscope shows them, are thus figured by Mr Youatt:—



SAXONY WOOL.
1. A fibre of Saxon wool as a transparent object.
2. Do. opaque.
3. Do. combed, transparent.
4. Do. combed, opaque.

SOUTHDOWN WOOL.
1. A fibre of Southdown wool as a transparent object.
2. Do. as an opaque.
3. Do. combed, transparent.
4. Do. combed, opaque.

LEICESTER WOOL.
1. A fibre of Leicester wool as a transparent object.
2. Do. an opaque one.
3. Do. combed, transparent.
4. Do. combed, opaque.

Softness and elasticity.

Mr Youatt appears to have gone too far in asserting that the felting properties of wool will vary absolutely with the number of these minute imbrications within a given space; but it is certain that they constitute one important element of those properties, that weavy or crumpled form which, from the earliest growth of each fibre, predisposes it to hook on, as it were, to its neighbour fibre, is another and essential element. Fine Saxon wool has 2720 such imbrications in an inch; the ordinary merino 2400; Australian from 1920 to 2400 (Macarthur's); South Down, 2000; Leicester, 1850. When the relative number of these imbrications is equal, that lock will be the softest and most elastic in which the imbrications are smallest and most uniform.

Of all European wools, the Saxon seems pre-eminent both for softness an dfineness of fibre. But American merino is now (1860) exhibited in London of a diameter of $\frac{1}{1772}$, and Americo-Saxon of $\frac{1}{1775}$ of an inch.

Soundness of staple.

(3.) *Soundness* of staple (a "staple," in this sense, is any lock that naturally sheds itself from the rest) consists in the equality both in length, lustre, and elasticity of the fibres composing it, as well as in its strength. If the staple be so held in both hands as that the third finger of the right hand may play firmly upon the fibres, its soundness will be indicated by a firm and sharp resonance, as well as by resistance to the sudden and repeated strain when the hands are forcibly jerked asunder.

Colour.

(4.) The *colour* of the fleece has, from of old, been a point of prime importance.

Cleanness.

Whatever may be the fabric, pure whiteness in the wool is the

[1] *Catalogue of the Collection of Animal Products at South Kensington* (860), p. 5.

Sources of Present Supply.

essential condition of a rich or brilliant dye. Hence it is that the old Scottish black-faced breed is gradually dwindling away.

(5.) The cleanness of the fleece, too, is important, not only for its influence on weight and the consequent fair adjustment of price between buyer and seller, but on account of that fermentation of the yolk or grease which results from imperfect washing, and by which the very substance that enriches the growing wool is made to deteriorate the shorn fleece. The clipping off of all dirty locks overlooked by the sheep-washers; the neat rolling of the fleeces, and their assortment in layers of like quality, are all points which claim the grower's attention, and are sure to repay his care.

(6.) All the qualities which commend wool to the clothier are also recommendations to the comber, the felting property only excepted. Length of staple is desirable for the comber only. For many purposes, combing wool should be at least four inches long, but wool of two inches can be combed by modern machinery; but always the shorter the staple, the more important becomes its soundness.

Weight of fleece.

In weight of fleece the ordinary short-woolled sheep of Great Britain range from 1¾ lb. to 3½ lb; and the ordinary long-woolled breeds from 3 lb. to 10 lb. The ordinary flocks of Saxony produce from 2 lb. to 2¼ lb. of fine wool, and the improved flocks from 2½ lb. to 4 lb. The Negrette flocks in Mecklenburgh are said to average 4 lb., and many rams yield from 8 lb. to 10 lb. of washed wool. The merinos imported into the state of New York, and crossed with part-blooded Saxons, average from 4 lb. to 5 lb.

Example of the "sorts" and proportions of wool in a Southdown tegg fleece.

Fleeces of pure South Down may be seen at the South Kensington Museum, so stapled as to show the different varieties of wool, suitable for different textile purposes, which may be obtained from a single fleece. Thus, a tegg fleece of 5 lb. and 8 oz. yields (1.) 1 oz. of "super" wool, used for flannels, blankets, hats, tweeds, and coarse cloth; (2.) 1 oz. of "Surrey;" and (3.) 2½ oz. of "grey" wool, both used for army, navy, prison, and workhouse cloths; (4.) 5¾ oz. of "prime white" wool, made into cloth of superior kinds, and into the best blankets, flannels, tweeds, shawls, and coburgs; (5.) 2 oz. of "choice" and (6.) 1 lb. "picked tegg," both used for tweeds, shawls, and blankets, and the former sometimes applied to the manufacture of cloths and flannels; (7.) 6¼ oz. "super tegg," for fringe, hosiery, yarns, and coach-lace; and, finally, (8.) 3 lb. 8 oz. of "long" wool, suitable for yarns, fringes, shawls, and blankets. "Tegg" or "hogget" wool, it may be added, is the wool of a sheep whose fleece has been allowed to grow to the second shearing season, instead of being shorn as lamb's wool.

Sources of Present Supply.

The prediction of the distinguished French naturalist, M. de Quatrefages, that "Industry will obtain from the fleece of the alpaca an important branch of commerce," has been more than realized; for that prediction was coupled with the proviso,—"if we succeed in acclimatising the animal." It is only in a very narrow sense, indeed, that Europeans can be said to have acclimatised the alpaca, since, of the many attempts to do so, only one has been attended with even slight success, and its ultimate establishment is very doubtful. But an important commerce in alpaca wool has existed for several years, and is yearly increasing.

Alpaca wool.

The alpaca is a species of llama, a genus allied to the camel and the dromedary, and comprising four species, namely *L. guanacas, L. glauca, L. vicugna,* and *L. pacos*, or alpaca. It is only in the wool of the latter that extreme fineness is combined with length of staple. The staple of alpaca wool ranges usually from 6 to 12 inches in length. If the animal be left unshorn, the wool will attain an extraordinary length, without becoming coarse. Samples have been exhibited in London of 42 inches.

Vicugna wool.

The wool produced by a cross of the alpaca with the vicugna is very soft and downy, but the product is small. That of the vicugna itself is short and fine, of a reddish brown colour, and in other respects somewhat like beaver wool. It is chiefly used in the hat-making and hosiery trades. The animal is wild, and grazes on the loftiest mountains of the Cordillera range, so that the supply of its wool depends on the successful enterprise of the Indian hunters. In the time of the Incas, the vicugna was domesticated, as the alpaca, only, is now. By Peruvian law, the exportation of the llama, alpaca, or vicugna, is prohibited. The weight of the alpaca fleece usually ranges between 10 lb. and 12 lb.

Mohair.

Mohair, or the wool of the Angora goat (*Capra Angorensis*) is the whitest wool known in commerce. It is very silky, hangs in long curls, and has an average length of staple of 5 or 5½ inches. The fleece weighs from 2 to 4 lb., and is free from under-down. Of an average fleece about three-fifths will be applicable to combing purposes, and the remainder to clothing.

The following table, drawn up by Mr Robert Milligan, of Bradford, on occasion of the Exhibition of 1851, exhibits the yield of 240 bales of alpaca, namely, 78 bales of black, 72 white, 58 brown, 15 grey, and 17 mixed; containing in the aggregate, and in gross, 19,057 lb.; as assorted for the various purposes of manufacture, according to colour, fineness, and other qualities:—

Colour.	For Combing purposes.					Noils.			Short Refuse.	Combing refuse (to be mixed with noils for re-combing).	Carding Wool.
Average value.....	No. 1. Extra sup. 5s.	No. 2. Super. 4s. 2d.	No. 3. Fine. 3s. 6d.	No. 4. Med. fine. 3s.	No. 5. Coarse. 2s. 4d.	No. 1. Inferior. 8d.	No. 2. Medium. 1s.	No. 3. Fine. 1s .3d.	1s.	4d.	1s. 8d.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
White.....	337	541	902	673	...	50	369	120	222	340	...
Brown	139	492	810	354	...	26	315	87	135	98	...
Grey	435	1282	2415	834	409	85	1042	444	397	130	112
Black	158	648	1358	446	...	26	434	150	256	66	...
Total	1069	2963	5485	2307	409	187	2160	801	1010	634	112

Wool of the shawl-goat.

The wool of the famous Cashmere or shawl-goat is very soft, rich, and lustrous. This goat is reared on the dry table-land of Thibet, at heights which vary from 12,000 to 16,000 feet above the level of the sea. At such an elevation the animal is of course exposed to intense cold. The shawl-wool (*poshm-i-shahal*) which grows close to the skin, under the usual hairy coat, would seem to be a special defensive provision of nature against the benumbing blasts which are characteristic of the Thibetian region. What have been the results of the various attempts to acclimatise the shawl-goat in Europe, we shall have to mention hereafter. The separation of the soft cottony down from the harsh hair or "hemp" of the outer coat, is a very difficult task. It has to be effected fibre by fibre. Hence the disappointment which has attended some celebrated endeavours to produce certain Cashmere fabrics in this country; hence, too, notwithstanding the cheapness of Indian labour, one element of the enormous cost of these fabrics when imported.

Shawls, however, are not the only textile product of this much-prized animal—

> "With glossy hair of Thibet's shaggy goat
> Are light tiaras wove, that wreath the head,
> And airy float behind."

Hair of the Rocky Mountain goat.

Attention has been recently called to the capabilities of the fleece of the Rocky Mountain goat of North America. It combines whiteness and softness. The pile is of two kinds, one resembling lamb's wool, the other like the under-coat of the poodle dog. A fleece, exhibited by Mr E. B. Roberts, may be seen at the South Kensington Museum.

SECT. II.—THE SOURCES OF PRESENT SUPPLY.

(1.) Supply of British wool.

Of the growth of wool within the whole of the United Kingdom, there have not been, at any period, authentic statistics. But the estimates, more or less plausible, have been numerous. In 1580, the Merchants of the Staple, addressing the Privy Council, rate the yearly production at about 91,000 packs. Two centuries later (1788), an estimate was laid before a select committee of the House of Commons, in which the annual shearing was rated at 600,000 packs. But there can now be no doubt that this estimate was greatly exaggerated. In 1800, Mr Luccock, basing his computation on a wider induction of evidence than had ever before been brought to bear on the question, estimated the then existing number of *long-woolled* sheep in England, and part of Wales, at 4,153,308; and the number of *short-woolled* at 14,854,299, making, together, 19,007,607. He also estimated the annual slaughter of sheep (carrion included), at 7,140,156, thus obtaining as the total number of sheep and lambs, 26,147,763. The long-woolled sheep were estimated to yield 131,794 packs; and the short-woolled, 193,475 packs—together, 325,269 packs, to which was added for skin wool and lamb's wool (both short and long), 58,705 packs, thus giving an aggregate total of 383,974 packs, or 92,153,760 lb.

Luccock's estimate of 1800 (for England and Wales).

This estimate was revised in 1828 by Mr James Hubbard, an experienced wool-stapler of Leeds, for the information of the

Sources of Present Supply.

Lords' Committee on the wool trade. Mr Hubbard computed that in the first twenty-eight years of the century, the yield of short wool had *decreased* from 193,475 packs to 120,655 packs; and that the yield of long wool had, on the other hand, increased from 131,794 to 263,847 packs—making a total, for 1828, of 384,502 packs; to which must be added, as before, for skin and lamb's wool, 69,405, making an estimated aggregate production of 453,907 packs, or 108,937,680 lb.; and showing a net increase, from the beginning of the century, of 69,933 packs, or 16,783,920 lb.

Hubbard's estimate of 1828.

No more recent account has been drawn up in so elaborate a manner as that of 1828. We are still mainly dependent on conjectural estimates, and most of those which have been recently put forward present great discrepancies.

Estimated yield of wool in Scotland (1814 and 1859).

As respects Scotland, the number of sheep was estimated in 1814, apparently on the best evidence then attainable, as amounting to 2,850,000. It is very certain that since that date the increase has been considerable. Mr M'Culloch, in the last edition of his *Dictionary of Commerce*, published in 1859, estimated the number at 3,500,000. There are other computations, but none which appear to possess any special claims to confidence. Taking Mr M'Culloch's datum, the average yield of Scottish wool would be about 72,900 packs or 17,496,000 lb.

The importance of public arrangements for the collection of agricultural statistics in a trustworthy form can scarcely, perhaps, be more conclusively indicated than by a quotation with respect to the wool of Ireland, from the work just referred to. No book of its kind, taking it as a whole, embodies more careful research, or has more justly attained a high reputation. Yet of the growth of wool in Ireland, Mr M'Culloch (in his edition of 1859), writes thus; "According to Mr Wakefield, there is not a single flock of breeding sheep in the province of Ulster; and though there be considerable flocks in Roscommon and other counties, we believe that *if we estimate the whole number of sheep in Ireland at* 2,000,000, *we shall be a good deal beyond the mark.*" When this statement was made, it was forgotten that *for Ireland* we have official returns of the highest authority, and of so recent a date as 1854. Those returns show that in 1854, the number of sheep in Ireland was 3,722,219; namely, in Ulster, 385,550; in Connaught, 1,013,318; in Munster, 1,015,131; and in Leinster, 1,308,220. Former returns of the same kind enable us to compare the figures of 1854 with those of 1841, and of some intermediate years. In 1841 the total number of sheep was returned at 2,106,189. In 1849 it had fallen to 1,777,111; but in 1853, it had risen to 3,142,656.[1] Were it not for the existence of the blue book which contains these official statistics, the well-merited reputation of Mr M'Culloch's *Dictionary of Commerce* would have given currency to a statement which is in error to the extent of nearly 90 per cent.

M'Culloch's statement as to the yield of wool in Ireland (1859); compared with the official returns of agricultural produce 1841–54.

M'Culloch's estimate of aggregate yield of British wool compared with that of Southey (1850 and 1859).

It follows very obviously that Mr M'Culloch's estimate of the total number of sheep in the United Kingdom is likely to have been put considerably too low. He states that number as "about 32,000,000." Mr Thomas Southey, who, as is well known, has bestowed great attention on the statistics of wool for a lengthened period, doubtless erred in the opposite direction, when (in 1850) he estimated the number of fleeces annually clipped at 40,000,000, in addition to 15,000,000 passing through the hands of the fellmongers. Taking the average weight of a fleece at 5 lb., the annual yield of domestic wool would, by the one estimate, amount only to 666,000 packs; by the other, to 1,145,000 packs.

Estimates of Mr L. Wray and of Mr E. Baines.

Again, in an able lecture on the supply of wool, and more especially on the methods which might be adopted for increasing it, delivered before the Society of Arts in February 1860, Mr Leonard Wray estimates the annual aggregate number of fleeces in the United Kingdom at 50,000,000, but as he takes their average weight somewhat higher than Mr Southey had taken it, he reckons the yield of wool as amounting to 275,000,000 lb. (1,145,830 packs), and thus arrives at a like result, although by a different road. Mr Edward Baines, on the other hand, in his paper read before the statistical section of the British Association in 1858, estimates the yearly production of wool throughout the United Kingdom at only 175,000,000 lb.

Until better materials become available, we can but put these discordant computations—all of them, however, made by men of eminent ability—side by side, and leave the reader to make his own deductions from them. We may, perhaps, venture to hope that what it has been found practicable to do in Ireland, will not eventually—and after mature consideration of the best methods—present insuperable difficulties in other parts of the United Kingdom.

(2.) Foreign and colonial wool.

The sources of the supply of foreign and colonial wools were, in 1859, respectively as follows. We give them in the order in which they stand in the tables of the Board of Trade:—

Wool (Sheep, Lamb, and Alpaca) imported into the United Kingdom in the year 1859.

Sources of Present Supply.

Imports of 1859.

	lb.
1. Spain,	153,874
2. Germany,	12,036,125
3. Other countries of Europe,	27,145,518
4. British possessions in South Africa,	14,269,343
5. British possessions in East Indies,	14,363,403
6. British settlements in Australia,	53,700,542
7. South America,	9,759,779
8. Other countries,	1,856,050
Total,	133,284,634

Comparison of the Imports of 1860 with those of 1859.

The computed real value of the wool imported into the United Kingdom in 1859, according to a return presented to the House of Commons on 21st February 1860, was L.9,831,007. The imports of the first five months of the present year (1860), show a considerable aggregate increase as compared with those of the corresponding period of 1859, namely, 43,020,704 lb. in 1860, against 39,928,467 lb. in 1859. The greatest increase is in the imports from Australia, which *for January, February, and March* only, show 5,909,830 lb., against 2,638,443 lb. in the corresponding three months of 1859, and against 1,818,359 lb. in those of 1858. The imports from other British possessions also show an increase; those, namely, from South Africa, 2,752,323 lb. in the first three months of 1860, against 2,029,993 in the like period of 1859; and those from the East Indies 2,194,591 lb., against 1,179,193 lb. The imports of European wool, on the other hand, show a decrease, amounting only to 5,332,071 lb. in the first quarter of 1860, against 6,009,359 in the first quarter of 1859.

Comparison of the exports of 1860 with those of 1859.

The aggregate exports of foreign and colonial wool (sheep, lamb, and alpaca) amounted in 1859 to 29,106,750 lb. against 26,701,542 lb. in 1858. Those of the first five months of 1860 show an aggregate of 9,624,316 lb., against 10,939,074 lb. in the corresponding period of 1859. The aggregate exports of British and Irish wool amounted in the same five months of 1860 to 3,148,123 lb., against 2,126,816 lb. in the corresponding period of 1859. Those of the whole year 1859 were 9,035,182 lb., against 13,455,984 lb. in 1858, and against 15,144,342 lb. in 1857. The average annual export of British and Irish wool may perhaps be fairly taken at 12,000,000 lb.

On these data, and taking somewhat of a medium estimate, between that of Mr Southey on the one hand, and that of Mr Baines on the other, of the annual yield of wool within the United Kingdom, the present supply of the chief raw material of our woollen and worsted manufactures may be stated approximatively thus:—

Estimate of the amount of wool of all kinds remaining for home consumption.

	lb.	lb.
Estimated annual production of British wool, say,		237,000,000
Less average amount of export,		12,000,000
Remains for home consumption,		225,000,000
Estimated import of foreign and colonial wool (comparing actual imports of part of the year 1860 with those of the year 1859),	144,000,000	
Less average amount of export,	29,000,000	
		115,000,000
Estimated total amount of wool for home consumption,		340,000,000

Dr Forbes Watson's paper on the raw materials of our textile manufactures.

In a paper of great research, and as remarkable for its felicity of arrangement as for the copiousness and beauty of the illustrations by which it was accompanied, Dr Forbes Watson placed before the Society of Arts (May 9, 1860) an estimate of the total quantity of wool (in common with that of the other raw materials of our textile manufactures)

[1] *Census of Ireland*, 1851, part 2, xiii.; xxxiii.–xxxvii.; *Returns of Agricultural Produce in Ireland in* 1854, xvii., *et seq.*

History of the Wool Trade in the United Kingom.

exported by all the producing countries of the world. In this paper, the aggregate export of wool was stated at 364,000,000 lb. The country most largely exporting wool is Italy, with its 92,000,000 lb.; then follows Australia with its 53,000,000 lb.; and the southern countries of Europe, exclusive of Italy, with their 46,000,000 lb. Russia appears as the exporter of 30,000,000 lb. In putting 16,000,000 lb. to the credit of Great Britain, Dr Forbes Watson is clearly in excess of the truth, as we have shown by our preceding extracts from the returns of the Board of Trade. The deficiency of this excellent paper is the absence of references to the authority for such statements as cannot, from their nature, rest upon personal knowledge.

Variety of the wool-exporting countries of the world.

One of the most salient facts connected with the traffic in wool is the variety of the producing countries whence it comes to those which chiefly manufacture it. In this respect wool contrasts strikingly with cotton. Of the total amount of cotton exported to all parts of the world, eleven-fifteenths is produced in the United States of America, and nearly three-fifteenths more in the East Indies (the total export is stated by Dr Watson at 1,550,500,000 lb., of which 1,444,000,000 lb. comes from America and the East Indies collectively), whereas of wool, marvellous as have been the recent strides in its production of our own colonial possessions, their aggregate export is still less than one-fourth of the whole. Probably, almost all countries possess advantages for the production, with commercial profit, of wool of one sort or other. But it seems indisputable that for the production of many sorts eminently adapted to the manufactures in which we have won distinction, the capabilities of the British colonies have been, as yet, very imperfectly developed.

The wool-producing facilities of the British colonies yet imperfectly developed.

Another salient characteristic of the import wool-trade is the large per centage of increase which it shows during the last forty years. The import of hemp in 1859 as compared with that of 1821, shows an increase of 158 per cent.; that of flax, 274 per cent.; that of silk, 376 per cent.; that of cotton, 825 per cent.; but that of wool 1261 per cent. How this trade has developed itself from its early beginnings, and by what successive steps the remarkable changes in our sources of supply have been effected, will be seen in the following section of this article.

Comparative import of wool and of other textile materials.

SECT. III.—NOTICES OF THE HISTORY OF THE WOOL TRADE IN THE UNITED KINGDOM.

The early prohibitions.

The records of our early Henries and Edwards abound with such entries as "*Arestacio Lanarum*," "*Prohibitio Lanarum extra regnum*," and the like. As the searcher unwinds membrane after membrane of the long rolls, and meets repeatedly with the same phrases, he begins, perhaps, to think that in the days of the Plantagenets, English wool must have been jealously restricted to English backs. On closer examination, however, he soon perceives that these stern-looking prohibitions were intended rather to extract as much money as possible from the merchant's pocket, than to protect native industry. Every interdict is followed by licenses granted either for valuable considerations, or by way of grace to special favourites, to whom such grants stood in lieu of gifts, and who, doubtless, knew well how to turn them to good account. The king, who had his "customers" at all the ports, no more wished to prevent the egress of the wool-merchant, than the baron whose men-at-arms watched the highways wished to prevent the passage of travellers with well-stored purses.

Both the prohibitions and the licenses, however, prove the high estimation in which English wool was held. An enactment of Henry II., quoted by Stow, to the effect that "if any cloth were found to be made of Spanish wool mixed with English wool, the Mayor of London should see it burnt," points in the same direction; but we have failed to find any record which might explain the precise purpose of the order, and the statute-book contains no notice of it.

The early history of the trade is in fact a history of nascent mercantile enterprise, in almost perpetual strife with the violence and the necessities of kings and barons; winning, indeed, step after step, but paying dearly at every step for its footing. Already, in the thirteenth century, a considerable wool-traffic had grown up both with Italy and with the Low Countries; but it was continually impeded by disputes and complaints arising out of some levy of black mail, either just as the wool was about to be shipped, or whilst it was on its way from the landing-port to the place of manufacture. In the reign of Henry III., for example, certain merchants of Lucca complain to the king (in a letter without date) that their wool had been seized at Dover "on account of tenths granted for the Holy Land," and they appeal to the king's feelings by reminding him of a promised loan which it will be impossible for them to raise, unless the wool be released.[1] In 1322, Adam Huntsman tells the Parliament a sad story of the doings of the sire John, lord of Fienles, who seized his wools when on the road to St Omers, took them into his castle, and there "had his will of them."[2] A few years earlier, we find Countess Margaret of Flanders writing to the King of England (Henry III.) to reproach him with the seizure, at Yarmouth, of twelve sacks of wool, belonging to a poor subject of hers, one Godfrey of Dixmund. The countess tells him that many like enormities have compelled her to make reprisals on the English merchants in Flanders, whose goods, however, she promises to release immediately that restitution shall have been made in England. But ten years elapse, and these quarrels are still unsettled. Count Guy, son of Margaret, entreats Edward I. to hear in person the matters in dispute between the merchants. The king remits the affair to the decision of Edmund, earl of Cornwall. Eventually, after long delays, the fault is laid upon the Flemings. The earl and seven knights are imprisoned at Montreuil-sur-Mer, and are released only on a solemn covenant that they will return to their imprisonment if satisfaction be not made within the time prescribed.[3] One of the results of this long quarrel seems to have been to throw the export trade very much into the hands of the Italians. In 1275, certain merchants of Florence were licensed to carry to Flanders 1068 sacks of wool, paying a customs duty of 10s. the sack; a tax heavier, by a third, than that paid by denizens of the realm.[4] Twenty years afterwards, we find Edward I. making a grant to his son-in-law, John, Duke of Brabant, of L.4000, out of the customs on wools.

History of the Wool Trade in the United Kingdom.

Levies of black mail on the wool merchants.

The quarrels between England and Flanders about seizure of wool.

Under circumstances like these, one of the most obvious expedients of the merchants was to band themselves together for mutual protection. The "Brotherhood of St Thomas Becket of Canterbury" is said to have obtained privileges in Brabant as early as 1248, and may be regarded as the germ of the great society of the Merchant Adventurers of England, where history, however, relates, in the main, to woollen fabrics, rather than to the raw material.

The early incorporated exporters of wool.

The merchants of the German Hansa in London (*Gildhalla Teutonicorum*), better known in history, as in popular speech, by the name of the "Merchants of the Steelyard," and sometimes by that of the "Easterlings," are older still. In 1220, King John granted to them (as "Merchants of Cologne") their first hall, afterwards exchanged for that "steelyard" on the river-bank, which gave them their familiar designation. They were great exporters both of wool and cloth, and kept many of their peculiar privileges until the time of Elizabeth, although the motives and the equivalents of those privileges had long ceased to exist.

German Hansa.

More important in regard to the direct trade in wool than either of these companies, but also of obscurer origin and of less well-defined limits, was the famous community known as the "Merchants of the Staple." The multitudinous enactments respecting this body seem on the surface conflicting. Under Henry III., certain owners of wool are prohibited from trading in it "because they had sold their wools for export to foreigners." Under Edward III., it was made a capital offence to sell wools for export to any but foreigners. No Englishman, Irishman, nor Welshman, could carry wool out of the kingdom, save under penalty of "life and limb." Again, the great "Ordinance of the Staple" (27 Edward III.) recites, that by holding abroad the staple of "those wools of England which are the sovereign merchandise and jewel of our realm, ... the people of foreign lands are enriched . . . . to the damage and impoverishment of the commonalty of our said realm." Yet many subsequent statutes provide for the establishment and confirmation of the staple of wools in foreign towns exclusively.

Merchants of the Staple.

Two leading aims, however, will be found to pervade this legislation, confused as at first sight it may appear, namely, (1.) to encourage the largest possible resort of foreigners to the staple towns, whether within or without the realm, for the purchase of wool; and (2.) to confine the trade to those places where the king's officers had the control of it, and could take effective precautions against "the

[1] *Royal and other Letters*, MS., No. 1007, about 1260? ("Merchants of Lucca to Henry III.;" Rolls House).
[2] *Petitiones in Parliamento*, 15 and 16 Edw. II., 151.
[3] *Royal and other Letters*, Nos. 133–136, 1510, 1511, 1516, 2127 ("Margaret, Countess of Flanders, to Henry III.," &c., Rolls House).
[4] *Patent Roll of* 3 *Edw. I.*, m. 22 (Rolls House).

History of the Wool Trade in the United Kingdom.

king being deceived in his customs." These were objects always kept in view. The bringing as much bullion as possible into England in exchange for wool was another prominent aim. Very often the king could receive the subsidies granted to him by parliament only in kind. His success in war depended on his successful enterprise as a wool-broker.

Subsidies of wool levied in kind.

Thus, in 1341, 30,000 sacks of wool were granted by parliament. Of these, 2206 sacks were levied in Norfolk, 1816 in Kent, 1265 in Lincolnshire, 1048 in Yorkshire, and so on, in diminishing proportions, down to 335 sacks in Leicestershire, 262 sacks in Cornwall, and 111 in Rutlandshire. The king laid an embargo on all other exports of wool,—unless by his express license, on payment of 40s. a sack,—under penalty of treble the value, and "to be at the king's will for life and limb." Other like grants followed. In 1343, the prices of wool were fixed by statute: that of Norfolk at L.5 the sack; that of Lincoln at L.4, 13s. 4d.; that of Leicester at L.8; that of Shropshire at L.9, 6s. 8d.; that of Cornwall at L.2, 13s. 4d. But, in the very next year, we find the Commons petitioning that the statutory tariff should be repealed, and "all men be free to make their bargains as they can."

Abstract of wool exports in the fourteenth century.

Of the extent and pre-eminence of the wool trade at this period of English history, there is a striking indication in an Exchequer record or abstract, not now to be found in the Rolls House, but printed in 1623 by a writer of good authority, Edward Misselden, in his treatise entitled *The Circle of Commerce*. By this document it appears that the total exports of the year 1354 amounted in value, customs included, to L.294,184, 17s. 2d. of which aggregate amount wool and wool fells together made up L.277,606, 2s. 9d. The quantity of wool exported was 31,651½ sacks, worth L.6 the sack. The number of fells was 364,385, worth L.2 for every 120; and the amount of customs duty on both was L.81,624, 1s. 1d. The total amount of the imports of the same year was L.38,970, 3s. 6d.[1]

The gift of English sheep to the King of Spain in the fourteenth century.

Some writers on trade, and those amongst the best of them, have ridiculed as mere romance the old tradition that English sheep were the original stock of the famous merino flocks of Spain. Nevertheless, the old tradition is backed by good evidence. Our own search, indeed, at the Rolls House[2] for contemporary record of the gift has not been successful, but the testimony of Spanish writers is of itself sufficient to establish the fact. For our present purpose, one citation must stand in place of many which are at hand. In a somewhat angry discussion between two Spanish courtiers which occurred in 1437, the taunt, "You are only the descendant of a Magistrate of Shepherds," was answered, in Castilian style, with the assertion that the derided office was one of high dignity, which King Alfonso had established "when the English sheep first came over" (*quando se traxeron la primera vez . . las pecoras de Inglaterra.*[3] Davila assigns 1394 as the date of the gift, and describes it as forming part of the dowry of Catherine, daughter of John of Gaunt; but it is probable that this was the second gift of its kind.

The migration of the merino flocks.

How far the improvement of the merino fleece in Spain may have been due to the system of migration is a curious inquiry, which cannot here be entered upon. The reader may find a concise account of that system in the chapter "*Sobre el ganado Merino*," in Bowles' *Introduccion a la Historia Natural de Espana.*[4]

Legislation against wool-exporting licenses.

The English staple for wool underwent many removals, but its longest abode was at Calais. The statute of 27 Henry VI. recites, that the customs there had greatly decreased "by reason of licenses granted by letters patent, and by misuse thereof, ... so that the said customs pass not yearly L.12,000, which is but little in comparison to that they have been heretofore," and enacts that "all licenses thereafter granted shall be void, and the grantees be out of the king's protection; and that any of the king's subjects may seize wools exported elsewhither than to Calais, and may keep them to his own use." But the prohibition is followed by a string of exceptions which may possibly remind the reader of the famous account of the freedom of the press as enjoyed in the days of Figaro. All such licenses are to be excepted from the operation of this statute, as shall have been granted either to the queen, or to the Duke of Suffolk, or to the community of St John of Bridlington, or to Thomas Walsingham, or to Thomas Brown, or to John Pennycock; and also "all such as shall have been granted for the export of wools by way of the Straits of Morocco."

History of the Wool Trade in the United Kingdom.

Some of the most important circumstances which controlled the trade in wool from this period onwards will be noticed in the following article on the history of our WOOLLEN and WORSTED MANUFACTURES. As those manufactures grew, the cry for prohibiting the export of their raw material became more clamorous. Complaints of the enhancement of prices meet the eye in the memorials addressed to the Privy Council, in the petitions sent up to Parliament, and in the statute book itself. The increasing markets for wool had favoured the aggregation of farms, the inclosure of commons, and the conversion of arable land into pasture. Some landowners possessed 20,000, or even 24,000 sheep. It is alleged in the preamble to the statute of 25 Hen. VIII. c. 13, entitled, *An Act concerning Farms and Sheep*, that "a good sheep for victual that was accustomed to be sold for 2s. 4d., or 3s. at most, is now sold for 6s., or 4s. at least; and a stone of clothing wool, that in some shires of this realm was accustomed to be sold for 1s. 6d. or 1s. 10d., is now sold for 4s., or 3s. 4d. at the least." The statute proceeds to enact that no farmer shall occupy more than two farms, and that none shall keep above 2000 sheep. But, the statute notwithstanding, the complaints on this score soon became louder and more numerous than ever.

Legislation against excessive sheep husbandry.

The staplers, on their part, already looked with an evil eye on the rapid increase of cloth-making at home. Their notion of the proper uses of wool was, that it should be carried over sea. At the accession of Elizabeth, they addressed a memorial to the council beseeching attention to the fact that 24,000 sacks of good wool, which were yearly sent over to the Low Countries in the shape of white cloth, paying only to her Majesty in customs and subsidy L.5833, 6s. 8d., would, if exported as wool, yield to her Majesty L.48,000; and they entreated that various regulations, which they specify in detail, should be enacted for the purpose of checking the excessive manufacture of cloth and encouraging the export of wool.[5] Statements to this purpose were reiterated again and again. One of the advocates presses his argument by enforcing on the council that "the commodities of any place are to be judged to be sent of God . . . to nourish amity and friendship between the people of sundry regions by trafique, and repair of those of one to the other; . . . not to keep the said commodities from helping of those nations that have need of them, no more than we would have the commodities of other countries whereof we have need kept from us."[6] But he fails to establish any connection between this very sound proposition and that which calls on the council to check cloth-making at home, that we may have the more wool to send abroad.

Renewed complaints against export of wool.

As late as 1577, the staplers were still insisting on the losses they had sustained by the fall of Calais, and the transfer of the staple to Hamburgh, where, say they, "the utterance is so indirect that some merchants returned their wool into England when it had been at Hamburgh five years."[7] But their capital grievance was the increase of licenses to court favourites and to official men for the export of wool. In handling so delicate a subject, the complainants of course found it necessary to attack the agents rather than the principals. Thus, in or about 1580, one Martin de la Fallia is charged with having bought more than 20,000 tods of wool, worth 23s. 4d. the tod. "The best," says the informer, "he hath shipped on Mr Secretary's license (*i.e.*, Walsingham's), and doth sell the rest in England at dear prices." These licenses were sought, it will be perceived, by Elizabeth's statesmen, as well as by her courtiers. Burleigh had one, as well as Leicester; and some curious calculations of the profit the great minister derived from it, in his own handwriting, may be seen at the State Paper Office.

All these facts tend to show that the export of wool continued to be large, notwithstanding a very rapid increase in the home consumption (see WOOLLEN and WORSTED MANUFACTURES), but there are not sufficient materials for any satisfactory estimate of its amount.

At this period the supremacy, for clothing purposes, of the wool

---

[1] Misselden, *The Circle of Commerce*, 119, 120.

[2] Too much praise cannot be accorded to Sir John Romilly for the liberal provision he has made with respect to the literary study of the public records. But there is still a singular contrast between the abounding facilities and the prevenient courtesy which await the literary inquirer both at the State Paper Office and at the Privy Council Office (the latter an office of business to which access is and must be a special favour), and the comparatively narrow restrictions he encounters at the Rolls House General Repository. Were the practice at the Rolls House but assimilated to that of the Paper Office, the student would have nothing to desire.

[3] Gomez de Cibdareal, *Centon Epistolario*, 126. This curious volume is before us, but we owe our knowledge of it to a passage in Southey's well-named *Omniana*.

[4] Pp. 480–489.

[5] *Papers relating to the Merchants of the Staple*, MS., Eliz., Domestic, vol. xv. § 54 (State Paper Office).

[6] John Johnson, *Discourse for the Reparyng of the Decayed State of the Merchants of the Staple*, 22d July 1557, MS., Eliz., Domestic, vol. cxiv. § 58 (State Paper Office).

[7] *A most humble Representation how the Staple is decayed*, MS., ibid. § 29 (State Paper Office).

History of the Wool Trade in the United Kingdom.

of Herefordshire was already well established. Early in the next reign Drayton sang its praises in his sonorous verse. In *Polyolbion*, he tells

"Of Lemster, for her wool whose staple doth excel,
And seems to overmatch the golden Phrygian fell.
Had this, our Colchos, been unto the ancients known,
When honour was herself, and in her glory shone,
He then, that did command the chivalry of Greece,
Had only to our isle adventur'd for this fleece.
Where lives the man so dull, on Britain's farthest shore,
To whom did never sound the fame of Lemster ore,
That with the silkworm's web for fineness doth compare?"

Relative merits of the wools of different parts of England.

But the beauty of the Leominster wool scarcely roused Drayton's enthusiasm more than did the abundance of the wool yielded by the flocks of the Cotteswolds—

"T' whom Sarum's plain gives place, though famous for her flocks,
Yet hardly doth she tithe our Cotswold's wealthy locks;
Though Lemster him exceed for fineness of her ore,
Yet quite he puts her down for his abundant store."

The testimony of economists and of historians fully bears out the encomium of the poet. Even a Portuguese contemporary of Drayton, the chronicler Bernardo de Brito, praises the Lusitanian wools, by saying that "they might vie with those English wools, which have been likened to hills of snow" (*tao finas lanas que podem competir com as de Inglaterra, que os authores dizem parecer montes de neve*).[1] "The wool of Herefordshire, of Romney Marsh, of Sussex, and of the Isle of Wight," says a later English writer, "is, for fineness and softness, but a trifle, if at all, inferior to the Spanish wool; but is incomparably more useful than that because of the length of the staple, being from an inch and a half to four inches long."[2] For combing purposes, the palm is given to the wools of Leicester, Huntingdon, Lincoln, and Northampton. When he proceeds to assert that no wool in Europe equals ours in goodness, either for combing or for clothing, the writer goes too far. He speaks as one familiar with foreign wools as well as with English, but probably his patriotism was too much for his judgment.

The illicit export of wool.

Under the Stuarts, the complaints about the smuggling of wool are incessant, but the prices show little variation. It has been noticed that in 1580 the average price of English wool was 23s. 4d. From 1600 to 1660 the lowest price mentioned in the various documents before us is 24s. In 1647 the current price was 35s., and in that year a new prohibitory law was made by the Lords and Commons in parliament. In 1651 the medium price of ordinary clothing wool appears to have been 28s. the tod. In the closing years of the Commonwealth there was a large and increasing illicit export to Holland.

One of the first enactments of the Restoration parliament was the renewal of the prohibition, with increased penalties. The reasons assigned are the avoiding of the losses that daily happen "by the secret and subtile exportation," and "to the intent that the full use and benefit of the principal native commodities of the same kingdoms (of England and Ireland) and dominion (of Wales) may come . . . amongst the subjects . . of the same, and not amongst the subjects . . . of the realm of Scotland, or of any foreign realms or states." In 1663 (12 Cha. II. c. 32) the penalties were still further increased to those of felony, which continued to be law until the reign of William III. The prohibition of export, under penalties of less severity, continued to be law until 1825. But the main result of this legislation was to create an enormous smuggling trade, attended by all the incidents of loss, vice, and crime, which are the natural product of such a trade. The growers suffered severely by the decline of prices. A writer of credit, who discussed this subject in 1677, states that in almost every year since the prohibition, "wool has abated of its price, and now (1677) there are divers persons who have four, and some five years' wool upon their hands, not being able to get above 4d. or 5d. per lb." In the reign of Anne we find it quoted at prices ranging from 6d. to 8d. per lb. In 1718 it had risen to 9d. In 1738 it had fallen to a fraction below 6d. per lb. The fall continued until it reached a fraction above 4d.; but in 1752 it had recovered to 7d. New enactments against smugglers were made in quick succession, but the smugglers continued to thrive.

Another of the old points of complaint and controversy came now to be revived. The "false winding" of wools, and the abuse of pitch and tar marks, were offences widely charged upon the wool-growers by the manufacturers. After much excitement and a long parliamentary inquiry, stringent regulations were made for the suppression of these practices; but the ill-feeling which had thus arisen between the two interests had scarcely subsided, when the advocacy by some of the landowners of a wiser policy in respect to the exportation of wool reproduced it in an aggravated form. In 1781, a meeting of the landed men and farmers of Lincolnshire suggested, in very cautious and temperate language, that it might possibly be right to seek "permission under the regulations of a temporary law, to export to the foreign market that surplus of our wool which is now unsold and unsaleable at the home market." But the manufacturers were instantly in arms. The idea of the smallest approximation towards a free trade in wool was intolerable to them. One of the leading champions of the mercantile interest characterised the attempt "as blind, rash, and ruinous," and suggested that parliament ought to set "a mark of censure on such petitioners who, for a local, temporary, perhaps imaginary relief to themselves, would sacrifice to the enemy, at the hottest crisis of the war, the chief *of those few resources yet remaining to this country*, nothing less than the whole woollen manufacture, that ancient, that fundamental support of Great Britain."[3] The proposed inroad on the protective system was vigorously supported by the arguments of Sir John Dalrymple, of Governor Pownall, and of Dean Tucker, as it had been many years before by those of the able author of the *Memoirs of Wool*, Mr John Smith. Those arguments were in substance unanswered and unanswerable; but they made no way with parliament, in face of the strenuous opposition of the manufacturers of Yorkshire.

History of the Wool Trade in the United Kingdom.

Contest respecting free exportation in 1781.

Until the year 1802, the importation of foreign wool into Great Britain was absolutely free. During the whole of the eighteenth century, the inducements to the sheep-farmer to look for his best market to the butcher rather than to the stapler had been on the increase. The main source of foreign supply was Spain. From 1791 to 1799 inclusive, the total import of foreign wool was 34,011,369 lb., of which no less than 33,190,595 lb. was Spanish. The details show that the use of Spanish wool was increasing, and that of all other foreign sorts diminishing. They are as follows:—

The imports of foreign wool.

Foreign Wool imported from 1791 *to* 1799.

Years.	Spanish Wool.	Other Foreign Wool.	Total Import.
	Lb.	Lb.	Lb.
1791	2,644,653	131,401	2,776,054
1792	4,350,819	163,157	4,513,976
1793	1,750,151	141,234	1,891,385
1794	4,423,893	61,689	4,485,582
1795	4,764,264	138,236	4,902,500
1796	3,400,236	53,975	3,454,211
1797	4,602,805	50,891	4,653,696
1798	2,362,469	35,657	2,398,126
1799	4,891,305	44,534	4,935,839
Total of 9 years...	33,190,595	820,774	34,011,369

Efforts to produce merino wool in England.

This increasing degree of dependence of our manufacturers on Spanish wool for the production of some of their finest fabrics, trivial as it now appears, gave an additional spur to the efforts of breeders at home to improve their flocks. To put a merino fleece upon South Down mutton, became for a time, a leading object of agricultural ambition. Only a few years ago, any notice of the history of wool must have included some account of the many experiments which were made in this direction, and of the measure of success which attended them. They occupied a large space in the public eye for a long period. The results have been considerable, although they have taken a different direction from that of the original aim. It has been found impossible to combine the finest wool with the finest mutton. Either the meat or the fleece must become a secondary object. But the energetic efforts then made, in which Lords Western, Leicester, and Somerville eminently distinguished themselves, have unquestionably resulted in the relative improvement, for certain purposes, of both. In the meantime, other and powerful influences have been unremittingly at work to lessen the comparative importance of the supplies both of home-grown and of foreign wool, and to enhance that of the supply of the wool grown in our colonies, where meat is redundant, and where there are great facilities for improving the fleece and increasing the yield.

Protection-ist legislation.

All that vicious legislation could do to impede the natural tendencies o things, beneficent to all classes if allowed fair play, was done assiduously. The manufacturers had insisted that English wool-growers should not be allowed to profit by the foreign demand for their produce. The English wool-growers insisted, in their turn, that the manufacturers should not be allowed to profit by the

[1] *Monarchia Lusitania*, i. 93.
[2] *Excidium Angliæ* (1727).
[3] R. Glover ("Leonidas" Glover), Letter to *The London Courant*, 17th Oct. 1781.

History of the Wool Trade in the United Kingdom.

foreign supply of their raw material, unless they submitted to a heavy impost. Beginning in 1802 with a duty of 5s. 3d. the cwt., the process went on until in 1819 the duty amounted to 56s. the cwt., being nearly 50 per cent on the price of a considerable portion of the wool imported.

Meanwhile, that remarkable change in the character of the bulk of British wool which has made it more fitted for combing purposes, but less fitted for cloth-making, continued to develope itself. The farmer, by dint of turnips, had succeeded in increasing both weight of carcass and weight of fleece, but quantity had been gained at the cost of quality, as far as respects the demands of the clothier. When the Lords' Committee of 1828 came to inquire into the condition of the wool-trade, it was stated in evidence before them that 420 lb. of Norfolk wool grown in 1790, yielded 200 lb. of "prime," while the same quantity grown in 1828 yielded only 14 lb. of "prime." And this testimony was fully borne out by other testimony of like character. From other causes, Spanish wool also had deteriorated. But the Spanish merinos which had been introduced into Saxony (in 1765, and again in 1778), and managed there with great care and skill, eventually produced finer wool than had ever been produced in Spain itself.

In the year 1800, the import of wool from Spain amounted, in the aggregate, to 6,062,824 lb. In 1815 it had increased only to 6,929,579 lb. The imports of wool from Germany, on the other hand, which in 1800 were but 412,394 lb. had increased in 1815 to 3,137,438 lb. Ten years later (1825) the German wool imported was 28,799,661 lb.; the Spanish, 8,206,427 lb.

Rapid growth of colonial imports.

This great change in the sources of our foreign supply becomes comparatively insignificant when placed beside that which has since arisen out of the enterprise and foresight of Captain John Macarthur, a British officer whom the chances of a military life led to become a settler in New South Wales, and to whose instrumentality a large portion of the commercial prosperity of Australia may fairly be ascribed. By this gentleman, three merino rams and five ewes were introduced into New South Wales in 1797. He continued to import and to breed with great judgment, until he became the owner of very large and choice flocks. The first shipment of colonial wool to the mother country was made in 1807, and amounted to 245 lb. In 1825, the shipment from New South Wales amounted to 411,600 lb.; in 1829, to 1,005,333 lb.; in 1835, to 3,776,191 lb.; in 1840, to 6,215,329 lb.,—from New South Wales alone; and to 9,721,243 lb. from the Australian colonies collectively; in 1845, the collective export had increased to 24,177,317 lb.; in 1850, to 39,018,221 lb.; in 1855, to 49,142,306 lb.; and in 1859, to 53,700,542 lb.

The duty of 6d. per lb. on all wool imported continued until December 1824. It did not convert the manufacturers to the doctrine of free trade. Intent as they were on the repeal of that most oppressive duty, they were as anxious as ever to maintain the prohibition of export. Mr Huskisson had to play off the one desire against the other, and eventually he succeeded both in abolishing the prohibition, and in reducing the duty from 6d. to 1d., per lb. on foreign wool, worth 1s. and upwards; and to a ½d. per lb. on wool of less value. Colonial wool was admitted free. All these changes took effect in 1825. The penny duty continued to be in force until the 6th June 1844.

History of the Wool Trade in the United Kingdom.

Under the comparatively low duty of 1818, the aggregate import of foreign wool had been 24,720,139 lb. Under the duty of 1819, it sank to 6,094,999 lb. The average price of South Down wool in 1818 was 2s. 6d. the lb., and that of Kentish long wool, 1s. 7d. In 1819, the former was 1s. 7d., and the latter 1s. 3d. the lb. In 1823, the import of foreign wool amounted to 18,863,886 lb. South Down was 1s. 3½d., and Kentish long, 1s. the lb. From 1825 to 1829 inclusive, the yearly import of foreign wool averaged 27,006,575 lb., and that of colonial wool, 1,128,248 lb. During the same period the average price of South Down wool was 10d. the lb., and that of Kentish long wool 11½d. In the last complete year of the existence of the penny duty (1843), the amount of foreign wool imported was 26,633,915 lb. In the first complete year of free import (1845), it was 44,970,793; the corresponding importations of colonial wool having been 21,151,148 lb. and 31,843,762 lb. In 1843, the price of South Down wool was 11½d., and that of Kentish long 11d.; in 1845, those prices were, respectively, 1s. 4d. and 1s. 3d.

Quantities of foreign wool imported, and prices of home-grown wool, 1818–45.

Growth of the aggregate colonial imports.

Second, only, in importance to the growth of the Australian supply has been that of our African colonies. In 1820, we received from this source only 13,869 lb. In 1845, we received 3,512,924 lb.; in 1850, 5,709,529 lb.; in 1855, 11,075,965 lb.; and in 1859, 14,269,343 lb. India began to send us wool, as a curiosity, in 1810, but no noticeable import occurred until 1820, when 8056 lb. were received. In 1833, the quantity was but 3721 lb. In 1840, it amounted to 2,441,370 lb.; in 1850, to 3,473,252 lb.; and, in 1859, to 14,361,403 lb.

The imports from Africa and from the East Indies.

It has been shown that, in the last year of the preceding century, our whole import of wool was but 4,935,839 lb. In 1810, it amounted to 10,914,137 lb.; in 1820, it was but 9,789,020 lb. In 1830, it had increased to 32,313,059 lb.; in 1840, to 49,427,284 lb.; in 1850, to 74,326,778 lb.; and in 1859, to 133,284,634 lb.

Details of the imports of wool (distinguishing colonial from foreign) 1840–1859.

The details, for the last twenty years, are exhibited in the following table. We have altered the arrangement adopted in the various tables issued by the Board of Trade, in order to bring out the total imports from the colonies, as compared with those from foreign countries:—

Years.	Foreign Wool Imported.						Colonial Wool Imported.				Total Import.		Average Price of best Australian per lb.
	From Spain.	From Germany.	From other Countries of Europe.	From South America.	From other non-European Countries.	Total Foreign Import.	From Australian Colonies.	From African Colonies.	From British East Indies.	Total Colonial Import (exclusive of New Zealand, &c.)			
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	tons.	d.
1840...	1,266,905	21,812,664	8,541,264	4,378,274	513,823	36,512,930	9,721,243	751,741	2,441,370	12,914,354	49,427,284	22,069	20
1841...	1,088,200	20,959,375	8,305,994	9,174,249	155,220	39,683,038	12,399,362	1,079,910	3,008,664	16,487,936	56,170,974	25,076	19
1842...	670,239	15,613,269	7,050,436	3,207,489	848,499	27,389,932	12,979,856	1,265,768	4,246,083	18,491,707	45,881,639	20,483	19½
1843...	597,091	16,805,448	5,877,538	4,588,987	295,667	28,164,651	17,433,780	1,728,453	1,916,129	21,078,362	49,243,093	21,984	21
1844...	918,853	21,847,684	15,313,087	3,760,063	1,308,831	43,148,518	17,602,247	2,197,143	2,765,853	22,565,243	65,713,761	29,337	24½
1845...	1,074,540	18,484,736	17,606,515	6,468,338	1,513,619	45,147,740	24,177,317	3,512,924	3,975,866	31,666,107	76,813,855	34,292	27
1846...	1,020,476	15,888,705	11,733,601	4,890,273	2,404,023	35,937,075	21,789,346	2,958,457	4,570,581	29,318,384	65,255,462	29,132	26
1847...	424,408	12,673,814	7,935,697	7,295,550	1,665,780	29,995,249	26,056,815	3,477,392	3,063,142	32,597,349	62,592,598	27,943	24
1848...	106,638	14,429,161	7,024,098	8,851,211	924,487	31,335,595	30,034,567	3,497,250	5,997,435	39,529,252	70,864,847	31,636	21½
1849...	127,559	12,750,011	11,432,354	6,014,525	1,004,679	31,329,128	35,879,171	5,377,495	4,182,853	45,439,519	76,768,647	34,271	21
1850...	440,751	9,166,731	8,703,252	5,296,648	2,518,394	26,125,776	39,018,221	5,709,529	3,473,252	48,201,002	74,326,778	33,182	20
1851...	383,150	8,219,236	14,263,156	4,850,048	3,420,157	31,135,747	41,810,117	5,816,591	4,549,520	52,176,228	83,311,975	37,193	19½
1852...	233,413	12,765,253	13,382,140	6,252,689	3,661,082	36,294,577	43,197,301	6,388,796	7,880,784	57,466,881	93,761,458	41,858	22
1853...	154,146	11,584,800	26,861,166	9,740,032	4,357,978	52,698,122	47,076,010	7,221,448	12,400,869	66,698,327	119,396,449	53,302	24
1854...	424,300	11,448,518	14,481,483	6,134,334	2,954,921	35,443,556	47,489,650	8,223,598	14,965,191	70,678,439	106,121,995	47,376	23
1855...	68,750	6,128,626	8,119,408	7,106,708	3,375,148	24,798,640	49,142,306	11,075,965	14,283,535	74,501,806	99,300,446	44,331	24½
1856...	55,090	8,687,781	14,480,869	8,076,317	3,167,430	34,467,487	52,052,139	14,305,188	15,386,578	81,743,905	116,211,392	51,880	26
1857...	397,238	6,088,002	23,802,520	9,306,886	7,287,028	46,881,674	49,209,655	14,287,828	19,370,741	82,868,224	129,749,898	57,924	25
1858...	110,510	10,595,186	17,926,859	10,046,381	3,024,216	41,703,152	51,104,560	16,597,504	17,333,507	85,035,571	126,738,723	56,580	24
1859...	153,874	12,036,125	27,145,518	9,759,779	1,856,050	50,951,346	53,700,542	14,269,343	14,363,403	82,333,288	133,284,634	59,502	23

History of the Wool Trade in the United Kingdom.

The exports of foreign and colonial wool from the United Kingdom, during the same period, were as follows :—

History of the Wool Trade in the United Kingdom.

Table showing the Export of Foreign and Colonial Wool from the United Kingdom, from 1841 *to* 1859 *inclusive.*

Exports of foreign and colonial wool, 1841–1859.

	1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Sheep and lambs' wool...	2,554,465	3,637,789	2,734,541	1,924,826	2,609,161	2,899,852	4,780,748	6,540,410	12,324,415	14,054,815
Alpaca wool	...	...	...	47,848	53,192	112,128	28,977	35,174	126,082	333,859
Total Export.....	2,554,465	3,637,789	2,734,541	1,972,674	2,662,353	3,011,980	4,809,725	6,575,584	12,450,497	14,388,674

	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Sheep and lambs' wool...	13,711,723	11,266,939	11,697,004	24,467,284	29,412,462	26,597,809	36,356,348	26,587,426	28,829,980
Alpaca wool	18,264	49,994	28,365	41,979	41,004	81,984	130,871	114,116	276,770
Total Export.....	13,729,987	11,316,933	11,725,369	24,509,263	29,453,466	26,679,793	36,487,219	26,701,542	29,106,750

Observations on the preceding tables.

If the figures of the table of *imports* for the year 1859 be compared with those of 1843, it will be seen that whereas, in the last named year, the quantity of wool imported from foreign countries amounted to 57 per cent. of the total import, that proportion had been reduced in 1859 to 38 per cent. of the total import; the colonial import being of course proportionately increased from 43 per cent. to 62 per cent. of the whole. Or, to put it from another point of view, while the *foreign* import has increased during the last twenty years by 37 per cent., the *colonial* import has increased by nearly 640 per cent. Within the same period, the total import itself had been increased by upwards of 170 per cent.; and the total export (of foreign and colonial wool) by nearly 1150 per cent.

It will also be perceived, that the exceptional circumstances which, during the last few years, have characterized the history of the British possessions, both in Australia and in India, have had a very marked effect on the supply of wool from thence. The gold discoveries in Australia led to immense losses of sheep. To the ordinary enemies of the Australian wool-grower—drought, disease, and dingoes (or native dogs)—were added the lack of shepherds, and the inordinate increase of the demand for mutton. But these are essentially drawbacks of a temporary character. In like manner, the rebellion in India and its contingent results, have momentarily checked the supply of Indian wool, which was less by 5,000,000 lb. in 1859 than it had been in 1857. Inferior as this wool is in quality, it is useful for many purposes, and, under an improved system of government, its production will doubtless be largely increased, and its quality ameliorated. The rapid increase of the shipments of wool from the Cape colony is pre-eminently of good omen. A province which little more than twenty years ago produced but 70,000 lb. of wool, now produces 16,000,000 lb. By the liberal introduction of merinos, and by their judicious treatment in the colony, the old Barbary breed, almost as wild in appearance as the antelope, has been converted into a fine wool-bearing sheep. The Angora goat, too, has been recently introduced with good promise of success.

Prices of wool, July 1859 and July 1860.

The following tables show (1.) the current prices of the principal sorts of English and foreign wool, in July 1859 and July 1860 respectively; and (2.) the current prices of colonial wool at the same periods :—

(1.) English and foreign.

(1.) *Prices Current of English and Foreign Wool.*

Description.	July 1860. From	July 1860. To	July 1859. From	July 1859. To
	s. d.	s. d.	s. d.	s. d.
Down	0 11	1 5	1 1	1 5
Kent	0 11	1 2	0 11	1 3
Spanish	None offered		1 2	2 4
German	Do.		3 3	5 8
South America.....	0 3	1 8	0 3	1 6
Turkey	0 5	...	...	...
Egyptian.....	0 7	3 0	...	...

(2.) Colonial.

(2.) *Prices Current of Colonial Wool.*[1]

Description.	June 1860. From	June 1860. To	June 1859. From	June 1859. To
	s. d.	s. d.	s. d.	s. d.
AUSTRALIAN—				
Fair and Good Clothing.....	2 7	2 9	2 3	2 6
Inferior Do.....	2 1	2 4	1 10	2 1
Good Scoured.....	2 11½	3 1½	2 7	2 10
Inferior Do.....	2 4½	2 6½	2 1	2 6
Handwashed.....	1 11	2 1½	1 9½	2 1½
Lambs.....	2 0½	2 3½	1 11½	2 3½
Locks, Pieces, and Broken..	1 5½	1 8½	1 4½	1 6½
Grease.....	1 2½	1 5	1 1½	1 4½
Skin	1 6½	1 9½	1 5½	1 8½
TASMANIAN—				
Superior Combing.....	2 5	2 7	2 3½	2 5½
Fair Combing and Clothing	2 2½	2 4½	2 1½	2 3½
Inferior Do., do.....	2 0½	2 3½	1 10½	2 0½
Scoured.....	2 6½	2 10½	2 3½	2 7½
Good Lambs'.....	2 5½	2 9½	2 2½	2 6½
Fair Do.....	2 1	2 4	1 10½	2 1½
Inferior Do.....	1 8	1 11	1 5½	1 8½
Locks, Pieces, and Broken..	1 3	1 5	1 0½	1 2½
In Grease.....	1 3	1 6	1 0½	1 3½
Skin.....	1 9	2 0	1 6½	1 9½
PORT PHILLIP—				
Superior Combing and Clothing.....	2 5	2 7	2 3½	2 5½
Fair and Good Combing and Clothing.....	2 1	2 4	1 9½	2 0½
Inferior Combing & Clothing	1 5	1 8	1 4½	1 7½
Good Scoured	2 6½	2 10½	2 3½	2 7½
Good Lambs'.....	2 3½	2 6½	2 0½	2 3½
Fair Do.	1 11½	2 1½	1 9	1 11
Locks, Pieces, and Broken..	1 4½	1 8½	1 2½	1 6½
In Grease.....	1 2	1 4	1 1	1 3
Slipe and Skin	1 7	1 9	1 6	1 8
SOUTH AUSTRALIAN—				
Fair and Good Combing and Clothing.....	2 0	2 3	1 9	2 0
Inferior Flocks	1 7½	1 10½	1 5	1 8
Fair Lambs'.....	1 10	2 2	1 7½	1 11½
Scoured.....	2 1	2 5	1 10	2 2
Locks, Pieces, and Broken..	1 2½	1 6½	1 0	1 4
In Grease.....	1 0	1 2	0 11	1 2
Skin.....	1 3½	1 5½	1 1	1 3

[1] For the second of these tables we are indebted to the courtesy of Messrs Thos. Southey and Son, the eminent colonial wool-brokers.

Woollen and Worsted Manufactures.

Prices Current of Colonial Wool continued.—

Description.	June 1860. From	June 1860. To	June 1859. From	June 1859. To
	s. d.	s. d.	s. d.	s. d.
NEW ZEALAND—				
Fair and Good Flocks	1 11½	2 2½	1 9½	2 0½
Inferior	1 7	1 10	1 5	1 8
Lambs'	1 10	2 0	1 8	1 10
Skin	1 3½	1 5½	1 1½	1 3½
Grease	0 10½	1 0½	0 8½	0 10½
SWAN RIVER—				
Fair Flocks	1 10	1 11	1 7	1 8
Lambs'	1 10	...	1 8	...
EAST INDIA—				
White	0 8	1 2	...	...
Yellow	0 5½	0 11	0 1	1 0½

Description.	June 1860. From	June 1860. To	June 1859. From	June 1859. To
	s. d.	s. d.	s. d.	s. d.
SOUTH AFRICAN OR CAPE—				
Good Flocks	1 11½	2 2	1 9	1 11½
Fair Do.	1 6½	1 10½	1 4	1 8
Inferior and Ill-conditioned Flocks	1 3½	1 5½	1 1	1 3
Lambs	1 9	2 0	1 6½	1 9½
Superior Scoured	2 0	...	1 5½	1 8½
Inferior Do.	1 7	1 9	0 9½	0 11½
Pieces	1 0½	1 1½	0 10½	0 11½
In Grease	0 10	1 0	0 9½	1 0½

Woollen and Worsted Manufactures.

The most noticeable circumstance in the recent sales of colonial wool, is the large increase of the demand for France. The quantity offered at the sales of May and June 1860, was 67,000 bales, of which nearly 25,000 were taken by French buyers,—an unprecedented proportion. Our export of colonial and foreign wool to France in 1854 was 8,489,255 lb.; in 1856, 12,204,242 lb.; in 1858, 11,656,649 lb.; and in 1859, 12,214,600 lb. That of British wool was, in 1854, 9,509,731 lb.; in 1856, 12,031,295 lb.; in 1858, 10,789,530 lb; and, in 1859, 6,170,228 lb. (E. E.)

WOOLLEN AND WORSTED MANUFACTURES.

I.—THE ANCIENT AND MEDIÆVAL MANUFACTURES OF WOOL.

WOOL seems to have been the staple material of the primitive weavers of Palestine, Syria, Greece, Italy, and Spain. In the industry of all those "flock-abounding" countries (to use the fine epithet which Pindar applies to Libya "πολυμήλος"),[1] the fleece played a part as characteristic as that of flax in Egypt, of cotton in India, or of silk in Central Asia. The woollen fabrics both of Greece and Italy attained especial excellence. The fame of Attic wool was spread abroad at far distant periods—from that of the ancient author cited by Athenæus,[2] to that of the Roman poet Liberius,[3] according to whom

> "Nihil refert molle ex lanitiâ Atticâ,
> An pecore ex hircorum vestitium geras.

The woollen manufactures of Greece;

The Greeks carried their skill in manufactures to their colony of Byzantium. Thither also, in process of time, came first the products, and then the industrial arts of Persia, of India, and of China. Constantinople became a centre of textile industry of all kinds. But its woollen fabrics were especially famous, both for beauty and variety. From Constantinople these and many other branches of skilful labour were disseminated throughout the newborn Italy. It is noticeable, that in this industrial mission monks bore a distinguished part; as, indeed, they had already done in bringing the arts of China to Constantinople. Early in the thirteenth century, some friars of St Michael (*alcuni Umiliati di S. Michele d'Alessandria* they are termed by the historians), established a woollen manufactory in Florence, apparently with processes much superior to those theretofore in use, which was signally successful, and became the model of many others; as at Rimini in 1261; at Perugia in 1279; and elsewhere. Within not very many years afterwards there were, says one of the historians of Florence, more than 200 shops of clothworkers (*botteghe di lanaiuoli*)[4] in that city alone. Villani, speaking of a period somewhat later, adds to a like statement of the number of shops, that there were made in them "from 70,000 to 80,000 cloths, worth upwards of 1,200,000 golden florins, more than a third of which sum was for wages."[5] Thirty years earlier (namely about 1310) there had been, he proceeds to say, about 300 shops, or thereabouts, making 100,000 cloths, but these were coarser fabrics, and of less value, "since we had then no English wool, nor did we know how to work it, as we afterwards learned to do." Early in the following century we have accounts of Mohair tissues, made at Perugia, which found their market at Cagliari. It was destined, however, that the textile industry of wool was only to strike a really deep root in Flanders, in Britain, and in France.

and of Italy.

The history of the woollen manufactures of Flanders has an especial interest, but it must needs be passed over. It is to Flanders that Britain owes some of her best instructors in those manufactures, although the craft of woollen weavers has older records in British annals than it has in those of the Netherlands, and even that of cloth-workers has an ancient as well as an honourable standing amongst us. The "scarlet cloths of England" figure in the chronicles of Orkney as early as the twelfth century, when a daring Orkney pirate made a successful "scarlet cruise."

Early woollen manufactures of England.

The *Gilda Tellariorum* is the oldest of the London companies. It possesses a charter of Henry I., which enacts that none but members "shall have power to intermeddle with their craft (*quod nullus se intromisit de eoram misterio*") within London, Southwark, or the parts adjacent. This charter was confirmed by Henry II. and by Edward I.; but in the 14th of Edward II. the privileges claimed under it were brought into question by a writ *de quo warranto*. The jury found that the powers of the charter had been exceeded, by the framing of new and unauthorised ordinances and by-laws, which had checked the progress of the clothing trades. Thirteen years before the date of the inquiry, say the jurors, there were above 280 burrillers (the burriller or burler is the workman who raises the nap of cloth with the teazle), and now but 80." The company had to moderate its pretensions, but it continued to exercise an important jurisdiction for several centuries.

The Company of Cloth-workers; and that of Merchant Tailors.

The company of drapers was not regularly incorporated until 1364, but it was already a community, possessing lands, in the twelfth century. Originally, the word "draper" meant not the dealer in cloth but the manufacturer, and the verb "to drape" covered the whole art of clothmaking. After a time, "clothier" came to be a specific term for the maker, but "draper" was still used both for the maker and the vendor. The term "cloth-worker" indicates the dresser and finisher of the fabric, but does not seem to have been used officially until the time of Henry VIII. The former designation was "cloth-shearer," or, more usually, "shearman." The shearmen's company was an offshoot of the drapers, and received a separate incorporation from Edward IV. in 1480. Henry VIII. united the shearmen with the fullers, and gave to them, conjointly, the name of "clothworkers" in 1528.

The tailors (now called "merchant tailors") or "fraternity of the scissors" (*fraternitate scissorum*) date, as a chartered community, from the year 1399. Anciently, they made all kinds of apparel, whether of wool or of linen, and also the padding of armour. Hence their designation, in several charters, as "linen-armourers." When they became dealers in cloth they were termed "merchant

[1] *Pyth.* ix. 11.
[2] Deip. xii. p. 540.
[3] In a passage, cited by Nonius Marcellus, which we quote from Mr Yates' excellent volume, entitled, *Textrinum Antiquorum*, a book which, like many other good books, has one serious defect, that of having remained unfinished.
[4] Denina, *Delle Rivoluzioni d'Italia*, ii. 372.
[5] Villani, *Istorie Fiorentine*, vii. 203.

Ancient and Mediæval Manufactures.

tailors;" and, from their possession of various tenter-grounds, it has been inferred[1] that they dealt in cloth collectively as well as individually. But the supposition lacks conclusive evidence, and seems on its face improbable. The tenter-grounds may have been provided, either as trading facilities to be enjoyed by the members in common, or as means for exercising that jurisdiction over trading processes, which was originally the distinctive function of the mercantile guilds.

Other guilds of workers in wool.

Besides the weavers, drapers, clothworkers, and merchant tailors, there were other chartered companies concerned with the great woollen manufactures of the realm. Of these minor companies, the dyers, burrellers,[2] and worsted-workers, were the chief. The last named guild belonged at first to Worsted in Norfolk,

The origin of the worsted manufacture.

whence the name of their fabrics. In its primary sense, a "worsted fabric" meant a manufacture from wool, combed, not carded. But those incessant changes in machinery which, amongst other striking tendencies, seem to have that of assimilating textile processes, whatever be the raw material, have rendered the old definition insufficient. It must now be said, that "worsted" means a fabric made wholly or partially from wool, which has been either combed, or combed *and* carded. The mixture in the worsted manufacture of wool with other materials has spread so rapidly, that a worsted fabric may almost be described as essentially a mixed fabric.

Bacon has set his stamp on the mercantile guilds of his own time, by calling them "fraternities in evil." Now-a-days, when so many of the loudest voices are agreed in asserting, that the "wisdom of our ancestors" *must* have been foolishness, it seems obvious that to speak of a guild is to speak of a mischievous absurdity, now happily obsolete. Here, however, it will suffice to suggest, that many of the functions of those trade corporations which have played so conspicuous a part in the history of our manufactures, were probably of real importance, and their action of real worth and service in their day. Like other and higher bodies, they degenerated when that day was over.

Settlement of foreign cloth-weavers.

In 1331, Flemish clothweavers were invited by Edward III. into England, and were established under his protection in the free exercise of their art. Other like invitations were given in 1336 and in 1337. In an act of the latter year (11 Edward III.), there is a clause providing that foreign clothweavers may come safely into the king's dominions. "Happy the yeoman's house," says old Fuller, in his characteristic way, "into which these Dutchmen did enter, bringing industry and wealth along with them. Such who came in strangers, soon after went out bridegrooms, and returned sons-in-law, having married the daughters of their landlords who first entertained them; yea, those yeomen in whose houses they harboured soon proceeded gentlemen, gaining great estates."

This successful inroad of foreign artizans excited much discontent amongst the native clothmakers. They broke out into riotous attacks on the new comers, who had to be protected by extraordinary measures. The manufacture spread, but was soon subjected

Taxes levied on woollens and worsteds.

to taxation. An impost was levied of 1s. 2d. on every broadcloth exported by English merchants, and of 1s. 9d. on every broadcloth exported by strangers; and other imposts of 1d. and 1½d. respectively, on every worsted cloth so exported. In 1347, the commons petitioned that these duties might be repealed. They were answered that the king and the lords "will that the custom shall stand; for it is good reason that such a profit be taken off cloths wrought within the realm and carried forth, as of wools of the land; rateable the cloth as the sack."

Growth of the Norwich trade.

The tissues first made at Worsted soon became the staple trade of Norwich, which rapidly attained importance as a great seat of manufactures. In 1388 an ordinance was made that no citizen should buy worsted goods of any country weavers, unless they set up their stalls at a certain place called the *Worsted Celde;* and wardens of the worsted weavers were appointed to oversee the business. The powers of these wardens were increased in 1442. In 1513 an act of parliament (5 Hen. VIII. c. 4) recites that whereas "worsteds which be truly made, shorn, dyed, and calendered, as of old time hath been accustomed, have been one of the goodliest merchandizes . . . of this realm, and also much used in other realms; and that now of late divers strangers beyond the sea have taken upon them to dry-calender worsteds with gums, oils, &c., to the injury of the said tissues"—such dry calendering is to be strictly prohibited within the realm, and wet calendering is to be practised only by persons duly bred thereunto. Two years later, an *Act of Apparel* (5 Hen. VIII. c. 6) renewed the prohibition that any person under the degree of a baron shoud wear any woollen fabric woven abroad, "except in bonnets." But the new fashions were too strong for the old laws, and the English weavers had to set to work on fabrics of a more attractive kind, after the example of their foreign rivals.

Progress in the United Kingdom.

There is a presumption, but no proof, that some of the earliest Norfolk weavers of woollens were Flemings. There is clear evidence that, in the early period of the manufacture, foreigners met with a better welcome there than in London. The Rolls of Parliament abound with entries relating to the almost incessant disputes between the London guilds and the alien weavers, to whom, at their first settlement, Edward III. had given an exemption from the authority of the guilds. These now strove to bring the new comers under rule, while the foreigners sought the confirmation of their immunity. In this way the natural progress of the woollen trade in the metropolis was materially checked, and an advantage was given to the clothiers of Norfolk.

Disputes between the alien clothiers and the London guilds.

Devonshire, too, attained a conspicuous place in the woollen manufacture at an early date. "Hose of fine Totness" occur not unfrequently in the chivalric romances, and in other primitive works of our literature. Worcestershire, at a somewhat later date, won distinction in the same branch of industry. *An Act for Clothiers within the Shire of Worcester* (25 Hen. VIII. c. 18, 1533) recites that, "in times past," the inhabitants of Worcester, Evesham, Droitwich, Kidderminster, and Broomsgrove, "made long cloths, short cloths, whites, browns, and blues, . . . and that of late divers persons in the hamlets, thorpes, and villages adjacent, nothing regarding the upholding of the said city and towns, nor the poor people which had living by the same, have become . . . husbandmen, and do also occupy the mysteries of clothmaking, . . . to the great depopulation and ruin of the said towns." It then forbids that any such clothmaking shall be carried on within Worcestershire, except in the towns first named. But Worcester did not recover its old prosperity in the woollen trade. Thirty-five years after the passing of this act, we find it asserted, in a state paper, that "the decay of Worcester clothing hath especially grown by translating their drapery from short and coarse usual cloths which commonly hath vent, into long and chargeable cloths, the utterance whereof dependeth upon the Low Countries, and so is most subject to restraints and prohibitions."[3]

The woollen fabrics of Devonshire; and of Worcestershire.

This invasion of urban industry by the insidious husbandmen—so much deprecated when it began, and so much lamented since it passed away—was repeatedly made the subject of legislative prohibition. An act of 1542 makes, respecting the "friezes and cottons" woven from the wool of Wales, a like statement to that of the act of 1533 regarding the broadcloths of Worcestershire, and proceeds to charge the husbandmen with weaving their wool "after the most false and deceitful manner." But denunciations like these lose much of their force when, in reading the statute-book or the state papers, we find them repeated on almost every occasion of manufacturing rivalry. Whenever a town or a privileged company tries to put a spoke in the wheel of a competitor, its actuating motive, according to its own showing, is never the lust of trading gains, but always the love of trading integrity.

II.—PROGRESS OF THE WOOLLEN AND WORSTED MANUFACTURES OF THE UNITED KINGDOM.

The woollen manufactures of Berkshire, *circa* 1550.

Towards the middle of the sixteenth century, Berkshire seems to have taken the lead in the English woollen manufacture. John Winchcombe—"Jack of Newbury," as he was popularly called—was indisputably the prince of the clothiers of his time. The hundred looms which worked incessantly in his house, and the hundred journeymen whom he equipped at his charges and led to Flodden, were the admiration of his contemporaries, and are probably the best known incidents of our early manufacturing history. How highly his wares were esteemed abroad as well as at home is curiously shown in a letter addressed by William Damosell, English envoy at Antwerp, to the Lord Protector Somerset in 1549:—"I find wondrous little profit," he writes, "to be had presently, either in cloths or kersies."[4]

[1] Herbert, *History of the Twelve Companies of London*, ii. 389.

[2] We have elsewhere described the burrellers as "burlers," a term still in use in the trade. But it is well to note that Mr Herbert, in his valuable book just quoted, describes the burrellers as "a mystery for inspecting as well as making and sealing cloth."

[3] "Notes of Conferences," &c., MS., *Domestic Papers of the Reign of Elizabeth*, xlvi. § 5 (State Paper Office).

[4] Damosell to Somerset, 25th May 1549, MS. in *Flanders Correspondence*, vol. xvi. (Rolls House Repository).

Progress in the United Kingdom.

But, as the Protector had just then to provide for the payment of a large debt to the Antwerp money-lenders, and might find it expedient to send to the Antwerp market some English fabrics, "it shall be best," he adds, "to have hither 1000 of Winchcombe's karsies."

In these days the old clothing-towns of Berkshire offer to the glance of the passing traveller but few signs of their ancient manufacturing prosperity. Their present importance depends mainly upon the agriculture of the surrounding district, and they wear a somewhat sleepy look, save on market-days. But observant eyes may yet see two evidences, at least, of their old flourishing condition. Many a substantial and stately mansion, built by a thriving clothier, is now subdivided into a number of humble tenements. And the superabundant almshouses tell, in their turn, of the copious charities by which those thriving clothiers testified their belief that the wealth they had won was not all their own. Nowhere are these evidences more striking than in the birthplace of old "Jack of Newbury."

Foreign cloth-makers settled by the Protector Somerset at Glastonbury.

The short protectorate of Somerset, stirring as it was, is marked in the history of our woollen manufacture by the settlement, at the cost of the Protector himself, of a colony of foreign clothmakers at Glastonbury. Their establishment, on a site hitherto devoted to very different purposes, was one of his first acts after he had obtained the royal grant of some of the rich possessions of the Benedictines. His fall quickly followed the commencement of the enterprise; but amongst the earliest grants made by the privy council out of his forfeited estates were those of L.1000 (a very large sum for such a purpose in those days), "to provide necessaries for the several mysteries and occupations of the strangers at Glastonbury;" and of certain allotments of land "to thirty-six households of the strangers there."[1] Had it not been for the change of circumstances which followed the accession of Mary, the local results of this infant enterprise would probably have been important.

A new era in the woollen and worsted trades opens with the reign of Elizabeth. On the one hand, they were largely promoted by the liberal encouragement given to the Flemish exiles (see WEAVING); on the other, they were for a time hampered by many monopolies and restrictions, growing partly out of errors of policy, but mainly out of the avidity of that crowd of brilliant but leech-like courtiers who basked, indeed, in the queen's smiles, but never lost sight of our homely English proverb as to the right use to be made of sunshine.

Privileges, licenses, &c.

The history of the "privileges," "licenses," and "monopolies," by which our woollen and worsted manufactures, like so many other branches of industry, were for a while impeded, would form by no means the least curious chapter in the narrative of the rise and progress of British trade,—a story yet really untold, notwithstanding the many books about it,—and would throw light on many things beside. Here, of course, we can give but the briefest glance at this part of the subject.

Johnson's correspondence on the woollen manufactures.

Among the many unused stores of our State Paper Office, is a portion of an extensive correspondence between one John Johnson and some of Elizabeth's ministers, more especially Walsingham, about the means of promoting trade, and of making it as profitable as possible to the promoters. Johnson had a fertile brain, and was perpetually suggesting projects for developing, at one time, the trade in wool; at another, the textile manufactures of the country, whilst intent, at all times, on improving the fortunes of his patrons as well as his own.

His proposal for a staple mart at Ipswich.

At this date, the main trade in the export of English woollens was in the hands of the great company of Merchant Adventurers, and a large proportion of their exports was of cloth undressed. Johnson, as the representative of the Merchants of the Staple (whose interest lay in the utmost possible export of the raw material), having vainly endeavoured to obtain some check to the large powers of the Adventurers—whose mart was then at Antwerp—set to work to persuade the government to remove the staple of cloth from Antwerp to Ipswich. He told the council that by allowing the Adventurers to export undressed cloth, 10,000 or 12,000 people were set on work beyond seas instead of at home. But he acknowledges that the workmen of the Low Countries gave a much needed example to those of England, where, he says, "the untruth used in making of cloth is not only a great offence to God, ... but also a great offence and enormity to the common weal," whereas, abroad, "their clothing is such as no man can be deceived in the buying, ... and they have thereby drawn the traffic of merchants unto them."[2] But the project of "an English Antwerp" not meeting with the favourable acceptance of the council, Johnson then entreats Walsingham that the Merchants of the Staple may share with the Adventurers in the licenses to export undressed cloths to the Netherlands" and by this," he adds, "every one of your honours before named shall have L.600 yearly at the least."[3] Their "honours before named" were Walsingham himself, Burghley, Sir Christopher Hatton, and the Earl of Bedford, all of whom appear to have been "free of the Staple." In another letter, he writes,—also to Walsingham,—"I received your honour's of the 1st December, proving thereby your honour's liking of the erecting of a staple *of wools* in England, *to serve strangers to occupy in their arts*, ... but your honour would be certified what profit may grow to her Majesty, and what the Merchants of the Staple will give to him that shall procure the same to be brought to pass." To the first question, he answers, that the customs "will be at least L.12,000 more than now." To the second he says, "Now, to give anything for the obtaining of such a matter whereby her Majesty shall have so great profit, I perceive no mean nor way;" but he adds, there will "proceed benefit unto you, and to me under your honour, in the executing of the office of trust that of necessity belongeth unto the same."[4] This particular project fell to the ground. The system of exporting woollens partly under the privileges of the incorporated companies, partly by licenses granted to favoured individuals, amongst others, to Leicester, Walsingham, and Burghley (of the working and proceeds of whose licenses curious particulars may be seen in the State Paper Office), was continued for many years.

Progress in the United Kingdom.

Extent of the export trade in English woollens, *temp.* Eliz.

Some indication of the extent, under that system, of the foreign trade in woollen cloth of English manufacture, will be found in the following summary of the customs paid thereon, in the port of London, during the first eighteen years of the reign of Elizabeth:—

Year.	Amount of Customs paid on Woollens. L.	s.	d.	Year.	Amount of Customs paid on Woollens. L.	s.	d.
1558–59	30,950	8	0	1567–68	31,553	6	10
1559–60	37,228	16	11	1568–69	32,594	17	0
1560–61	27,604	13	6	1569–70	30,713	15	10
1561–62	25,250	4	7	1570–71	26,893	15	0
1562–63	19,645	16	10	1571–72	22,971	15	3
1563–64	19,195	6	1	1572–73	26,901	4	4
1564–65	45,439	6	6	1573–74	31,035	17	5
1565–66	27,872	17	10	1574–75	33,410	12	0
1566–67	23,319	12	5	1575–76	33,000	0	0[5]

Another statement of the woollen trade, *circa* 1603.

About twenty years later, in a paper ascribed (but on doubtful evidence) to Raleigh, it is stated that, on the average, about 80,000 undressed and undyed cloths had been annually exported from England, during the preceding half century, whereby, concludes the writer, "L.400,000 per annum, for fifty-five years past, has been lost to the nation, which sum, had the said cloths been dressed and dyed at home, would have been gained, beside the farther enlarging of traffic by importing materials for dyeing." "Moreover," he adds, "there have been annually exported in that time, in bayes, northern and Devonshire kersies, all white, about 50,000 cloths. .... Our bayes are sent white to Amsterdam, where they are dressed, dyed, and shipped for Spain and Portugal. There, they are sold by the name of Flemish bayes, so that we lose the very name of our homebred commodities."[6]

Patent of James I. to the Duke of Lennox for the "new draperies."

Elizabeth's liberality to her courtiers had been occasionally modified by her shrewdness of judgment, and her amenability to better counsel. The profuseness of her successor (when giving away what was not his own) encountered no such obstacles. The results of Elizabeth's experience in this direction were open to James, but he learnt nothing from them. An inquirer into the history of our trade can rarely meet with a more significant document than that entitled, *Demands of the Right Hon. Lodowick, Duke of Lenox, Patentee to the King's Majesty of the New Draperies.* It contains at once a summary of a leading staple trade of the realm, as it then stood, and a pregnant and typical indication of that Stuart policy, the folly of which was equalled only by its paltriness, and by the tenacity with which it was clung to in the face of all warning.

---

[1] *Register of the Privy Council*, 5 Edw. VI., 22d March and 29th Nov. 1551, vol. i. pp. 519, 650, MS. (Privy Council Office).

[2] "A briefe declaration of the proffits, honors, and comodities ... by the erecting of the ... Staple of Cloths in Englande," &c., MS., *Domestic Papers of Eliz.*, vol. cliv. § 30 (State Paper Office).

[3] Johnson to Walsingham, June 1582, ibid. § 31. See also a Memorial, entitled *Ipswich out of England, or Antwerpe in England*, ibid., lxxxviii. § 22.

[4] Johnson to Walsingham, Dec. 1582, ibid., clvi. § 3.

[5] "A note of the particular somes yerely receyved for custome within the porte of London," &c., MS., *Dom. Papers, ut sup.*, clvii. § 59. (State Paper Office).

[6] *Select Observations relating to Trade*, &c. 6, 7.

Progress in the United Kingdom.

The demands of this ducal "patentee to the king's majesty" on craftsmen, the fluctuations of whose trade had repeatedly and notoriously brought large numbers of people to the brink of starvation, and had more than once already put the government itself into great peril, were of four sorts:—(1.) He demanded on forty-five several varieties of fabrics (including satins, bombasines, mohairs, and worsteds of all sorts), if exceeding the breadth of 6 inches, fourpence for every 64 lb. by weight, and for the ullnage (or measuring) of every 24 yards, a halfpenny; (2.) On mixed wares (such as darnex or diapers, carpetings, linsey woolseys, tobines, coverlets, and scarves), the like rates; (3.) On all narrow wares (such as staylaces, girdleings, garterings, girthwebs, and Norwich laces), a like rate of fourpence by weight, together with "such ullnage as the Court of Exchequer shall please to order, as compensation for the ascertainment of the true contents as between buyer and seller; (4.) On all stockings, woven or knit, of worsteds, Jersey or woollen yarn, string, crenell, and all other stuffs, the like rate, but without ullnage.[1]

Litigation between the patentee and the manufacturers.

The worsted weavers objected that "the king's grant and letters patent are not available by law;" the Darnex weavers, that neither subsidy nor ullnage is due by them by the laws of the realm; and a like objection was taken by the stocking-knitters.[2] A long litigation ensued, with the natural consequence of great injury, not only to those who were parties to the various suits, but to the entire trade. The patent had been granted in 1606. The litigation was still in progress in 1619. Its voluminous story may be seen in the papers of Sir Julius Cæsar (who was then master of the rolls), now preserved in the British Museum.

Depression of the woollen trade from the reign of Charles I. to that of Charles II.

Under the Stuarts, and during the Commonwealth, both branches of the woollen trade were almost constantly depressed. There were frequent disputes between the Merchants Adventurers and the "interloping" merchants, of which advantage was repeatedly taken during the civil wars for the raising of loans, to be repaid (at least in part) only by the enlargement or confirmation of privileges for exclusive trading. Under the Restoration, the merchants of Exeter petitioned parliament against the continuance of the privileges of the adventurers. They stated that, by the restraints recently put upon them, the woollen trade of Devonshire had greatly fallen off. The reply of the company alleged, that the decline of the woollen and worsted trade was solely owing to the want of vent abroad, and that, of their last year's shipments, they had then lying in their warehouses at Hamburgh, unsold, not less than 14,000 stuffs, besides other fabrics, "to the amount of near 30,000 cloths." To such an extent had the growth of the continental manufactures, together with an unwise policy at home, affected the market for English goods.

Relative extent of the home and export trades in woollens in 1688.

Of the relative extent of the home and foreign trades in woollens, no very trustworthy account can be given until the date of the Revolution of 1688. At that period some questions of taxation led to the preparation of an official account of the manufacture and consumption of such woollen and worsted fabrics as were in chief demand. This statement is preserved amongst the Lansdowne MSS., and runs thus:—

An Account of Woollen Manufactures Made, Exported, and Consumed, 25th December 1687 to 25th December 1688.

Nature of Fabric.	Total No. made.	No. Exported.	No. consumed at Home.
Serges, perpetuanos, sayes, and stuffs (Norwich stuffs excepted)	682,200	390,000	292,200
Kerseys, single dozens, Penestones, single bayes, Devons, Dunstables, and Dorsets, Spanish cloths, short cloths, double dozens	266,686	88,210	178,476
Under the denomination of short cloths	111,150	21,392	89,758
Long cloths	48,260	29,943	18,317
Miniken bays	9,600	5,660	3,940
Colchester bays and double bays	86,000	35,565	50,435
Total (exclusive of crapes, camblets, Norwich stuffs, &c.	1,203,896	570,770	633,126[3]

Progress in the United Kingdom.

It is stated in a note to this paper, that the estimated yearly value of the woollens exported, taking an average of the preceding twenty years, "doth not exceed two millions sterling." Under the government of William, however, it rapidly increased. Gregory King's estimate of the entire value of the woollen manufactures of England, at a period not very distant from that of this official account, was L.8,000,000, a statement which has been endorsed by many eminent writers on trade, but which is scarcely reconcilable with the document we have quoted.

Estimated value of the woollen exports.

Growth of the woollen manufactures of the West Riding.

We have now reached a date at which Yorkshire begins to occupy an important position in the history of our subject. It was still very far from the predominant place it holds in our own day, but quite as far from the insignificant one which is so curiously indicated in the preamble to an Act of Philip and Mary, where we read that certain exceptional immunities ought to be granted to the parish of Halifax, "forasmuch as that parish and other places thereunto adjoining, being planted in the great wastes and moors, where the fertility of ground is not apt to bring forth any corn, nor good grass but in rare places, . . . and the inhabitants . . . live by clothmaking, and the greater part of them neither getteth corn, nor is able to keep a horse to carry wools, nor to buy much wool at once, but hath ever used only to repair to the town of Halifax, and some others nigh thereunto, and there to buy upon the wool-driver, . . . according to their ability, and to carry the same to their houses, some three, four, five, or six miles off, upon their heads and backs," &c.[4] Defoe, in his *Tour through Great Britain*, written about 1714, bears testimony to the importance of the Halifax manufacture of kerseys, and speaks of the then recent introduction thither of worsted fabrics. A writer of 1741, after describing the productions of certain manufacturing towns of the south-eastern and midland counties, proceeds to say:—"Yorkshire hath rivalled them since, by underworking them, and very much decreased their trade, as also lowered their prices; they have also robbed the east and west."[5] "Thenceforward, Yorkshire rapidly became the chief seat both of our worsteds and of our woollens.

Extent of the woollen and worsted trades in 1772.

Some elaborate accounts which were prepared in 1772, for a Committee of the House of Commons, afford a comprehensive view of the then position of both these main branches of trade. The aggregate annual value of the manufactures made in Yorkshire and Lancashire from short wool are stated at L.1,869,700, and that of those made from long wool at L.1,404,000; making, together, L.3,273,700. The details are as follows:—

TABLE I.—*Export and Home Consumption of the Woollen and Worsted Manufactures of Yorkshire*, 1772.

Nature of Fabrics.	Export.			Home Consumption.			Total.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.
Clothing or short wool	1,248,741	12	10	620,959	2	9	1,869,700	15	7
Combing or long wool	1,123,200	0	0	280,800	0	0	1,404,000	0	0
Total	2,371,949	12	10	901,759	2	9	3,273,700	15	7

TABLE II.—*Estimated Proportions of Raw Materials and of Labour in the Woollen and Worsted Manufactures of Yorkshire*, 1772.

	Materials.			Labour.			Total.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.
Clothing or short wool	623,233	11	10	1,246,467	3	9	1,869,700	15	7
Combing or long wool	234,000	0	0	1,170,000	0	0	1,404,000	0	0
Total	857,233	11	10	2,416,467	3	9	3,273,700	15	7

Relative proportions of labour and material in the two branches.

One of the most salient features in these tables is the enormous proportion borne by the value of the labour to that of the raw material used in the worsted manufacture. Whilst the wool carded woven, and worked into cloth is trebled in its value, that combed, woven, and finished into stuffs and mixed fabrics is multiplied six-fold. At the date of the estimate, the worsted manufactures of

[1] "Demands," &c., MS., *Domestic Papers of the Reign of James I.*, xxiv. § 1, 2 (State Paper Office).
[2] "The Worsted Weavers' Allegations," &c., MS. in the *Cæsar Papers* (British Museum, Additional MSS. 12,504, § 64).
[3] Lansdowne MSS., dcccxlvi. 284 (British Museum).
[4] 2 and 3 Phil. and Mary, c. 13, *An Act for the Inhabitants of Halifax*, &c.
[5] "A Short Essay upon Trade in general" (1741), as quoted by Mr James, in his very able book, *History of the Worsted Manufacture in England* (1851).

Progress in the United Kingdom.

Yorkshire were computed to employ 84,000 persons; those of Norwich and the wide district connected with it, 72,000; making a total of 156,000 persons, women and children included,—earning, however, on the average, but from five to six shillings weekly.

We have seen that the annual export of the fabrics of Yorkshire alone was estimated in 1772, in round numbers, at L.2,372,000. That of the fabrics of the remainder of the kingdom was estimated at L.1,958,000, making a total value of L.4,330,000. Of these exported fabrics, America took about one-fourth; Spain, Portugal, and the Italian States, each about one-eighth. Holland took somewhat less than a tenth; the various German States, collectively, about one-seventeenth. The East Indies took about the same proportion as Germany.

Improvements of machinery (see subsequent section).

Thenceforward, the history of our woollen and worsted fabrics is closely connected with the development of the powers of machinery: less so, indeed, than that of some other branches of our textile industry, but still in a very important degree. The more conspicuous inventions affecting the manufactures from wool will be noticed in a subsequent section of this article: here we can only indicate results, and that, of necessity, in but a cursory manner.

In the preceding article (Wool and Wool Trade), we have noticed the false position in which the manufacturers found themselves in relation to the heavy tax on the importation of foreign wool. Their stubborn insistance on the non-exportation of home-grown wool was a weighty and a just obstacle to their endeavours to remove an impost which lay like an incubus on their own industry. In 1820 and 1821, however, they made vigorous efforts to escape from this pressure. They alleged, in petitions to parliament, that the exports of woollen manufactures had decreased in three years by nearly two millions sterling, and those of worsted and mixed wares by nearly three quarters of a million. The general view of the state of the entire foreign trade, as submitted to the legislature in 1821, ran thus:—

State of the export trade, 1819 to 1821.

Exports of Woollens and Worsteds, 1819–1821.

Year.	Value of Fabrics made from Short Wool only.	Value of Fabrics made from Long Wool only.	Value of mixed Fabrics.	Total value of Exports.
	L.	L.	L.	L.
1819	5,829,573	2,603,854	614,532	9,047,959
1820	4,364,334	2,146,381	391,972	6,899,687
1821	3,742,059	2,208,925	328,180	6,279,164[1]

The incidents which attended the repeal of the tax on foreign wool have also been noticed in the preceding article (Wool and Wool Trade). Under free importation, the trade in worsteds and mixed fabrics improved, but only by slow steps. Many adverse circumstances had to be struggled with both abroad and at home. In 1826, the total export of woollen and worsted *stuffs* was 1,125,308 pieces; in 1827, 1,258,667 pieces. At this point, that class of exports continued nearly stationary, until 1831, when it advanced to 1,487,404 pieces. In 1832, it reached 1,800,714 pieces, and then declined a little for several subsequent years, when it again made considerable and steady progress. In 1831, the United States was our best customer; Germany came next, and then the East Indies and China. In the main, this continued to be the state of the foreign trade in stuffs for a considerable period.

Progress in the United Kingdom.

Progress of the stuff trade;

The export of woollen cloth, on the other hand, had fallen off materially. In 1816, the number of pieces exported had been 636,368. In 1826, the number had fallen to 384,508 pieces. It then, under free importation of foreign wool, recovered by degrees, but the amount of export of 1816 has never since been permanently attained. The enormous difference between the fortunes which have attended the cloth trade and the worsted stuff trade, respectively, will be best exhibited in a tabular shape, and may be brought down to the present period. The comparison will stand thus:—

contrasted with the decline of the export cloth trade.

Comparative Export of Woollen Cloth and of Woollen and Worsted Stuffs, 1816–1859.

Fabrics.	1816.	1826.	1846.	1856.	1859.
Woollen Cloth, *Pieces*.....	636,368	384,508	288,580	651,246	574,240
Woollen and worsted Stuffs, *Pieces*	593,308	1,138,588	1,748,430	2,219,090	2,721,941[2]

Many causes have combined to bring about this striking contrast. In the worsted manufacture, the machinery and processes have been largely improved; many new materials, combining beauty with comparative cheapness, have been introduced; and the changes in taste and fashion have been assiduously watched, and ingeniously turned to account. In these respects, British worsted manufacturers have had advantages over their foreign rivals which have not fallen to the lot of the woollen manufacturers.

Causes of this contrast.

During the last fourteen years, the declared real value of our aggregate exports of woollen and worsted manufactures of all kinds has increased from L.6,335,102 to L.12,053,708; whilst that of woollen and worsted yarns has increased from L.908,270 to L.3,104,061. The details are as follows:—

Value of the exports of woollens and worsteds, 1846 to 1859.

Declared Real Value of British Woollen and Worsted Manufactures Exported, 1846 *to* 1859.

Description.	1846.	1847.	1848.	1849.	1850.	1851.	1852.
	L.	L.	L.	L.	L.	L.	L.
I. Cloth of all kinds, Coatings, &c.....	1,605,258	1,613,048	1,322,167	1,814,649	2,692,492	2,572,181	2,683,395
II. Mixed Stuffs, Flannels, &c.....	1,741,839	2,321,692	1,840,038	2,413,625	2,882,607	2,822,961	3,015,283
III. Worsted Stuffs.....	2,745,666	2,709,639	2,342,911	2,827,933	2,689,042	2,679,003	2,733,804
IV. Other kinds	242,339	251,659	228,712	286,516	324,549	303,038	298,452
Total of Woollen Fabrics of all kinds	6,335,102	6,896,038	5,733,828	7,342,723	8,588,690	8,377,183	8,730,934
Woollen and Worsted Yarns.....	908,270	1,001,364	776,775	1,090,223	1,451,642	1,484,544	1,430,140

Description.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
	L.	L.	L.	L.	L.	L.	L.
I. Cloth of all kinds, Coatings, &c.....	2,923,515	3,089,334	2,371,324	2,762,622	3,030,788	2,548,394	2,905,756
II. Mixed Stuffs, Flannels, &c.....	3,641,767	3,050,548	2,503,984	3,220,011	3,699,324	3,388,313	4,220,480
III. Worsted Stuffs.....	3,106,609	2,565,474	2,368,451	2,833,541	3,325,564	3,326,731	4,208,921
IV. Other kinds	500,291	415,403	474,615	684,254	647,699	513,506	718,551
Total of Woollen Fabrics of all kinds	10,172,182	9,120,759	7,718,374	9,500,428	10,703,375	9,776,944	12,053,708
Woollen and Worsted Yarns	1,456,786	1,557,612	2,026,095	2,889,642	2,941,800	2,966,923	3,104,061

[1] *Statements of the Manufacturers*, printed by Bischoff, ii. 16.

[2] *Statistical Abstracts*, published by the Board of Trade, *passim*.

Progress in the United Kingdom.

Principal seats of the woollen cloth manufacture;

and of the worsted manufacture.

Leeds, with its surrounding townships, has for several generations held the first place among our clothing towns. Broadcloth, cloakings, beavers, mohairs, cashmerettes, and tweeds, are conspicuous in the long list of its fabrics. Huddersfield distinguished itself in the Exhibition of 1851 by its fine specimens of double-faced cloth (each face of a different colour) and of fancy trouserings. Stroud in Gloucestershire, with Eastington, Stonehouse, and Minchinhampton, may be regarded as the chief centre of the production of West of England broadcloths. Next in importance are Chippenham, Melksham, and Bradford, all in Wiltshire. Trowbridge, too, has a special reputation for its trouser goods.

The unquestioned metropolis of the British worsted trade is Bradford, in the West Riding of Yorkshire. In 1857, the number of firms engaged in the manufacture in that parish singly was 220; the number of spindles was computed at 521,860; that of powerlooms at 18,761; and that of the persons employed at upwards of 36,000.[1] The quantity of wool worked up annually in Bradford is more than sixteen times greater than it was in 1810. This large growth becomes the more striking, when it is remembered that in the mixed fabrics, which are the staple productions of Bradford, wool constitutes only the weft, whilst the warps are of cotton or of silk. The entire population of Bradford, taking the township only, numbered 6393 in 1801; in 1851 it had increased to 52,493.

Halifax ranks next to Bradford for the production of worsteds of almost every kind, whether plain or figured. For a considerable period, the heavier sorts of fabrics were chiefly produced here; but what is termed the fancy-trade has, for many years past, become increasingly prominent. At the beginning of the present century, calimancoes were a leading article in the local industry of Halifax, and were followed (1811) by moreens; (1819) by bombazines and Norwich crapes; (1822) by camblets and taborines; (1824) by damasks; (1826) by French merinoes; (1834) by French figured damasks made of single-worsted warp and fine English or merino weft; (1836) by alpaca figured goods; (1838) by figured orleans, in which a cotton warp is substituted for the worsted warp of the "French figures." The proportional increase in the consumption of wool during the last half century is much larger at Halifax than at Bradford. In 1810, the quantity on which drawback was allowed by the Excise was 491,520 lb. In 1850 it had increased to 14,423,040 lb., or nearly thirty times the quantity consumed forty years before.[2] At this date, the number of worsted firms within the parish of Halifax was 75; that of spindles, 235,921; that of powerlooms, 4040; and that of the workpeople employed, 16,601. The population of the township, which in 1801 was enumerated as 8886, had increased in 1851 to 25,180. Next in importance, as seats of the worsted manufacture, rank Keighley, Bingley, and Wakefield, all in the West Riding. Colne, in the north-eastern portion of Lancashire, has attained considerable fame for its production of mousselines-de-laine, and of the fabrics called cobourgs.

Norwich, the cradle of the worsted manufacture, continues to produce certain light and elegant fabrics, which are unrivalled in their kind. Its paramattas, made of silk warp and worsted weft, are especially conspicuous. But its trade is small in comparison with that of the northern towns. Kidderminster for a time vied with Norwich in the production of the once fashionable but now obsolete bombazines. At present carpets are the staple of that town, and the number of looms employed on them exceeds 2000.

In 1857, Mr James estimated that of the whole worsted manufactures of England, nearly seven-ninths are produced in the West Riding (taking goods and yarn together), and another ninth part in Lancashire; the remainder being divided amongst the various fabrics of Norwich and the West of England, and the worsted hosiery of Leicestershire.[3]

Estimates of the annual aggregate value of the woollen and worsted manufactures.

Of the aggregate value of the worsted and woollen manufactures of the country, there have been many and very diverse estimates. The importance of those manufactures, both intrinsically and in comparison with the other great branches of our national industry, has for ages been so great as to be well able to dispense with all exaggeration; yet exaggeration has been common. Almost fifty years ago, their value was stated by Mr Stevenson at L.18,000,000, —a computation greatly in excess of the truth, yet much more moderate than several which had preceded it. In the last edition of this *Encyclopædia*, Mr Chapman estimated the then value at somewhat above L.26,000,000. This was probably the nearest approximation to the truth which the information then available admitted, and it was certainly based upon elaborate inquiries; yet it also erred on the side of excess.

Progress in the United Kingdom.

Mr Baines' estimate of the woollen manufacture, taken singly, as it was placed before the British Association in 1858, stood thus:—

Estimate of the Woollen Cloth Trade of the United Kingdom.

(1.) 75,903,666 lb. of Foreign and Colonial carding wool; and averaged at 15d. per lb.	L.9,717,492
(2.) 80,000,000 lb. of British wool	
(3.) 45,000,000 lb. of shoddy and mungo wool (30,000,000 lb. at 2½d. per lb., 15,000,000 lb. at 4½d. per lb.)	609,370
(4.) Cotton warps and other like materials	206,537
(5.) Dyewares, oil, and soap	1,500,000
(6.) Wages (150,000 workpeople, averaging 12s. 6d. per week)	4,875,000
(7.) Rent, wear and tear of plant, repairs, coal, interest on capital, and profits	3,381,680
Estimated total	L.20,290,079

The shoddy and mungo trade.

The third item in this estimate is a significant one. It refers to a branch of the woollen trade which is wholly the growth of the present century. In its early days, the novelty was always spoken of, if not with direct reprobation, at least with reserve and distrust. But when shoddy-weaving began to attain an eminent degree of commercial success, it became the fashion to compliment it as "one of the triumphs of art and civilisation."[4]

By "shoddy" is meant the old wool obtained from the rags of soft fabrics, and by "mungo" that obtained from the rags of hard fabrics. The average price per lb. of the former is 2½d; that of the latter 5d. These rags are torn into fibre by cylindrical machines; of which there were in 1857, 50 in the town of Batley alone, producing about 12,000,000 lb. of rag-wool in a year. The shoddy manufacture is also the staple trade of Dewsbury, and even at Leeds a sufficient number of machines is employed in it to produce some 4,000,000 lb. yearly, which is termed by one recent writer on the woollen trade of the Leeds district, "adding 400,000 fleeces to the annual stock of wool." This rag-wool is mixed with fresh wool in various proportions, according to the nature of the fabric and the conscience of the manufacturer, and with the inevitable result of adding enormously to the deceptions of trade. "No honest manufacturer," says Mr M'Culloch, "will, of course, substitute old for new wool in the manufacture of any sort of goods, *without apprising his customer of the fact.*" "But this," he adds, "is all that he is required to do." It is told of some early makers of "Dutch bays," that when, from accidental imperfections, their goods fell below the average quality, the deficiency was carefully estimated, and those fabrics were exposed for sale at the ordinary prices, but with such coins attached to them as were sufficient to compensate the purchaser. We doubt, however, if the example has been followed in any fashion by the dealers in shoddy goods. The machinery which has given so vigorous an impulse to their trade is a marvel of ingenuity, but it imparts additional point to the old maxim—"*Caveat emptor!*"

Estimates of the annual value of the worsted manufactures.

Of the aggregate value of the worsted branch of our woollen manufactures, two estimates have been recently made from independent inquiries. At first sight, their disparity seems considerable, but the difference is chiefly owing (1) to the variations in the price of wool, and (2) to the rapid growth of the manufacture, even in the brief interval between 1852 and 1857:—

Estimates of the Aggregate Value of the Worsted Manufactures of the United Kingdom.

I. Forbes' *Estimate*, 1852.[5]

(1.) 15,000,000 lb. Colonial and Foreign combing wool at 1s. 9d.	L.1,312,500
(2.) 60,000,000 lb. British do. at 1s. 2d.	3,500,000
(3.) Cotton and silk warps, dye-wares, soap, oil, &c.	1,500,000
(4.) Wages	3,000,000
(5.) Rent, wear and tear of plant, repairs, coal, interest of capital, and profits	3,187,500
Estimated total	L.12,500,000

[1] James, *History of the Worsted Manufacture*, 609, 610. These numbers are based on actual returns from all the townships which compose the parish of Bradford, those of Thornton, Clayton, and Howarth excepted, in respect to which previous returns of the year 1850 were used.

[2] James, ut supra, 618.

[3] Ibid. 543.

[4] M'Culloch, *Dictionary of Commerce* (1859), 1429.

[5] Forbes, *Lecture before the Society of Arts*, ut supra.

Numbers and Condition of the Work-people employed.

II. James' *Estimate*, 1857.[1]

(1.) 15,000,000 lb. Colonial and Foreign combing wool at 2s. 8d.	L.2,000,000
(2.) 85,000,000 lb. British do. at 1s. 9d.	7,438,500
(3.) Cotton and silk warps, dye-wares, soap, oil, &c.	1,700,000
(4.) Wages	3,061,500
(5.) Rent, wear and tear of plant, repairs, coals, interest of capital, and profit	3,800,000
Estimated total	L.18,000,000

If we take the estimate of Mr Baines for the woollen branch, and that of Mr James for the worsted branch, which estimates are very nearly identical in date, we obtain an aggregate of L.38,000,000; and it has to be borne in mind, that during the last twenty years, the quantity of foreign and colonial wool remaining for home consumption, after deducting the reshipments for export, has been more than doubled, in addition to the considerable increase of home-grown wool.

III.—NUMBERS AND CONDITION OF THE WORK-PEOPLE EMPLOYED ON THE MANUFACTURES OF WOOL IN THE UNITED KINGDOM.

Census of 1851.

The census of 1851 assigns to the woollen and worsted manufactures collectively, 295,568 persons, including in the enumeration wool-staplers, salesmen, drapers, and dealers of all kinds. Probably about 170,000 of these may be assigned to the woollen branch, and 125,000 to the worsted branch.

Number of the work-people employed in clothmaking;

It is estimated that in the cloth manufacture there are as many people employed out of factories as within them, and that the people actually engaged on the production, as distinguished from the distribution, of cloth of all sorts, amount in the aggregate to 150,000. It has been further estimated upon good evidence, that each of these workers on the average supports from three to four persons, so that the number actually dependent on the woollen manufacture may be taken approximatively at 525,000 persons.

Numbers and Condition of the Work-people employed.

In the worsted manufacture, factory labour is predominant, and the number of women and children employed is proportionally in excess. In England alone, the number of worsted factories in 1856 was 511; and that of the work-people employed in them, 86,690. The total number of work-people employed on worsted fabrics may, perhaps, be fairly taken at 120,000, and the number of persons dependent on the workers as averaging five to every two of the latter. By this computation, the whole number of persons dependent on the worsted branch will amount to 300,000, and the aggregate number dependent on both branches together to 825,000.

On worsted fabrics.

Rate of wages.

The same peculiarities in the cloth manufacture which have restricted—speaking comparatively—the introduction of machinery, have also tended to lessen those extreme fluctuations in the rate of wages which so conspicuously mark the history of other branches of our textile industry. The period from 1805 to 1815 was, to some extent, an exceptional one in all departments. The improvements in spinning had then enormously increased the production of yarn, and weavers, for a time, were enabled to make their own terms. In worsted-weaving, and, most of all, in cotton-weaving, the labour of women and children soon supplanted that of men; but many kinds of cloth-weaving continue to be emphatically a man's work, and to be paid for proportionally. The following very interesting table, exhibiting the rate of wages in the Leeds woollen district from 1795 to 1858, was communicated by Mr Baines to the statistical section of the British Association in 1858. It is based on the wages-books of an eminent firm at Leeds:—

Wages in the Leeds Woollen District, 1795 to 1858.[2]

Wages in the Leeds woollen district.

Description of Work-People.	Present weekly Hours of Labour.	How Paid.	Amount of Weekly Wages, on the average, in the several Years							
			1858.	1855.	1845.	1835.	1825-26.	1815-16.	1805.	1795.
	Hours.		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sorters (men)	54	Piece work.	24 0	20 8	22 4	26 9	29 3	37 1	31 1	...
Slubbers, do.	60	Do.	27 0	24 0	29 6	24 9	...	30 6	30 8	22 6
Spinners, do.	Do.	Do.	29 0	17 0	22 11	25 1	20 4	31 8	24 8	16 9
Powerloom weavers (women)	...	...	12 0	9 9	9 0	9 0	...	...	...	...
Handloom do. (men)	...	...	15 0	...	...	...	...	...	...	...
			s. s.	s. s.	s. s.	s. s.	s. s.	s.		
Millers (men)	62½	By the week.	18 to 20	...	...	18	18	18	...	...
Do. *foremen*	Do.	Piece work.	...	...	...	30	30	26	...	...
Dyers (men)	58½	By the week.	16 to 18	16 to 18	16 to 18	16 to 18	16 to 18	...	...	...
Do. *foremen*	Do.	Do.	35 to 60	35 to 60	30 to 70	30 to 70	30 to 40	...	...	...
Dressers (men)	64½	Do.	20 to 21	20 to 21	20 to 21/8	20 to 21	21 to 22	...	...	...
Do. (young men and boys)	60	Do.	6 to 16	6 to 16	5 to 14	5 to 14	4 to 12	...	...	...
Do. *foremen*	64½	Do.	26 to 30	26 to 30	28	28	...	...	...	...

Another and independent estimate of the wages in the Leeds district, based on returns, obtained also in 1858, from the several factories, by Mr Baker, one of Her Majesty's inspectors, gave an average *for every worker* employed in spinning and weaving, of 11s. 7¾d. weekly; for every worker employed in the finishing processes, of 15s. weekly; and for every worker employed on "shoddy," of 6s. 0¼d. weekly. The details are as follows:—

Statistics of the Woollen Manufacture of Leeds, 1858.[3]

Statistics of the woollen manufacture of Leeds.

No. of Firms.	Nature of the Business.	Nominal horse-power.	No. of Spindles.	No. of Gigs.	No. of Looms.	No. of Rag Machines.	No. of Persons employed.	Wages.	
								Yearly Aggregate.	Weekly average to each hand employed.
								L.	s. d.
68	Manufacture	1936	8640	...	952	...	3636	110,120	11 7¾
48	Finishing	860	...	860	...	...	6209	254,215	15 0
12	Shoddy	128	...	...	...	16	348	5,760	6 0¼
128	Total	2924	8640	860	952	16	10,193	370,095	...

The average wages, per worker, in nine worsted mills within the same district, were 10s. 5¾d. There were at this date (1858) still about 200 hand loom worsted-weavers, earning, like those employed on woollens, about 15s. weekly on the average.

[1] James, *History of the Worsted Manufacture*, 543.
[2] Baines "On the Woollen Manufacture," &c., *Journal of the Statistical Society*, ut supra, 25.
[3] Baker, "Industry and Sanitary Economy of Leeds," Ibid. 436, 437.

Progress of Woollen and Worsted Manufactures in France.

In the Bradford district, the wages of powerloom worsted-weavers average 10s. weekly; those of wool-sorters, about 22s. The general average of workers of all kinds appears to be somewhat below that of the nine mills at Leeds just referred to. Everywhere, the worst paid class of worsted operatives is the woolcomber, whose employment is also essentially unhealthy; but it is one which machinery is gradually superseding.

Sanitary condition of the woollen and worsted districts.

On the momentous point of sanitary condition, all that can be said to the advantage of the woollen and worsted towns is, that, although their improvement is slow, they do improve. By far the worst incidents which attend on manufacturing employment are everywhere remediable ones. It is lamentable to find, in the tables of the Registrar General, that from 1841 to 1850 the rate of mortality in the Bradford district amounted to 25 deaths, and that in Leeds to 30 deaths, annually, out of every 1000 persons. But there is consolation in the certainty that, by very simple and practicable sanitary arrangements, such rates may be largely reduced. What has been achieved already in the amelioration of the condition, both physical and social, of the work-people employed on textiles, under the influence of the various Factory Acts, is of good omen for other improvements to come.

IV.—PROGRESS OF WOOLLEN AND WORSTED MANUFACTURES IN FRANCE.

Woollen manufactures of France.

Prior to the reign of Henry IV., France derived the greater part of its woollen cloth from England, Spain, and the Netherlands. Its own manufactures were petty and enslaved to routine. The clothiers had a sort of hereditary succession, and each of them esteemed it almost a sacred duty to adhere to the processes of his forefathers. To these obstacles the wars of religion added others. It was not until the League was destroyed and the Edict of Nantes promulgated, that manufacturing industry struck a firm root in France. The triumph of intolerance in Spain aided its growth. When Philip III. drove away the poor remnant of the Moors of Granada, the fugitives established themselves at Carcassonne, and other towns of the South of France, and set to work at cloth-making.

Their development by Colbert.

Under Louis XIII., and during the minority of his successor, the progress of the infant manufacture was checked. Neither Richelieu nor Mazarin cared much about textile industry. The task of developing its latent powers was reserved for Colbert. He brought Gosse Van Robais from Holland (1665), established him at Abbeville, and gave him large privileges "for the manufacture of fine cloths, after the manner of those of Spain and of Holland." A few years later, like privileges were given to Ricard, Langlois, and others, of Louviers (1681). From being a poor hamlet, Louviers soon became an important town, and its rise awakened the emulation of Elbeuf. By the middle of the following century, the trade of cloth-making, notwithstanding its share in the evil influences of the Revocation of the Edict of Nantes, and of the wretched misgovernment of Louis XV., had thriven sufficiently to enable Savary des Bruslons to assert, with some show of plausibility, in his *Dictionnaire de Commerce*, that "the kingdom is now in a condition to dispense entirely with the fine cloths of the English and the Dutch." But it is certain that at this period the prosperity of the woollen manufactures of France was very unequal. The carpets and tapestries of the Savonnerie, of the Gobelins, of Beauvais, and of Aubusson (largely assisted by royal grants and special immunities), commanded universal admiration, but the cloths of Louviers, of Sedan, and of Abbeville, scarcely kept their ground in the markets of the world.

The subsequent history of the woollen trade of France is pregnant with instruction, but the limits of an article like this do not admit of our retracing it, even briefly. It must suffice to observe that, with a short interval under the treaty of 1786, the French manufacturers have been uniformly propped up by a prohibitory tariff against the competition of foreign fabrics. They have had an abundant supply of the raw material from the best sources, and have displayed skill in the manufacture of it so admirable, that for a long period an English tailor made it a point of conscience not to make out his bill without inserting "a coat of French cloth," even when scarcely a single piece of French cloth was imported. And yet, notwithstanding so many intrinsic advantages, the history of the woollen manufactures of France affords conclusive proof of the suicidal nature of a protectionist policy.

Processes of the Woollen Manufacture.

Chief centres of French woollen industry.

The chief centres of the French manufacture are, for cloth of all sorts, Elbeuf; for fine black cloths and fancy fabrics, Sedan and Louviers (where, also, yarn is largely spun for the Elbeuf market); for common cloths, tablecovers, and the like, Vienne, Nancy, Metz, Orleans, Carcassonne, and the adjacent districts; and, for worsteds and mixed fabrics, Reims and its neighbourhood, and Limoges.

Discordant estimates of the French manufactures.

Of the total value of the French woollen and worsted manufactures, the estimates have been far more discordant than even those which have been put forth respecting the English manufactures. For example, in an elaborate work on the commerce of France, published in 1857, they are put at L.10,000,000 sterling. In a treatise on custom's tariffs, published in 1860, a document is quoted, according to which they amount to nearly L.40,000,000. Such computations are obviously worthless. The only trustworthy data are those afforded by the tables of exports.

In 1857, the total exports of woollen and worsted fabrics amounted to 179,984,802 francs (L.7,199,392), and they are thus made up:—(The arrangement is that of the French Department of Commerce.)

Details of the exports of French woollens in 1857.

French Woollens and Worsteds, including tissues of Hair, exported in 1857.[1]

	Francs.
Tablecovers, &c.	2,811,124
Carpets	1,039,138
Kerseymeres	194,040
Merinoes	22,328,673
Cloths	44,373,155
Stuffs of various kinds	44,139,719
Shawls	17,724,789
Lace	58,860
Woollen caps, &c. (*Bonneterie*)	4,209,013
Ribands and small wares	1,783,638
Mixed fabrics	40,148,424
Cashmere shawls	424,958
Other Cashmere fabrics	8,190
Carpets and tablecovers	92,505
Horsehair tissues	506,838
Other fabrics of Hair	141,738
Total export	179,984,802

The details of the exports of the year 1858 are not before us, but their total amount had fallen to 158,000,000 francs. In the same year the value of the foreign wool imported into France was 105,000,000 francs, of which somewhat more than one-third was imported from the United Kingdom.[2] The actual value of the French woollen goods exported to the United Kingdom in 1858, was L.1,095,045 (27,376,139 francs.)

Of the condition of the workpeople employed on this branch of industry in France, the reader may find an interesting account in a series of papers by M. Audiganne, entitled, *Du Mouvement Intellectuel parmi la Population Ouvrière*, which was published in the *Revue des deux Mondes*, in the years 1852 and 1853.

V.—PROCESSES OF THE WOOLLEN MANUFACTURE.

In the article WEAVING, we had occasion to notice how strikingly the textile industry of Britain, in its early stages, was indebted to foreigners for the chief improvement of its processes. That statement is as applicable to our manufactures of wool as to those of any other textile material. British inventiveness has since discharged the debt with very liberal interest, and can well afford to acknowledge the historical obligation. But there is another acknowledgment exacted of the truthful annalist which cannot be made without some repugnance, yet for making which there are reasons which have a special relevancy to our woollen trade, and to its present circumstances.

[1] *Tableau général du Commerce de la France pour l'année* 1857, pp. 293–297.
[2] *Returns of Exports from the United Kingdom to France*, printed 6th March 1860, Sessional Paper, No. 137.

Processes of the Woollen Manufacture.

The early records of our industry abound with allusions to the "untruthful making" of English fabrics. As we have indicated already, some allowance is to be made from testimony, which has often a close relation to questions of commercial rivalry. But there is ample independent evidence which leads to the conviction that some of the earliest efforts of our industrial ingenuity were directed, not to the production of good fabrics, but to the clever dressing up of bad fabrics, so that they might pass for good.

Latimer's account of clothmaking processes in the sixteenth century.

In the third of those memorable sermons before King Edward VI., which depict the national life of that age not less lucidly than they mirror one of its master-minds, Latimer thus adverted to the practices of the woollen craftsmen of his day:—"I hear say there is a certain cunning come up in mixing of wares. How say you, were it not a wonder to hear that clothmakers had become apothecaries? . . . . If his cloth be 17 yards long, the maker will set him on a rack and stretch him out with ropes, and rack him till the sinews shrink again, while he hath brought him to 18 yards. When they have brought him to that perfection, they have a pretty feat to thicken him again. He makes me a powder for it, and plays the apothecary; they call it 'flock-powder.' They do so incorporate it with the cloth that it is wonderful to consider; truly a good invention! Oh, that so goodly wits should be so ill applied! They may well deceive the people, but they cannot deceive God. . . . These mixtures come of covetousness. They are plain theft. As God said to the Jews, 'Thy wine is mingled with water,' so might he have said to us of this land, 'Thy cloth is mingled with flock-powder.'"[1] The contemporary author of the curious tract, entitled *The Request and Suite of a true-hearted Englishman* (William Cholmeley), repeats Latimer's warning in words very similar to some of those of the excellent bishop. "We do not," he says, "apply our good wits to the searching out of good knowledge, but to the inventing of subtle deceit."[2] In another paper submitted to the Privy Council in the reign of Elizabeth, the writer gives a minute account of the particular deceits most prevalent in the several cloth-making districts. "Flockes, chalk, and other ointment cast upon cloth is," he says, "specially used in the northern parts, where no true cloths are made. . . . For colours [*i. e.* deceitful colours], Kent is most infected, but not for stretching. Suffolk for Barbary blues, is equal or worse. The town of Reading doth follow. All the coloured cloth made in the North is worst of all."[3] Schemes for putting down these frauds were repeatedly contrived. In 1570, one such project was sent to Leicester, and was by him forwarded to Cecil, as tending "much to the necessary reformation of such an enormity, as sufferance a while longer will greatly hinder the whole commodity of this realm, standing chiefly on clothing."[4] Twenty years later, however, similar complaints are as rife as ever. In 1590, for example, the Privy Council Register contains a letter from the Council to the Earl of Huntingdon, which recites, that whereas "there have been great complaints of chopping of flockes and rubbing the same into cloth by the greatest part of the clothiers in the county of York," certain persons are to be appointed in that county "to deface, cut in pieces, or burn all such blocks or boards as have been or are used for chopping of flocks."[5]

Other like testimony.

But the most effectual remedy proved to be that unforeseen one brought gradually into operation by the foolish policy which continued to drive away from the old seats of the woollen manufacture on the Continent their most skilful artisans. The inventive ingenuity of many of the new comers at length directed that of our homebred clothiers into a better channel, and then improvements followed improvements in quick succession. To retrace these, in their long series, would be an interesting task, but the briefest narrative would exceed the limits of an article like this. We must content ourselves with describing the more important processes of the manufacture in its present condition, first enumerating all the processes which are incident to cloth-making, in their usual order.

Enumeration of the processes of the woollen manufacture.

The first operation of course is that of (1) sorting the wool. Then follows (2) scouring; (3) washing; (4) drying; (5) dyeing, when dyed in the wool; (6) willying; (7) teasing; (8) oiling; (9) moating; (10) scribbling; (11) plucking; (12) carding and slubbing; (13) spinning; (14) reeling; (15) warping; (16) sizing; (17) weaving; (18) scouring; 19) dyeing, when piece-dyed; (20) burling; (21) milling, or fulling; (22) scouring again; (23) drying or tentering; (24) raising, dressing, or teazling; (25) shearing or cutting; (26) boiling; (27) brushing; (28) pressing; (29) shearing again; (30) picking, drawing, and marking; (31) pressing again; (32) steaming; (33) folding or packing. Of these multifarious processes, we notice, in detail, such only as seem to need explanation, and have not been sufficiently elucidated in preceding articles. (See, especially, DYEING, SPINNING, and WEAVING.)

Processes of the Woollen Manufacture.

Scouring.

The scouring of wool, in the West of England invariably, and in Yorkshire generally, is effected as follows. Stale urine, called in the west of England "ley," is mixed with a small quantity of soap, and heated to about 120°. In this detergent the wool is soaked. On removal it is placed in a wire basket, and submitted to the operation of running water, by which the grease and other impurities are washed away. By some manufacturers of Yorkshire the wool is washed with warm soap and water, and, after receiving a second washing in clean water, to free it from the soap, is passed through strong iron rollers, by which the wool is pressed nearly dry. The business of scouring or washing is performed by men; and, by the first process, two are capable of cleaning two packs in a day.

Cloth, other than white cloth, is either "wool-dyed" or "piece-dyed." Of the former, the dyeing is the first process after washing. The larger manufacturers themselves dye all the common colours, such as browns and olives; but the true or woaded colours, such as blue, wool-black, and green, can only be well done by those who make it their special business. The small manufacturers send all colours to the dyers. The prices paid for dyeing vary according to the colours. Piece-dyed cloths are sent to the dyeing-house after fulling and scouring. (See DYEING).

Delivered at the mill, the wool (dyed or undyed, as the case may be) is now submitted to the first of a series of machines, all of them admirably adapted to perform their respective parts in the production of the woven fabric. This first machine is called the willy, or the shakewilly in Yorkshire, and the twilly in Gloucestershire. Both seem to be a corrupt mode of pronouncing "willow;" and even willow is probably a corruption of "winnow," *winnowing* the wool being really the office it performs.

Willying.

There are various kinds of willying machines in use, but the best appears to be the conical willy, first applied to the cleansing of cotton. The willy consists of a revolving cone, armed with four rows of iron spikes, strongly fixed to four longitudinal bars, which are fastened to three concentric wheels of different diameters, the common axis of which forms the shaft of the machine. This cone revolves at the rate of from 300 to 500 revolutions per minute, within a casing cylinder, armed with similar spikes, but placed so as to alternate with the spikes on the cone. At the small end of the cone is a concentric covering of thin sheet-iron, and at the large end is a gridiron plate.

The machine is fed by means of an endless apron, the wool entering at the smaller end, so that when most entangled it is subjected to the least motion. This apron is a great improvement on former machines, which were filled by hand,—an operation attended with danger, and sometimes resulting in accidents. By the revolutions of the cylinder the wool is torn, disentangled, and cleansed; and by the gradually increasing centrifugal force, it is impelled forwards towards the large end of the cone, encountering in its way increased motion, which, however, it is the better able to bear by becoming less entangled at every revolution.

When the wool thus reaches the base of the cone, it is tossed into a chamber, where it is received upon another endless apron, moving in a direction from the machine instead of towards it. Over this apron is a cylindrical wire cage, which revolves on an axis disposed parallel to the apron, and immediately over it is a revolving fan. Both these are covered and protected by sheet-iron casings, but communicate with the chamber which receives the wool from the cone. When the whole is at work, the fan, drawing the dust out of the chamber, blows it through a chimney or pipe, connected with the machine for the purpose. The cage prevents the escape of the wool with the dust, and by its passage over the apron it lays down the wool in a continuous fleece.

The coarser wools, destined for common cloths, are willied more than once; for instance, before as well as after dyeing, and after oiling and before being scribbled. The finer wools do not, however, require this, as the operation of scribbling is sufficient preparation for carding.

Moating.

In the West of England the wool is beaten with wooden rollers by women, after which it is placed on a wire screen or hurdle, and pulled with the hands, so as to get rid of any burs, or pitch, or other dirt which may not have been separated by the willy. In Yorkshire the wool is picked by a boy, called a wool-moater. If this be not done, the scribbling machine is injured by the lumps of pitch which are so frequently found in wool.

The wool is next oiled for the scribbling machine, three or four pounds of Gallipoli oil being intimately mingled with twenty pounds of wool. A man can oil about twenty score, that is, about 400 lb., in a day.

The process of scribbling differs but little from that of carding;

[1] Latimer's *Sermons* (edition of 1758, i. 113).
[2] "Request," &c., printed in the Camden Society's *Miscellany*, vol. ii. § 3.
[3] "Discourse against Clothiers," &c., by William Leake, MS. *Domestic Papers, Eliz.* vol. cxi. (State Paper Office).
[4] Leicester to Cecil, Sept. 3, 1570, ibid. vol. lviii. (State Paper Office).
[5] *Privy Council Register, Eliz.* MS. vol. ix. p. 21 (Privy Council Office).

Processes of the Woollen Manufacture.

the only difference being that the machine is coarser, and that the wool is delivered in a continuous fleece, instead of narrow bands or slivers. The object of both is further to separate and open out the fibre, and even to tear it asunder. Both processes should, if successfully performed, equalize the quantity of wool in a given length of cardings. In order that the disentangling and separating of the wool may be as complete as possible before it is moved from

Scribbling.

the scribbling to the carding engine, it is sometimes made to undergo the scribbling process two or even three times.

Carding.

The wool-carding engine consists of one large cylinder or card-drum, surmounted by other and smaller cylinders, called urchins, covered with card-cloths armed with carding-wires (fig. 1). The larger of the two is called the *worker*, and the smaller the *cleaner*, which revolves at great speed. At one end of the engine is an endless feeding-apron, upon which equal portions, by weight, of the oiled wool is evenly spread by hand. This apron, by its motion *towards* the engine, delivers the wool through a pair of *feed-rollers*, which distribute it upon the card-drum. From this the wool is gradually stripped, as it were fibre by fibre, by the first worker, whence it is received by the first cleaner, and by it again deposited in the card-drum. This is twice repeated, so that the disentanglement and separation of the fibre becomes more and more complete. When it has passed over the last cylinder on to the drum, it is taken from it by a cylinder somewhat larger than the workers, and called a doffer; from which again the wool is scraped off by a *doffing-knife*, or comb, and is drawn by a pair of rollers, fixed at the side of the frame, through a revolving tube, which imparts an amount of false twist to the sliver. The wool is then returned between a lower pair of rollers to the top machine in front of the engine, which is arranged so as to form a lap 16 inches diameter, and 4 inches wide. When the required length of sliver is wound on, notice is given by a bell, and if not attended to, another movement doffs the lap, so as to ensure each one being of a uniform length.

These narrower laps are placed side by side upon rods, so as to form four rows, as shown in fig. 1, (each row being of the whole

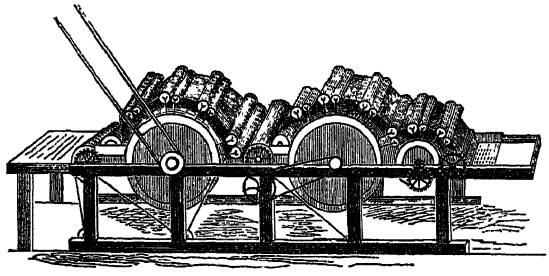


Fig. 1.

width of the engine), which are turned off into the engine by the unlapping-rollers. Each sliver passes through a guide or reed, as it enters the feeding-rollers, to keep it in its proper place. The quantity of sliver thus put up at the feeder end of the machine will last a whole day. The wool having passed through the engine, and been carded in the usual way, is removed from the main cylinder by the condenser-doffers, which are provided with rings of cards and alternate blank spaces, so that the wool which is left upon the cylinder by the top doffer is removed by the lower one. The stripper-rollers take the bands of wool from the doffers, after which they pass between the doubled endless twisting-straps in order to receive that degree of false twist which enables them to carry forward to be spun. They then pass between the delivery-rollers to the bobbins, on which they are lapped by the friction of contact with the drum. When the bobbins are filled, they are removed direct to the mule, where they are unlapped in a similar manner.

The intermediate processes, between the scribbling of the wool and the scouring of the woven fabric, have been sufficiently described in the specific articles to which we have already referred.

Scouring of the cloth.

After the cloth comes from the loom, and before it can undergo any other process, it is necessary to scour it, in order to get rid of the oil and size to which the wool and yarn have been subjected in the preparatory processes. This is performed at the mill, in a somewhat rude machine called the stocks, and consisting of a pair of wooden mallets, worked alternately by a cog-wheel. The cloth is exposed to the stroke of the mallet in an inclined trough, the end of which is curved, so that the tendency of the stroke is to turn the cloth round and round, and different portions are alternately exposed to the operation of the hammers. At first soap or some other detergent is used, but at last a stream of pure water is let in upon it.

Drying.

It is now carried to the drying-room or tenter-ground, and stretched upon a vertical rail or tenter-hooks, where it is left to dry in the extended state. The lower rail of the tenter-frame is made to slide, so that the cloth may acquire the requisite degree of tension.

Processes of the Woollen Manufacture.

The cloth thus cleansed and dyed is delivered over to the burlers, who pick out all irregular threads, hairs, or dirt of whatever kind, which may remain in the fabric. This process is called burling, and to perform it, the cloth is examined both on the surface and through the web against a strong light. In the larger factories a room is assigned to the business of burling; but in the cloth-villages of the West Riding, during the summer months, the process is carried on by the wayside and in lanes, on walls and on hedges.

Burling.

Milling.

The cloth is now ready for the operation of the fulling-mill, which, like the scouring-stocks, is furnished with mallets driven by a cog-wheel; but the milling-trough has a square instead of a circular end, so that the cloth receives the direct blow of the mallets, and is not made to escape from the blow by the operation itself. The stroke of the mallets is extremely heavy, but it does not injure the cloth, on account of the multitude of folds. This greater force, as compared with the scouring-stocks, is produced by the hanging of the hammers. The shafts of the scouring-stocks are nearer to the perpendicular, so as to cause the mallets to move more horizontally, and therefore with less velocity. They are hence called *hanging* stocks, while those of the fulling-mill are called *fulling* stocks.

Improvement has found its way into this branch of the cloth-manufacture as well as into others. The old fulling-mill was of wood; but such machines have long been constructed of iron, with much more accuracy, and work with greater precision. The best of these is the invention of Messrs Willans and Ogle of Leeds. The bed of this machine is hollow, so as to form a steam-chest, connected by a pipe with a boiler, so as to keep up the degree of heat necessary to the perfection of the fulling or felting process. But the great improvement of this machine is a contrivance for altering the form of the trough against which the cloth receives the stroke of the mallet. This consists of a moveable curved plate, traversing on a fixed hinge-road at the bottom of the trough. The upper edge of this curved plate is capable of being advanced towards or withdrawn from the mallets, by means of a screw-rod attached to its back. By this means the directness, and therefore the force, of the stroke is altered so as to suit the different qualities of cloth.

To the felting property of wool we have already alluded. By the united operations of beating, heat, and moisture, the minutely jagged surfaces of the fibres of the wool are made intimately to cohere, and form, not a mere woven tissue like cotton, flax, or silk, but a felted homogeneous mass, similar to the paper on which we print. If a piece of cloth be cut, it will not unravel; the tissue is almost lost under the thick fulled surface raised upon it; and the weaving seems less to give a character to the fabric than to impart the requisite degree of strength. Superfine cloths have four fullings of three hours each, a thick solution of soap being spread between each layer of cloth every time. Scouring is aided by fuller's earth, that which is found in England being said to be superior to any other. Rinsing with clear water completes the process, which diminishes the width of the cloth between 40 and 45 per cent., and the length about 35 per cent. After every impurity is washed out, the cloth is again stretched upon the tenters until it is completely dry.

Teazling.

The cloth next undergoes the operation of teazling, by which the loose fibres of the wool are raised to the surface, so as to form, when duly cut or sheared, the pile or nap. For this purpose the teazle, a species of thistle (*Dipsacus fullonum*) is employed. This useful plant is cultivated in the clothing-counties, and especially in Somersetshire.

Formerly the teazle was fixed in a hand-frame, and worked by two men in the manner of a two-handled brush or hand-card; but for many years the gig-mill has been employed, in which the teazles are arranged in a cylinder, and the cloth being stretched on two cloth-beams, one above and one below the teazle cylinder, the cloth moving in a direction contrary to its revolutions, its surface is exposed to the operation of the teazles. In the older gig-mills, the cylinder was completely bristled with the teazles; but in the modern mills they are arranged in longitudinal frames parallel to the axis of the cylinder, with equal spaces between each pair, like the bars of an immense reel. The mode in which the cloth is stretched on the beams is shown in the annexed diagram (fig. 2), which is a section view of the beams and cylinders, without the framework which supports the machine. The arrows show the direction of the cloth and of the cylinder, on the outer circumference of which are seen the ends of the frames in which the teazles are made fast. It will now be easily understood that, by the rapid revolution of the cylinder, and the slower motion of the cloth in a contrary direction, the loose fibres of the wool are brought to the surface. The longitudi-

Processes of the Woollen Manufacture.

nal teazle-frames can be removed from the cylinder at pleasure, and when the teazles become clogged with wool, they are removed and cleaned with a comb by children.

In the gig-mills with metallic teazles, a series of longitudinal teazle-cards take the place of the ordinary teazles; these teazle-cards rest on a spring, which gives them elasticity, and prevents any damage to the cloth. The teeth incline slightly in the direction of the line of motion, and they are cleaned by a wheel similar to the cleaner of a wool-card. In the Exhibition of 1851, an improved gig-mill was shown by Mr E. Hunt, which, by working on both sides, finished the teazle dressing process without removing the cloth from the machine, and performed an increased quantity of work.

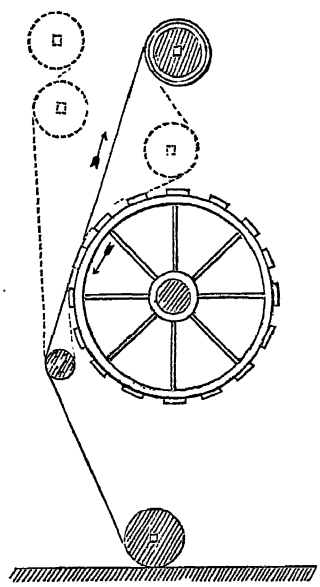


Fig. 2.

The mode of winding the cloth from one roller to another has also varied from time to time, still varies in different factories, and has even been made the subject of a patent by Mr Walker of Mill-Shaw, near Leeds. Mr Walker's improvement consisted of five rollers instead of three. Two are immediately over the cylinder. The lower one brings the cloth close to it. The effect of this lower roller is to cause the cloth to be operated upon by a greater number of the rows of teazles, as the cloth touches the cylinder for about one-fifth of its circumference. It then passes round another roller and ascends to a second pair, round one of which it is wound. The dotted lines in the above figure show this improvement.

Shearing.

When the fibre has thus been brought to the surface, the pile so raised is cropped or sheared. This, like all the other operations of clothmaking, was formerly performed by hand, a large pair of shears being employed for the purpose. But the disposition to apply machinery to every process of manufacture was not here neglected; and in the early part of this century a machine was invented, in which the shears were retained, but all their motions were regulated by machinery. The cloth was stretched horizontally on a frame, by means of two cloth beams or rollers situated at each end of the lower part of the frame. Two pair of shears were then so fixed as to clip the surface of the cloth, being moved by two small cranks. Upon this first machine there have been many improvements; but it will be sufficient to describe one of them, which has the merit of being extremely simple. It is the invention of Mr George Oldland of Hilsley in Gloucestershire, and was patented in 1832. It will be readily understood from the annexed figure, which represents the machine in operation against a piece of cloth. The machine consists of a fixed semicircular rack, within or rather behind which is a cutting edge, called by the inventor a *ledger-blade*; and a large revolving wheel, armed with eight small cutting discs, which, being in contact with the ledger-blade, form when in motion a series of far more delicate shears than had heretofore been applied to the process of cloth-shearing.

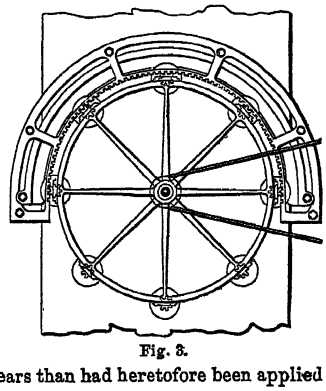


Fig. 3.

It will be observed that each cutting disc has a toothed pinion, working in the semicircular rack, which, as the larger wheel revolves, imparts to the cutting discs an independent rotatory motion, in addition to their revolution with the large wheel. These motions have not inaptly been likened to those of a planet round its axis and its orbit. Another machine in use consists of an iron cylinder, around which is a spiral cutting blade, which is made to revolve with great rapidity, cutting the pile of the cloth immediately in contact beneath it, the cloth being stretched in a longitudinal moving frame.

Mozing.

Superfine cloths are cut and raised several times. In the West of England the first raising is called *roughing*, in which process the cloth is torn by the teazles both ways. After being sheared, it is subjected to the gig-mill in one direction only, which is called *mozing*. It is afterwards cut and teazled several times.

Processes of the Worsted Manufacture.

In most cases the cloth is subjected to an operation which imparts great lustre to it, and at the same time prevents its spotting when used. This operation is called roll-boiling. Its introduction may be said to have opened a new era in the cloth manufacture. The lustrous and permanent face is imparted by rolling the cloth, before being racked or tentered, round a cylinder, with a moderate degree of tightness, and immersing it in scalding water for two or three hours. It is then taken out and allowed to cool; the operation being repeated two or three times during the process of dressing. This roll-boiling process was patented by Messrs Daniell and Wilkins of Tiverton near Bath in 1824, and was improved by Mr William Hirst of Leeds. It seems, indeed, to be doubtful whether the invention was first used in Gloucestershire or in Yorkshire.

The roll-boiling process.

As usually happens in the course of mechanical improvement, the roll-boiling method led to many other improvements. It was found, for example, that the practice of dyeing the cloth in the piece did not work well with the improved fabrics, and thus an impulse was given to the far better method of dyeing in the wool.

Other processes for obtaining a permanent face.

There are in use, chiefly, perhaps, among continental manufacturers, shorter methods of obtaining a permanent face than that which has just been described. By some, the cloth is rolled tightly round a hollow perforated cylinder heated by steam. By others, a permathe cloth is folded, subjected to powerful pressure, and then saturated with steam throughout its bulk. But neither plan is so good as that of Daniell and Wilkins, to whom also is owing the improved beaver-cloth or "double-cloth," patented in 1838. This fabric is both pliable and durable. On one side it is coarse and warm; on the other, it is of the finest material that is woven.

Brushing.

The brushing process is effected by a series of brushes affixed to cylinders. In its passage, the cloth is exposed to steam, which escapes in minute jets from a copper box, extending the whole length of the machine. For this purpose the cloth is made into an endless web by stitching its ends together.

Picking.

Before the final brushing, "mozing," or finishing, the cloth is closely examined, picked, fine-drawn, and marked. The picking removes the blemishes; the fine-drawing closes any minute breaks in the fabric; the marking works in with silk the usual trade-marks indicative of quality, number, and the like.

Pressing.

The pile is then again brushed; and after its final dressing it is subjected to the hydraulic press,—polished pressing-boards, similar to those used for books, being placed between the several folds of the cloth, and two iron plates—each one-half the width of the cloth—between the several pieces which are pressed at each operation. Certain inferior kinds of cloth, which do not undergo the process of roll-boiling, are hot-pressed by heating these iron plates, so as to produce a deceptive sort of gloss.

VI.—PROCESSES OF THE WORSTED MANUFACTURE.

Processes of the worsted manufacture.

The processes necessary to the fabrication of worsteds are less multifarious than those of the cloth manufacture. They may be enumerated thus:—(1.) Sorting; (2.) washing (3.) drying; (4.) plucking; (5, and for certain fabrics only), carding; (6.) combing; (7.) breaking; (8.) drawing; (9.) roving; (10.) spinning; (11.) reeling; (12.) weaving; (13.) dyeing.

Washing.

In washing wool for the worsted manufacture, the old practice was to squeeze out the moisture by pressure between rollers; but by the patent washing-machine of Messrs Petrie and Taylor this rolling is dispensed with, and the wool is both washed and dried effectually, with great saving of time. The wool is thrown into an iron trough containing soft soap and hot water, and is moved about rapidly by iron rakes. It is then drawn from the trough by a "porcupine," or cylinder set with iron teeth, and is briskly winnowed, so that it becomes fit at once for the first stage of the combing process.

Combing.

Combing is of two kinds—by hand-labour and by machine. As we have had occasion to notice already, in referring to the condition of the work-people [above, § iii.], the mechanical process is rapidly gaining ground upon the manual one. The latter nevertheless is still largely used, and both will need description.

(1.) Hand-combing.

In hand-combing each workman has two pair of combs; one pair having two rows of teeth, and the other three rows, usually one-third of an inch apart, and set in a wooden stock, as shown in the annexed figure (fig. 4.) These combs are heated in a stove, which is furnished with two plates at top, with sufficient space between them to admit the prongs of the combs. A post also is fixed in the combing-room, with an iron stem or receiver for the combs, and with an upturned end which enters the hole in the middle of the handle of the comb, whilst at the other end of the stem is a pin which

Processes of the Worsted Manufacture.

enters the hollow end of the handle. The operation of both these pins is to keep the comb sufficiently firm for the workman's purpose. In the annexed figure (fig. 5), *a* exhibits the pin which enters the end of the handle, and *b* the upturned end, to which the hole in the middle of the handle of the comb is adapted.

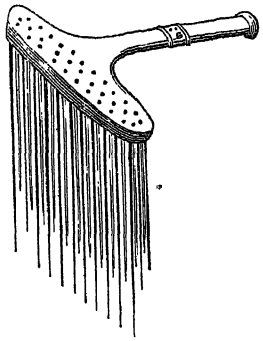


Fig. 4.

The combing operation is thus performed. The comber first takes a handful of wool of about four ounces, and sprinkles upon it a quantity of oil varying from one fortieth to one sixtieth of the weight of the wool. One of the combs, duly heated, is affixed to the post with the teeth upwards, and the comber, taking half the oiled wool in his hands, throws, or, to use his own term, "lashes" successive portions over the teeth of the comb, drawing it through and through, and leaving a portion of the wool on the comb, till the whole is deposited. The comb is now placed with its points in the stove, and the wool hanging down so as to become heated. The other comb then takes the place of the first on the post, and receives the other half of the wool, when it also is removed to the stove. When the combs are sufficiently heated, the comber takes one in each hand. That in the left he holds over his knee, and with that in his right he combs the wool upon the first, passing the teeth of one comb into the wool upon the other, beginning with the extremities of the fibres, and continuing till he reaches the thicker mass of wool, near to the teeth of the comb. Thus the combs gradually approach each other, but without touching, as that would break the fibres, instead of laying them parallel, which is the object of combing.

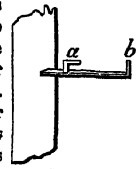


Fig. 5.

In order that the wool on both combs may be combed equally, the comber frequently changes hands; but when it is nearly sufficiently combed, he continues to comb off the one comb on to the other, so that nearly all the wool is gathered upon one comb, and hangs down in a long lock. This comb he warms for a short time, and fixes in the post, and proceeds to draw off the fleece in a continuous sliver. A small portion of short wool remains on the combs after the sliver has been drawn off. This is called *noils*, and is sold to the cloth-makers. The wool then undergoes a second combing at a lower temperature, and being collected in parcels of ten slivers, is ready for the next operation.

(2.) Machine-combing.

The machines for wool-combing which are actually in use by the worsted trade are various. The specific merits of some of them have won distinctive preference in particular localities, but there is still not a little diversity of opinion on those merits. To describe them severally, in the order of their invention, but with as much brevity as possible, will give the reader the clearest view of the subject which it is in our power to furnish, and will, at the same time, afford some suggestive illustrations of the history of mechanical inventions. For this purpose we avail ourselves of an epitome of the several official specifications given in Mr James's valuable *History of the Worsted Manufacture*,[1] to which we have had occasion to refer already.

Cartwright's combing machine.

Cartwright's combing machine of 1790 was founded on a close imitation of those hand-combing processes which we have already described. In fig. 6 is a table supporting a number of cans out

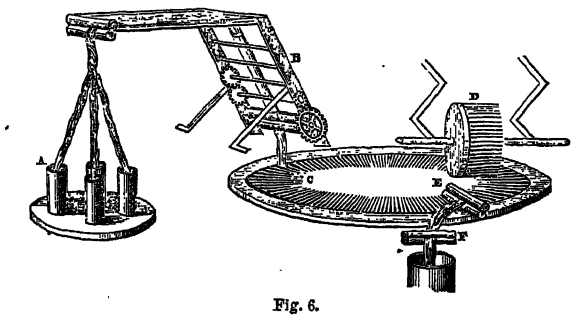


Fig. 6.

of which the prepared wool—wool, that is, previously washed, and then drawn out into continuous slivers by a preparing machine—is passed through the oscillating frame B, and is made to pull its wool over and into the teeth of a circular comb, C, furnished with rows of teeth pointing horizontally towards its centre. The fringe of the tufts of wool lashed into this comb by the frame B, is carried round until it passes under the working comb D, which traverses, by a crank motion, the face of the circular comb C, thus inserting its teeth into the fringe of wool, combing out the refuse, and then bringing the fringe into contact with the drawing off rollers E, whence the sliver is carried forward through the conducting rollers F into the receiving-can below.

Processes of the Worsted Manufacture.

This rude machine excited a storm of indignation, amongst the work-people, at the audacity of its aim, and its introduction was violently opposed, with the usual results. Nearly forty years passed before any greatly improved machine was constructed. The first which merits notice is that of Platt and Collier, patented in 1827, and shown in figs. 7 and 8. Here, two circles of combs heated by steam are placed

Collier and Platt's machine.

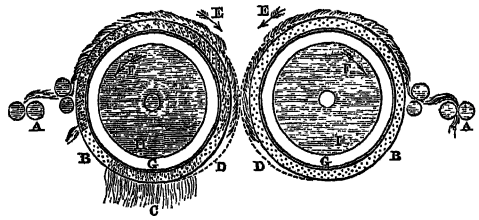


Fig. 7.



Fig. 8.

at an angle to each other, with teeth of reciprocal inclination. The raw wool being hand-filled into one of the combs at C, both are set into rapid motion towards EE. By means of a screw and lever, both combs traverse gradually towards each other, the empty comb depriving the full one of a portion of its wool, until, when they have reached the position indicated by the dotted lines DD, each comb is equally charged with worked wool. They are then put out of motion and drawn away towards FF. The drawing rollers are moved up, and the top drawn off; the noils being removed by hand at BB. Thus far, and until 1846, all the improvements attempted in mechanical combing imitated the hand-process, the main evil of which had always been the coiling round the teeth of the comb of the crossed fibres, in a manner which greatly increased the "noil" or refuse wool, and proportionally diminished the "top" or good wool.

Heilmann's machine.

Heilmann's machine, patented in England in 1846, but not brought into actual operation until 1849, solved the problem in a new fashion, yet by a process so simple as to increase the wonder that it had remained so long unsolved. The construction and working of Heilmann's comber is shown by fig. 9. A is a frame-work

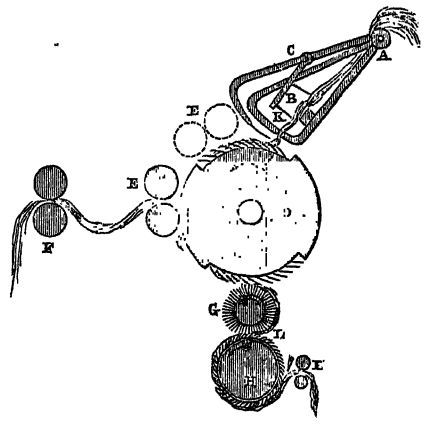


Fig. 9.

containing two feeders by which the prepared wool is supplied. As the wool passes, a pair of nippers close upon it, and hold it firmly at K. D is a revolving drum, part of the surface of which is armed with combing teeth, which move up and comb the overhanging wool. As the drum revolves, the plain portion of its surface also moves up, presses against the uppermost of the drawing rollers E, gathers up the cleansed wool, and passes it between these rollers; the upper roller is turned by the friction of the drum, and the lower one by the pressure of the upper. As soon as the roller and drum have taken hold of the cleansed wool, the first pair of nippers opens so as to press the fleece up into the teeth of the comb B, and then under those of C. The wool is then held entirely between the two drawing rollers, which are made to travel from the higher to the lower position, at a greater speed than that of

[1] James, ut supra, 564–574.

Processes of the Worsted Manufactures.

the surface of the drum, by contact with which the rollers are reversed, so as to give the partly combed wool a second combing. The rollers then return to their original position, and repeat their operations. A continuous sliver is formed by each succeeding tuft being so laid as slightly to overlap its predecessor, and is passed into the can by the conducting rollers F. The card rollers GH brush the noil out of the teeth of the drum. It is thrust forward from H by the point of the knife L, and removed by the conducting rollers I.

Lister and Donisthorpe's machine.

Lister and Donisthorpe's machine of 1851 is an improvement of Heilmann's. It both increases the quantity of work performed within a given time, and enlarges the range of material to which the comber is applicable, enabling it to deal with fibre of all kinds. In this engine (fig. 10), the feed-rollers A, and the screw-gill A, A

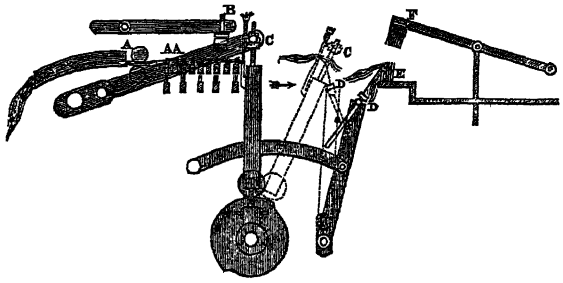


Fig. 10.

conduct the prepared wool into the machine, and the screw-gill also combs the tail-end of each tuft of fibre that is drawn out of it. The nipping instruments C somewhat resemble those described already, but the upper jaw consists of a broad blade with a sharp edge, and the under one of an upright bar with a grooved surface, into which the edge of the blade is inserted at every nip. The brush B descends upon the fleece every time that the nippers detach a portion, to prevent its escape from the teeth. The porter-comb D takes the tuft from the nippers, and deposits it in the teeth of the circular comb E. F is another brush, which presses the tuft down into a proper position for being drawn off. The other processes differ but little from those we have already detailed.

The close resemblances between Lister and Donisthorpe's machine and that of Heilmann, led to a trial very famous in the long annals of "patent cases," and resulted, ultimately, in the purchase by Lister of Heilmann's patent for the sum of L.30,000. But this result was only attained after a long series of attempts to deprive the real inventor of his legitimate reward,—a practice which would be deemed eminently discreditable, were it not for its strict consistency with previous example.

The machine of Preller and others.

In September 1852, Messrs Preller, Eastwood, and Gamble obtained a patent for improvements in combing machinery, the nature of which is indicated in fig. 11. A A are feed-rollers; B is a reciprocating arm, with a raking comb at its end. This arm traverses, backward and forward, from the feed-rollers through a semicircle, so as to deposit the tufts of wool in and over the teeth of a receiving-comb F; the brush E descending and pressing down the tufts in the usual way. C is a cam, working within the arm B, which causes the taking-comb to be drawn in towards its centre, when it arrives at B B, and thus gives it room to pass without disturbing the action of the receiving-comb. D D D are card cylinders, through the teeth of which the taking-comb lashes the tail-end of its tuft. The tuft is drawn off in a sliver, and the noil removed as in other machines.

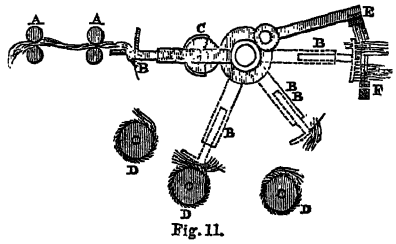


Fig. 11.

Processes of the Worsted Manufacture.

Crabtree's machine.

Crabtree's patent of 1854 varies the machinery of Preller's, by substituting for the single taking-comb a series of combs arranged at equal distances around the periphery of a drum, and causing each of the series, as it arrives opposite to the receiving or holding comb, to describe a half circle on its own axis, for the deposit of its tuft. And it also places the card cylinders at the top of the machine instead of at the bottom. Thus A A in fig. 12 are the feed-rollers; B C E and F are the series of taking-combs; H H H are the card-cylinders; G is the receiving-comb, and I is the brush.

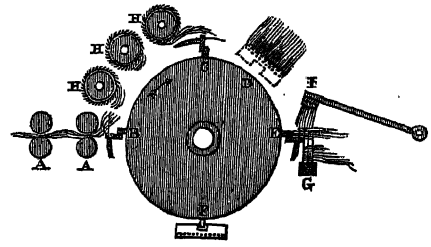


Fig. 12.

Ramsbotham and Brown's machine.

One other machine remains to be described, that, namely, of Ramsbotham and Brown, also patented, in its complete form, in 1854. The chief novelty of this machine consists in its filling its fibre into the teeth of the receiving-comb *across* the face of the screw-gill, and with the teeth of the one standing at right angles to the teeth of the other. Thus C (fig. 13) is the bed on which the

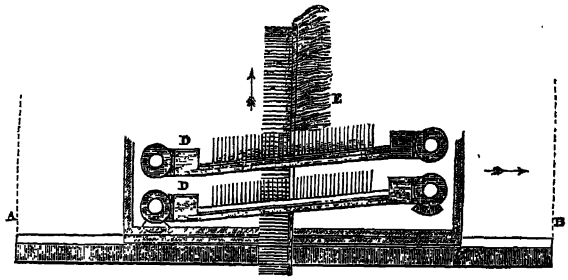


Fig. 13.

screw-gill D D is made to slide, in order to effect a feed. When it is close up to the end of the slide at A, and just as it is about by reversing its motion to return to B, a catch-comb, not seen in the drawing, but suspended in front of the position A, drops into the end of the fleece projecting from the face of the gill, and by its receding motion moves the coil into a better position for reaching the back chambers of the receiving-comb, yet without fastening it as is done by the ordinary taking-comb. The catch-comb then rises out of the wool, and the screw-gill slides onward, past the outer orbit of the circular receiving-comb E, and delivers its feed into the teeth from one end of the gill-bar to the other. These gill-bars, being inclined to the plane of their motion, distribute the feed over a larger surface of teeth, cause the portions of wool supplied to overlap each other, and so to draw out with greater ease than they would do if supplied at one point from a level bar. The receiving-comb revolves vertically in the direction of the arrow marked on the drawing. Thus, the action of the catch-comb, in the machine of Ramsbotham and Brown, avoids that injurious pressure of the noil into a hard mass, which results from the action of the ordinary taking-comb in other machines constructed on the same general principle, that, namely, of "lashing" in the wool, instead of "nipping" it.

Long as is this list of combing-machines, others have been added, very recently, by various modifications of the processes we have described. Their relative merits experience only can demonstrate.

For the remaining operations of the worsted manufacture—many of them identical with those employed in the manipulation of cotton—the reader is referred to the articles COTTON MANUFACTURE; DYEING; SPINNING; and WEAVING. (E. E.)

Wooler ‖ Woolwich.

WOOLER, a market-town of England, county of Northumberland, on a small affluent of the Till, 45 miles N.N.W. of Newcastle. It stands on a gentle eminence on the eastern declivity of the Cheviot Hills, and was at one time much frequented by invalids. It has a neat parish church, several dissenting places of worship, a grammar school, public library, mechanics' institute, and a dispensary. In the neighbourhood are remains of ancient fortifications, and a pillar commemorative of the defeat of the Scots under Douglas by Earl Percy in 1402. Pop. of parish (1851) 1911.

WOOLSTON, THOMAS, was born at Northampton in 1669, and educated at Sydney College, Cambridge. He was chosen a fellow, and proceeded to the degree of B.D. His first appearance in the learned world was in 1705, in a work entitled *The old Apology for the Truth of the Christian Religion, against the Jews and Gentiles, revived.* He afterwards wrote many pieces; but what made the most noise were his six *Discourses on the Miracles of Christ*, which occasioned a great number of books and pamphlets upon the subject, and raised a prosecution against him. At his trial in Guildhall, before the Lord Chief Justice Raymond, he spoke several times himself, and urged that "he thought it very hard that he should be tried by a set of men who, though otherwise very learned and worthy persons, were no more judges of the subjects on which he wrote than himself was a judge of the most crabbed points of the law." He was sentenced to a year's imprisonment, and to pay a fine of L.100. He purchased the liberty of the rules of the King's Bench, where he continued after the expiration of the year, being unable to pay the fine. The greatest obstruction to his deliverance from confinement was the obligation of giving security not to offend by any future writings, he being resolved to write again as freely as before. While some supposed him to have written with the settled intention of subverting Christianity under the pretence of defending it, others believed him disordered in his mind; and many circumstances concurred which gave countenance to this opinion. He died January 27, 173$\frac{3}{4}$, after an illness of four days, and a few minutes before his death, uttered these words: "This is a struggle which all men must go through, and which I bear not only patiently but with willingness." His body was interred in St George's churchyard, Southwark.

WOOLWICH, a town, dockyard, and great national arsenal, in Kent, on the river Thames, is 9 miles from London by water, and 8 miles by road. The North Kent railway passes through the town, and has two stations, about one mile apart, in connection with the royal dockyard and the arsenal. Population in 1851, 22,534. The town is dirty, irregularly built, and without any houses of architectural pretensions. Its streets are mostly composed of mean-looking houses and shops, stretching along the river bank, and rising a little towards the south, where the ascent is crowned by the royal artillery barracks. Here, in 1618, was born Richard Lovelace, the cavalier poet, at the house of his father, Sir William Lovelace, but its site is now forgotten. The parish church, dedicated to St Mary Magdalene, was rebuilt in 1740. St John's church was erected in 1840. Trinity Church, and St Thomas's, near Charlton, are recent erections.

Woolwich owes its importance to its *dockyard* and its *arsenal*. Its name indicates, it is said, "the settlement," or "home on the creek" (*hulviz*), and its growth dates from the reign of Henry VIII., whose great ship, the "Henrye Grace à Dieu," was burnt here in 1553. "The Sovereign of the Seas," which Fuller pronounces "a liege ship of state," and "the greatest our island ever saw," was built in "the mother dockyard of England" in 1637, by Mr Peter Pett. She mounted 100 guns, was richly carved and decorated, and from the notable part she played in their great naval defeats, was called by the Dutch the "golden devil." There are here two dry-docks of great size; a basin, 400 feet by 300; an iron shed, over No. 5 slip, erected in 1857, which consists of a centre 261 feet by 82, and two side-spans, each 232 feet by 32. Some of our finest men-of-war have been launched from this dockyard, whose various sheds and buildings extend nearly half a mile along the river bank.

Worcester.

The *arsenal* was established in 1716. Previous to that date a royal foundry for casting brass cannon had existed in Moorfields. In that year some cannon taken from the French were ordered to be re-cast, and numerous officers and persons of distinction assembled to witness the process. Among them was a German named Schalch, whose experienced eye noticed a moisture in the moulds which the workmen had overlooked. He warned the master-general that an explosion would take place, and when his warning was disregarded, left the foundry. His prediction was fulfilled, and the government immediately advertised for the prophet. He was found, and the superintendence of a new factory, which at his instigation was established at Woolwich, was placed in his hands. The buildings were designed by Vanbrugh. The Armstrong guns are now manufactured or at least completed here. The laboratory is an important department. One of the three furnaces in the foundry will absorb 19 tons of metal. In the carriage factories, sawing, planing, turning, and dove-tailing are done by machinery, and the various portions are put together by hydraulic power.

Woolwich Common is covered with buildings of national importance. The *rotunda* is a tall, tent-like edifice, crowded with military curiosities, with models or specimens of every kind of cannon, mortar, bomb, musket, rifle, matchlock, and arquebus. The *Royal Military Academy* was built in 1805, at a cost of L.150,000, from Sir Jeffrey Wyattville's designs. It usually contains about 200 cadets. The hall is a handsome and well proportioned chamber.

The *Royal Artillery Barracks* (for horse and foot) can accommodate nearly 4000 men. The front is 1200 feet in length, and the parade nearly 1 mile. Five remarkable pieces of ordnance are stationed here; the central piece, an immense brass gun, was captured at Bhurtpore.

Between Woolwich and Plumstead lies the *practice range*, where important experiments in the improvement of artillery are carried on, under the direction of a select committee; and on the borders of the parish, near Charlton, stands the small but important building of the *Compass Observatory*, where the compasses used in her Majesty's ships are duly examined and regulated.

North Woolwich is on the opposite bank of the river, and communicates with London by a branch of the Eastern Counties Railway. That portion of the river which lies between Charlton Stairs and Woolwich Arsenal is called Woolwich Reach, and is navigable for vessels of any burden. (W. H. D. A.)

WORCESTER, the capital of Worcestershire (and a city and county in itself, with separate assizes and quarter sessions), stands on the east bank of the Severn, about 26 miles from Birmingham, and 111 from London by road, and 139 by railway. It is governed by a mayor, 12 aldermen, and 36 councillors, is the seat of the bishopric of Worcester, returns two members to parliament, and gives the title of marquis to the Duke of Beaufort. The population in 1851 was 27,528. Worcester is one of the most ancient cities in the kingdom. Roman remains have been found there, and a city and bishopric were founded in 680 by the Saxons, who also built a cathedral there which was destroyed, but rebuilt in 983 by St Oswald; but being again destroyed, was reconstructed by St Wulstan in 1084. Examples of Norman architecture are still visible in parts

Worcester. of the cathedral, and the crypt beneath the choir is a most exquisite Norman structure; but the present building is chiefly of the early English and decorated periods. The exterior, however, has been so patched and altered, as to present in many parts a very unsightly appearance. The interior is remarkable for its chaste simplicity; the nave, especially, will bear comparison with that of almost any other cathedral in England. The plan of the church is a double cross, with a heavy square tower (without a spire) rising from the centre to a height of 167 feet. The length of the church is 514 feet, breadth of transepts 78 feet, and height of nave 68 feet. The cathedral contains numerous monuments, of which the principal is that of King John, which stands in the middle of the choir, bearing a recumbent effigy of the king, flanked on either hand by St Wulstan and St Oswald. The body of the king was supposed to lie under a stone at the east end of the church; but in 1797, on opening the tomb, the royal remains were found within it, but showing traces of removal at an earlier period. In the transepts there are several beautiful mortuary chapels, the most remarkable of which is that erected in honour of Prince Arthur, eldest son of Henry VII. This chapel is richly decorated with sculptured effigies, representing virgins, bishops, kings, confessors, and martyrs. In the choir stalls are many very curious carvings on the under-side of the stall seats or *misereres*; some of the designs are not commendable for decency. The cloisters are very perfect, and are noticeable for their groining and for a series of lychnoscopic openings in the buttresses. The cathedral was much defaced and injured in the civil war by Cromwell's troops, who stabled their horses there, and used the church as a barrack. Near the cathedral is a grammar school, formerly the refectory of the canons; and close to the school is a noble pile of buildings known as the Guesten Hall, now almost in ruins. The close surrounding the cathedral is occupied by the houses of the canons, of whom there are six, besides minor canons, and other ecclesiastical officers. The ancient Episcopal palace, now the deanery, stands close to the cathedral, and, like it, overlooks the Severn, which spreads out here into a broad stream, crossed by a handsome stone bridge of five arches, erected in 1781, at a cost of L.30,000. There are twelve parish churches in Worcester, but few of them are of great note. There are also numerous charitable foundations, enjoying in the aggregate a large annual revenue from endowments. The see enjoys the rare distinction of having numbered not fewer than four saints amongst its bishops. Egwin, Dunstan, Oswald, and Wulstan. Since the Reformation the bishops of Worcester have included the martyrs Latimer and Hooper, and Bishops Hough, Prideaux, Stillingfleet, and Hurd.

Besides the cathedral, Worcester contains many other objects of interest, such as remains of religious houses, curious half-timbered buildings, and public edifices. Amongst the latter is the Guildhall, a quaint building, standing in the Foregate. Its front, which is of brick, is adorned with stone quoins, with stone mouldings and tablets to the windows. The principal entrance is ornamented with columns of the composite order, highly enriched, and crowned with an indented cornice and open pediment, in which are the city arms. On each side of this entrance are statues of the Kings Charles the First and Second in niches; and over the doorway a statue of Queen Anne. There are also a handsome market hall, county hall or assize court, museum, music hall, school of art, an hospital, and an arboretum or public pleasure-ground. The county jail is situated near the city, and there are also lodgings for the judges. The principal streets of Worcester are broad, and lined with lofty houses, chiefly of brick. The city is well supplied with water, and is lighted with gas. The immediate neighbourhood is singularly beautiful, and within easy reach by coach and railway is the town of Malvern, the mineral springs of which, and its lovely situation at the foot of the Malvern Hills, have brought it into great repute as a fashionable watering-place or "spa." Worcestershire.

Worcester was anciently of necessity strongly fortified, as it had to resist frequent attacks from the Welsh, and in turbulent periods of English history was often the object of assault by contending parties. In the civil war the final great battle between the puritans and the cavaliers took place there. This battle, which Cromwell called his "crowning mercy," was fought on September 3, 1651, between the parliamentary troops, commanded by Cromwell in person, and the Scotch army of Charles the Second. The battle lasted several hours, and at its close the Scotch were utterly routed, nearly the whole of them being killed or made prisoners. The latter were sold as slaves to settlers in the Virginian plantations. The king escaped from the battle with great difficulty, and afterwards remained in various hiding-places in the neighbourhood, until he obtained the means of passing over to the continent. The city was heavily fined by the parliamentarians, and at the Restoration it received from Charles the honourable motto—

"Civitas in bello et in pace fidelis."

This appellation of "the faithful city" it continues popularly to bear to the present day. Worcester is connected with London, Birmingham, Stratford, Hereford, Malvern, and other places by railways, canals, and excellent roads. The manufactures of the city are porcelain and glove-making. (J. T. B.)

WORCESTERSHIRE, an inland county, forming part of the west midland division; bounded on the north by Staffordshire, east by Shropshire and Herefordshire, south by Gloucestershire, and west by Warwickshire. The county is very irregular in shape, and several portions of it lie detached and surrounded by other counties, while in its turn Worcestershire comprises isolated parts of other counties. Its greatest length is about 34 miles, and greatest breadth 30 miles. Its surface measures 738 miles or 472,165 statute acres. In 1851 it contained 55,639 inhabited houses, 2723 uninhabited, and 337 building. The population was in 1801, 146,441; 1811, 168,982; 1821, 194,074; 1831, 222,655; 1841, 248,460; 1851, 276,926, of whom 136,956 were males, and 139,970 females. The increase for the fifty years from 1801 to 1851 was 89 per cent. The last census gave an average density of 375 persons and 75 inhabited houses to a square mile, 1·7 acre to a person, and 5 persons to a house. The religious census in 1851 gave the following results. Total places of worship 489; sittings, 141,512. Church of England, 244 places, 85,155 sittings; Roman Catholics, 12 places, 2834 sittings; Independents, 24 places, 7404 sittings; Methodists (various sects) 127 places, 16,926 sittings; Baptists, 46 places, 9949 sittings; Unitarians, 9 places, 2461 sittings; Mormons, 3 places, Quakers 7, Jews 1, Presbyterians 1, miscellaneous sects 6. The statistics of education, obtained at the census of 1851 were—total day schools 701; scholars 30,557—males, 16,694; females, 13,863. Of these there were public schools 233, with 21,279 scholars; private schools 468, with 9278 scholars. 130 of the public schools are supported by religious bodies, and of these 108, with 8053 scholars, belonged to the Church of England. There were also in the county 15 collegiate and grammar schools, and 70 other endowed schools. The Sunday schools numbered 341, with 35,221 scholars (17,540 males and 17,681 females), with 3603 unpaid and 262 paid teachers. Of these schools 193 (with 17,922 scholars) belonged to the Church of England. The Wesleyans stood next on the list with 87 schools and 9846 scholars. There were also 19 evening schools (with 379 scholars) and 21 literary

Worcestershire.

institutions. The criminal returns for 1859 show that in that year the police force for the whole county (including boroughs) numbered 217 men, maintained at a cost of L.14,682. The crimes committed during 1859 were 782, and the number of persons apprehended 536. The number of known thieves, or persons living wholly or chiefly by crime, was 3181—namely, 2209 males and 972 females. The vital statistics of the county for 1858 (the last year yet issued of the registrar-general's corrected returns) were—births 9616, deaths 5855; excess of births over deaths, 3761. The illegitimate births were 656, or 1 in 14½. The average rate of mortality for the ten years from 1841 to 1851 was 21 in the thousand. The marriages in 1858 were 2392, of which 2208 were solemnized according to the rites of the Church of England.

The county is included within the diocese of Worcester, and the archdeaconry of the same name. The archdeaconry includes the rural deaneries of Blockley, Droitwich, Evesham, Kidderminster, Pershore, Powick, Worcester, Kinelon, and Warwick. (The two last-named places are in the county of Warwick.) For legal purposes, the county is within the Oxford circuit. The assizes are held at the city of Worcester, which is also a county in itself with separate assize. The quarter-sessions are likewise held at Worcester, where the county jail is situated. The lunatic asylum is at Powick, near the city. The parliamentary divisions of Worcestershire are into *east* and *west*—the former containing the divisions of Stourbridge, Dudley, Droitwich, Northfield, Blockley, Pershore, and Evesham; and the latter the divisions of Upton, Worcester, Hundred House, and Kidderminster. County courts are held at ten places, and the county includes thirteen poor-law unions. Worcestershire sends twelve members to parliament, two from each division of the county; two each from Worcester and Evesham, and one each from Kidderminster, Dudley, Droitwich, and Bewdley. For police purposes Dudley was transferred to Staffordshire by an act of parliament passed in 1859.

The manufacturing portions of Worcestershire are situated principally in the north and north-eastern districts. At Stourbridge the glass manufacture is carried on to a large extent; Dudley is the centre of a great iron and coal district, which also includes Stourbridge, Rowley Regis, Oldbury, and many other adjacent places. Vast quantities of limestone are also obtained from the bases of the hills at the southern extremity of which Dudley is situated. Redditch is occupied in the manufacture of needles and fish-hooks: the annual produce of the former, from this town alone, is between three and four thousand millions. Nails are made at Bromsgrove, and at Kidderminster there are numerous carpet factories. In connection with this town it is a curious fact that the so-called Kidderminster carpets are not made there at all, the looms being occupied exclusively in producing Brussels, velvet-pile, and the more valuable kinds of carpets. A great impetus has within the last few years been given to this trade by the introduction of steam-power and improved machinery. At Worcester a considerable manufacture of porcelain is carried on, and the city still retains the glove trade as an important branch of industry, though of late years the extent and value of its production have sensibly declined.

The salt made at Droitwich supplies nearly one half of England with that indispensable article. The duty collected there before the abatement of the tax amounted to more than L.1000 per day. The water from which the salt is made by evaporation is more highly saturated than any other that has been discovered. Researches in the bowels of the earth have shown that a river of salt water, about 22 inches in depth, runs about 250 feet below the surface. Immediately above this subterranean stream is a bed of gypsum 130 feet thick. When this stratum is penetrated by the borer, the spring rises to the surface, and yields a never-failing supply of water, so fully saturated that no more salt can be dissolved in it. The springs at Droitwich hold in solution about one fourth of their weight in salt; and no other in England holds more than a ninth. The subterraneous river runs over a bed of rock-salt, whose thickness has not yet been ascertained. Besides the springs at Droitwich, other mineral springs are found at Malvern which are resorted to for their healing properties, as well as for the pure air of the district. The combinations of the wells are carbonate of soda, carbonate of lime, carbonate of magnesia, carbonate of iron, sulphate of soda, and muriate of soda.

Worcestershire.

The new red sandstone occupies nearly the whole vale of Severn, and the lias formation the vale of Avon, in which the Evesham district is situated. In the north-west are beds of coal and ironstone, the Dudley district also includes limestone; quartz is in the Lickey hills, and the Malvern hills are chiefly composed of granite. The principal chains of hills are the Clent and Lickey to the north and east; and the Abberley and Martley hills to the west, running southwards to the Malvern chain, the loftiest heights in the midland counties. The Malverns attain a height of 1300 feet; there are no other hills of greater altitude than 900 feet. There are several detached hills of some importance, such as Bredon Hill and Broadway Hill. The chief rivers of Worcestershire are the Severn, the Avon, the Tame, the Salwarpe, the Leddon, and the Rea. The Avon and Severn are navigable: the latter for a distance of 200 miles from its mouth. Great labour and vast sums of money have been expended in improving the navigation of this river, and at Worcester an important series of locks and basins has been formed during the last few years. Lamprey, shad, and salmon are found in the Severn, but the take of the latter is rapidly diminishing, although at one period it was so plentiful that when boys were apprenticed in Worcester it was formally stipulated in the indentures that they should not be obliged to eat salmon more than twice a week.

Independently of the advantage of navigable rivers, Worcestershire is well supplied with good roads, canals, and railways. The principal canals are the Birmingham and Worcester, the Trent and Severn, the Droitwich, the Dudley and Leominster, and their various branches, which reach nearly every town of note in the county, and afford means of easy and direct communication with Warwickshire and Staffordshire. The Dudley canal, which proceeds from the Worcester and Birmingham canal, about four miles below the latter town, and joins the Stourport canal near Stourbridge, is remarkable for the stupendous character of the engineering difficulties overcome in its construction. Some idea of these may be formed from the fact that during its course of 13 miles it passes through three tunnels of an aggregate length of four miles. The railways are the Oxford, Worcester, and Wolverhampton, which enters the county at Evesham, runs to Worcester, and thence by way of Droitwich and Kidderminster to Dudley, and thence to Birmingham. This line has a branch to Stratford-upon-Avon. The Gloucester and Birmingham line runs right across Worcestershire, starting from Birmingham, and traversing the county from north-east to south-west. A line of railway likewise runs from Worcester to Malvern, and a line is in course of construction to connect Worcester with Hereford.

Worcestershire is on the whole a fertile county, although it contains many patches of poor intractable land. To the north the soil is a loamy sand, mixed with gravel; towards the east it is a strong clay, with occasional patches of sand and peat earth; clay and red marl prevail between Worcester and Evesham. In the vale of Evesham the soil is a peculiarly rich and deep dark earth resting on clay; and on

Worcester. the southern boundary of the county the soil is partly limestone and partly a rich loam. Wheat is grown in large breadths, and barley and beans are likewise extensively cultivated. Hops form a staple of agricultural produce; but the chief glory of the county consists in its orchards of apples and pears, which are most abundant and of fine quality. The making of cider and perry constitutes an important portion of agricultural industry, and these beverages are in common use in the country districts. Worcestershire has no peculiar breeds of either cattle or sheep. The aspect of the county, as seen from the various ranges of hills, is extremely pleasing: it presents the appearance of a richly cultivated plain, well wooded, and watered by innumerable streams. The farms are usually small in size, varying from 40 to 300 acres; but there is at present a tendency to increase their acreage.

The early history of Worcestershire cannot be determined with accuracy. There are traces of Roman occupation, in camps on the Malvern, Bredon, and Woodbury hills, and in the Ikenield Street and the Ridgeway, which traversed part of the county. Under the Saxons the county was included in the kingdom of Mercia. Soon after the Conquest the dignity of earl of Worcester was created, and the nobles who governed the county under this title were also frequently engaged in keeping the peace on the Welsh borders. The dignity did not long remain in one family, but at last settled in that of Somerset, which was raised successively to the marquisate of Worcester, and the dukedom of Beaufort, in which title the marquisate is now merged. The county has shared in all the great civil wars of England. It was frequently the scene of contests between the Saxons and Danes; the great battle which decided the fate of Simon de Montfort was fought in the vale of Evesham; and during the civil war Worcestershire was disturbed by frequent skirmishes. The battle which settled Cromwell in possession of the government was fought under the walls of the chief city (see WORCESTER). There were numerous abbeys, monasteries, and other religious houses in the county before the dissolution, and several of those which remain are now converted into churches. Amongst these are Malvern and Evesham Abbeys.

The principal seats in the county are Hagley, Lord Lyttelton; Witley, Lord Ward; Hartlebury Castle, Bishop of Worcester; Madresfield, Earl Beauchamp; Westwood, Sir J. Pakington, Bart., M.P.; Ombersley, Lord Sandys; Hewell Grange, Lady Windsor; Daylesford (formerly the property of the famous Warren Hastings) Croome, Earl of Coventry; and the Rhydd, Sir E. Lechmere, Bart.—In his *Noble and Gentle Men of England*, Mr Evelyn Shirley (see WARWICKSHIRE) gives the following as the only existing "knightly" and "gentle" families who were settled in Worcestershire before the beginning of the sixteenth century. *Knightly*,—Acton of Wolverton, Lyttelton of Frankley (Lord Lyttelton), Talbot of Grafton (Earl of Shrewsbury and Talbot), Hanford of Wollashill, and Winnington of Stanford.—*Gentle*,—Noel of Bell Hall, Lechmere of Hanley, Sebright of Besford, and Boughton of Rouse Lench. The towns having populations of 3000 and upwards in 1851 were Bromsgrove, 4426; Bewdley, 3124; Droitwich, 3125; Evesham, 4605; Kidderminster, 18,462; Dudley, 37,962; Oldbury, 5114; and Worcester, 27,528. (J. T. B.)

WORCESTER, FLORENCE OF, one of the earliest historians of the twelfth century. His work is entitled *The Chronicle of Chronicles, from the Beginning of the World to the Year* 1117. The early part seems to have been compiled from Gildas, Bede, Marianus Scotus, and the Saxon Chronicle; the latter part is curious, as it gives a great deal of local information not to be found elsewhere. Higden says he died 1118. The work has been continued to 1163 by a monk of the same abbey. The best old edition is that affixed to the *Flores Historiarum* of Matthew of Westminster, folio, Frankfort, 1601. Worcester ‖ Wordsworth.

WORCESTER, *William of*, another of the ancient chroniclers, whose name is said to be Botoner, was born of noble parents. His principal work is the *Annales Anglicarum rerum*, which commence at the year 1324, and go down to 1491, and which contain much curious matter, particularly as regards the city of London. Affixed to these is a book which he calls Ἀνεκδοτα, a collection of miscellaneous historical information. An itinerary is also extant, chiefly relating to the west of England and city of Bristol. This last has latterly excited much interest, in consequence of the notices of the architecture of Redcliff church therein. He is also said to have written several works on astrology, and *Polyandrum Oxoniensium*, a list of the worthies of Oxford. Little is known of his history, except that he was a great friend of the Fastolffs of Norfolk. Bale and Pitts both speak very highly of him. The last edition of the *Annals* is that affixed to the *Liber Niger Scaccarii*, Hearne, Oxford, 1728; of the *Itinerary*, Nasmith, Cambridge, 1778.

WORDSWORTH, CHRISTOPHER, the youngest brother of the poet, was born at Cockermouth in 1774. After a preliminary education at the grammar school of Hawkstead, he removed to Trinity College, Cambridge, in 1792, where he took his bachelor's degree in 1796, was elected a fellow in 1798, and graduated as master of arts in 1799. In 1802 he printed *Six Letters to Granville Sharpe, on his Remarks on the Uses of the Article Definitive in the Greek Testament*, which were highly admired by such scholars as Horsley and Middleton, and procured him the patronage of Manners Sutton, then archbishop of Canterbury, who appointed him his domestic chaplain. This patronage, of course, secured him ecclesiastical preferment; and among other livings which were conferred on him was that of dean of Bocking, the same which Gauden, the presumed real author of the *Icon Basilikè*, had held. In 1809 he issued his *Ecclesiastical Biography*, in six volumes, which, on its subsequent re-issue, were augmented by four more. This work was rewarded with the title of B.D., which was conferred on him by royal mandate, and was speedily followed by valuable church preferment. In 1814 he was made rector of St Mary's, Lambeth; in 1816 he became chaplain of the House of Commons; and in 1820 was elected master of Trinity College, Cambridge. Perhaps his residence at Bocking had inspired him with a more than usual interest in the vexed question of the Icon Basilikè, at all events he wrote two volumes on the subject, the one entitled, *Who wrote Icon Basilikè considered and answered;* the other, *King Charles the First the Author of Icon Basilikè proved in reply to the objections of Lingard, the Edinburgh Review, Mr Hallam, &c.* The question is so usually discussed under the influence of political bias, that we shall be excused pronouncing an opinion on the success of his work in proving Charles to be the author of the *Icon*. He has, however, accumulated a mass of evidence in his favour which must be disproved before it can again be asserted that Gauden was the real author. In 1837 he prepared his *Christian Institutes*, intended for students for holy orders; and in 1841 resigned his mastership of Trinity, an office in which he has been worthily succeeded by Dr Whewell. After his resignation he retired to his living at Boixted, where he died in 1846.

WORDSWORTH, *William*, a philosophical and patriotic English poet. The anniversary of St George, the patron saint of England, was appropriately marked by the birth and death of Shakspeare, whose pen achieved greater miracles for his country than those ascribed to the sword of the fabulous champion. The same festival—the memorable

Words-worth.

23d of April—was further signalized, in 1850, by the death of another truly English poet, one who sang of her hills and groves, her lakes and rivers, with intense delight, and who sympathized equally with "the heroic wealth of hall and bower," and with the virtues found among "the huts where poor men lie." This enthusiastic worshipper of nature and simplicity resided for about half a century in the picturesque lake-country in Westmoreland, and gave forth his poetical oracles, as the great Pan of the lakes, with unfaltering confidence and power. He was long neglected, ridiculed, and contemned; but he lived to see his creed widely adopted and firmly established. He never sank into apathy nor despondency, but dignified his retirement by the careful cultivation of his intellectual powers, and by the lustre of a blameless and unspotted life. Without the force and splendour of Byron, the universality of Scott, the chastened energy and melodious pathos of Campbell, or the sparkling brilliancy of Moore, Wordsworth was more original and philosophical than any of his great contemporaries, and he has sent forth strains that recall the divine genius of Milton. He was not without grievous faults. His taste was not equal to his genius; the power or the will to discriminate, reject, and condense, was wanting; and hence his description is often too minute and his style redundant. He brooded over his poetical conceptions and theories with a fond and undistinguishing partiality, that extended to puerilities and conceits, no less than to his loftiest and most profound speculations. This error lay upon the surface, and was peculiarly open to satire. It was not prominent, however, in his later and most finished productions; and those higher flights kept possession of the better part of the public. By repeated efforts, he stamped his mind upon the age, and his influence promises to be lasting. Some of his odes and minor poems have never been excelled. Numbers of his sonnets, too, are unique, and unrivalled in modern poetry. Even his worst pieces are suggestive of some reflection or emotion; some link of affinity between man and external nature. The rise of Wordsworth's reputation, in spite of every obstacle, in the face of a dazzling file of competitors, and in defiance of hostile criticism, furnishes a remarkable proof of the purer taste and elevated moral feeling that have, during the last half century, gained ground among the readers of poetry, and of that love of nature and that kindred sympathy with humanity, even in its lowliest forms, which it was the great and unceasing business of his life to inculcate. It may be compared with one of his own grand yet simple illustrations:—

> "Within the soul a faculty abides,
> That with interpositions, which would hide
> And darken, so can deal, that they become
> Contingencies of pomp, and serve to exalt
> Her native brightness. As the ample moon
> In the deep stillness of a summer even
> Rising behind a thick and lofty grove,
> Burns like an unconsuming fire of light
> In the green trees; and kindling on all sides
> Their leafy umbrage, turns the dusky veil
> Into a substance glorious as her own,
> Yea, with her own incorporated, by power
> Capacious and serene; like power abides
> In man's celestial spirit; virtue thus
> Sets forth and magnifies herself—thus feeds
> A calm, a beautiful, and silent fire."

The real life of Wordsworth was internal, and must be read in his works. The few incidents in his external career are easily related. He was a native of the lake-district, which he has helped to render so famous. He was born at Cockermouth, in Cumberland, on the 7th of April 1770. His father was law-agent to Sir James Lowther, afterwards earl of Lonsdale, and was descended from an old Yorkshire family. His mother, Anne Cookson, daughter of a mercer in Penrith, was connected with the ancient Westmoreland family of Crackanthorp. The poet was one of five children, four sons and a daughter. The eldest son, Richard, died a respectable attorney-at-law in London, in 1816; the second was the poet; the third, John, was commander of the Earl of Abergavenny East Indiaman, in which he perished by shipwreck, off Weymouth, in 1805; the fourth, Christopher, became master of Trinity College, Cambridge, and died in 1846; the only daughter, Dorothy, survived the poet unmarried, and was his cherished literary associate and his travelling companion at home and abroad. She was about two years younger than he was, and exercised a most beneficial influence on his character and tastes. This amiable and attached family were early deprived of both parents. At the age of fourteen, William was an orphan. After some elementary instruction at Cockermouth and Penrith, he was sent to school at Hawkshead in Lancashire, which he continued to attend until his eighteenth year, when he removed to St John's College, Cambridge. The academical career of Wordsworth was not distinguished. He was headstrong, impatient of control, and, like Milton, averse to the studies and discipline of his college. His last summer vacation he spent on the continent in a pedestrian tour with a fellow-collegian, Mr Robert Jones, with whom, in the following year, after taking his degree, he proceeded on an excursion to North Wales. The result appeared in *Descriptive Sketches*, written in 1791 and 1792, addressed to his fellow-traveller, and published in 1793. The same year appeared another poem, *An Evening Walk, addressed to a Young Lady*. The latter contains sketches of the English lakes, commemorating the charms of Derwent, Rydal, Grasmere, and Windermere: scenes with which the young poet's happiness and fame were ever afterwards to be associated. The versification of the poems is in the regular heroic couplet, easy and flowing, but without much animation. Wordsworth was then a republican in sentiment, glorying, like Coleridge and Southey, in the new day of liberty which had dawned upon France:—

> "Before him shone a glorious world,
> Fresh as a banner, bright, unfurled."

He wandered from place to place, "unfitted with an aim." His friends were desirous that he should enter the church, or adopt the legal profession; but to both he had insuperable objections. He projected a monthly miscellany, to be called *The Philanthropist;* and he looked about for an engagement as a newspaper writer. Neither scheme took effect. A young friend, Raisley Calvert, fell ill of a consumption; Wordsworth attended him faithfully for months, and on the death of Mr Calvert, in the spring of 1795, it was found that he had left the poet a sum of L.900. "Upon the interest of the L.900," he says, "L.400 being laid out in annuity, with L.200 deducted from the principal, L.100, a legacy to my sister, and L.100 more which the *Lyrical Ballads* brought me, my sister and I contrived to live seven years, nearly eight." A further sum of about L.1800 each came to his sister and himself, as part of his father's estate, due by Lord Lonsdale; and with this humble provision (still farther reduced by an advance made to their sailor-brother) the poet resolved to devote himself to poetry and retirement. He first settled at Racedown Lodge, Dorsetshire, and there (June 1797) met with Coleridge, with whose conversation and poetical enthusiasm, Wordsworth and his sister, like all other persons, were fascinated. To be near Coleridge, they removed to the neighbourhood of Nether Stowey, Somersetshire, inhabiting a large house called Allfoxden, situated in a large park, with seventy head of deer around them. In this congenial retreat, Wordsworth wrote many of his smaller poems, and his tragedy, *The Borderers*, which was offered to the managers of Covent Garden Theatre, but rejected, and not published till 1842. In 1798, appeared *Lyrical Ballads, with other Poems*, for the copyright of which a poetical bookseller, Mr Joseph Cottle of Bristol, gave thirty guineas. Mr Cottle printed

Words-worth.

an edition of 500 copies; but he says the sale was so slow, and the severity of most of the reviews so great, that its progress to oblivion seemed certain. He disposed of most of the 500 volumes at a loss to a London bookseller, and the copyright being valued at *nil*, Cottle presented it to Wordsworth. Yet the first piece in this collection was Coleridge's "Ancient Mariner," and the concluding poem, Wordsworth's exquisite lines on revisiting Tintern Abbey. After a tour in Germany, partly with Coleridge, and after six months residence there, the poet and his sister settled down in a cottage at Grasmere. In 1800 was published *Lyrical Ballads*, in two volumes; the first being a reprint of the previous series, and the second containing "Hartleap Well," "Ruth," "The Fountain," "The Pet Lamb," and other pieces since highly popular. Another edition of the *Ballads* was published in 1802, and a third in 1805. The *Edinburgh Review* at this time exercised an almost despotic sway over current literature, and its editor, the brilliant Francis Jeffrey, set himself in direct opposition to the lake-poets, and especially to Wordsworth. He ridiculed the poet's choice of subjects, picked out all his most doubtful and puerile productions or passages, and for years kept up a constant fire of sarcasm, reproof, and invective against the devoted poet. There was, of course, some truth in this harsh criticism. There was no occasion, as Scott said, that Wordsworth should "crawl upon all fours, when God had given him so noble a countenance to lift to heaven." The wrong and injustice inflicted on the poet was, that the critic looked only on the unfavourable side of the picture. He concealed or appeared insensible to all the brighter and better traits of his genius, and would not or could not see that Wordsworth was leading the public taste into pure and natural channels, and reclaiming poetry from its alliance with false excitement and immorality, as well as from the stiff conventional restraints of the old regime. The poet, on the other hand, with characteristic firmness or obstinacy, seemed determined on persevering in opposition to the public taste, and defended his views as to the proper subjects for poetry, and the nature of poetic diction, in prefaces and essays which savoured strongly of paradox and egotism. Gradually, however, a reaction took place, and there were concessions on both sides. The original and suggestive character of the poems was felt and acknowledged, readers multiplied, and the new school extended (for it was based on nature and on our best feelings and affections), while its founder, without professing to yield, tacitly abandoned his own theory, and supplied his admirers with productions of a higher order. Some pieces were silently dropt out of the later editions of the *Poems*, and others were considerably modified; nor did the poet ever return to the style of "Goody Blake," "Alice Fell," or the "Idiot Boy."[1]

Limited as were the worldly fortunes and hopes of Wordsworth, he found a lady willing to share them, and fitted to add fresh blessings to his cottage at Grasmere. In 1802, he was married to Miss Mary Hutchinson, Penrith, whom he had long known and esteemed. The wedded life of poets has been supposed to be rarely productive of happiness. The names of Dante, Milton, Shakspeare, Dryden, Addison, and Byron, have been cited in illustration of this dictum, though in the cases of Shakspeare and Addison there is an absence of all direct proof; Coleridge might with more certainty be added to the ill-starred list. But with Wordsworth there was no disturbing influence. His life to its close was eminently prosperous, and his beautiful lines, "She was a phantom of delight," written in the third year after his marriage, with various other passages in his works, attest the durability as well as intensity of his domestic happiness. Generous friends also came forward. Sir George Beaumont chose a beautiful spot near Keswick (Applethwaite), which he purchased and presented to Wordsworth; Lord Lonsdale placed L.800 to the poet's credit, that he might become owner of a small estate at Patterdale. Of this sum, however, only a fourth part was accepted. The poet continued to reside at Grasmere until his increasing family rendered a removal necessary, and, in 1813, he took up his abode at Rydal Mount, in which he was destined to spend the remainder of his life, extending to the long period of thirty-seven more years—

> "On man, on nature, and on human life,
> Musing in solitude."

The same year that witnessed his removal to Rydal, Wordsworth was rendered easy and independent in pecuniary circumstances by his appointment, through the influence of Lord Lonsdale, to the office of distributor of stamps in the county of Westmoreland. The duties of this office he could discharge by deputy; and in his official co-adjutor Wordsworth, with his usual good fortune, is said to have found a person not only well qualified to administer his affairs, but also a corrector of the press, a scholar, and critic. The ladies of his household—his wife and sister—acted as amanuenses. "Muttering his wayward fancies" among the lakes and mountains, the poet composed most of his poetry in the open air; afterwards dictating it from memory to the fair hands that were proud to commit it to paper.

In 1814 appeared *The Excursion*, the most elaborate work of its author—a poem in blank verse, irregular and unfinished in design, but containing episodes and descriptions of great beauty, pathos, and grandeur. The hero is no higher personage than a Scotch pedlar, a "gray-haired wanderer," with whom the poet roams over his region of lake and mountain, and visits some of its inhabitants, including a "solitary," or moralizing recluse (a sort of Jaques), and a pious pastor, who recounts to them some of the vicissitudes that had taken place in his sequestered district, and some of the characters he had known. Disquisitions moral and political are interspersed, occasionally rising into a strain of pure and lofty eloquence; but the chief interest centres in the cottage scenes and narratives, and in the portraits of the living or dead drawn by the pastor from his own observation of life among the mountains. The next work of the poet was a feudal story. *The White Doe of Rylstone*, founded on a tradition connected with Bolton Priory. This work brought Wordsworth more into comparison with Scott and Byron, the subject and versification being similar to those of their romantic tales. In the art of relation or narrative he was greatly their inferior; but in poetical imagination and description, Wordsworth in this poem appears fully equal to his great contemporaries. His picture of Rylstone Hall by moonlight (opening of the fourth canto), and the conclusion of the poem, are among the finest passages of our modern poetry. Recurring to his youthful studies and productions, Wordsworth, in 1819, published his serio-comic tales of *Peter Bell* and *The Waggoner*, written, one twenty, and the other thirteen years before publication. They are impregnated with the faults of his early period, yet contain fresh and living transcripts

[1] In the poem on the "Blind Highland Boy," Wordsworth had made his humble hero set sail in

> "A household tub, like one of those
> Which women use to wash their clothes."

He afterwards substituted (not very naturally) a turtle shell—

> "A shell of ample size, and light
> As the pearly car of Amphitrite."

Numerous other corrections and alterations were made by the poet from time to time, and they cannot all be considered improvements.

Working-ton.

of nature. These tales were followed at intervals by some volumes of sonnets devoted to the River Duddon, to Ecclesiastical History, and to a Tour on the Continent. He made journeys to Scotland and the Highlands in 1831 and 1833—on the latter occasion, visiting Staffa and Iona—and these excursions called forth a volume of poems, *Yarrow Revisited*, &c., which was published in 1834. His latest appearance as an author was in 1847, when he indited an ode on Prince Albert's installation as Chancellor of the University of Oxford. This ode was not, in lyrical power, what Wordsworth could have done and had done. He did not like "writing to order," and a request coming from the queen's consort almost implies a command; yet the production, for a poet of seventy-seven, was no ordinary achievement.

Wordsworth continued in robust health long after the allotted threescore and ten years, and his reputation was daily brightening and extending. In 1839, he was honoured by the University of Oxford with the degree of D.C.L. In 1842, he resigned his office of stamp-distributor in favour of his second son—the elder son was a well-beneficed clergyman—and at the same time a pension of L.300 a year was settled upon him by the recommendation of Sir Robert Peel. In 1843, he succeeded his friend Southey as Poet Laureate. The appointment had been refused by Mr Rogers; Wordsworth also, at first, declined it; but he was assured that it was offered to him, as it has since been continued to his eminent successor, Mr Tennyson, as a mark of the royal favour and respect for what he had written, not as a retainer for future court services. In 1847, the venerable poet was shaken by a severe calamity, the death of his only daughter, Mrs Quillinan, the "Dora" of his poems, and a lady of great taste and accomplishments. His brother, the Master of Trinity, had died the year before. But enjoying, as he did, an easy competency, living in his own romantic and beloved district, with the society of his affectionate family, and in the enjoyment of public honours and respect, the lot of the poet must be pronounced eminently fortunate and happy. Death had indeed thinned his household, and removed his early poetical associates and friends; but even these visitations were long deferred: and when did any man live to the age of fourscore without paying this penalty on prolonged existence? Wordsworth died on the 23d of April 1850, and was interred in the green churchyard of Grasmere, between a yew-tree he had planted and an aged, perhaps tri-secular, thorn-tree. His daughter Dora is at his side. A plain headstone with his name marks the spot. He had no desire for any other memorial of him but such as might survive for a while in the affection of his friends, and such as he was sure of in his works, and in every hill and valley around him. (R. C—S.)

WORKINGTON, a seaport and market town of England, county of Cumberland, on the left bank of the Derwent, here crossed by a stone bridge of three arches, about a mile from its mouth, and 7 miles N. by E. of Whitehaven. The lower part of the town is old, with narrow and inconvenient streets, but the upper portion is better built, and contains a number of good houses and a square in which the corn market is held. It has a parish church, rebuilt in 1760; a chapel of ease, erected in 1825 in the Tuscan style; chapels for Independents, Methodists, Presbyterians, and Roman Catholics; several schools, mechanics' institute, subscription library and news-room, theatre, assembly rooms, and a dispensary. Shipbuilding, rope and sail making, &c., are carried on, but the town is chiefly indebted for its prosperity to the extensive coal and iron works in the vicinity, which furnish its principal articles of trade. The harbour is protected by a breakwater, and has extensive quays and commodious warehouses. On 31st December 1858, 97 vessels, of in all 20,363 tons, were registered as belonging to the port; and during that year 102 vessels having 6616 tons entered, and 1202 vessels having 100,004 tons left the harbour with cargoes. An active salmon-fishery is carried on on the river. Pop. (1851) 5837.

Worksop ‖ Worms.

WORKSOP, a market town of England, Nottinghamshire, pleasantly situated on the Ryton, an affluent of the Idle, 25 miles N. by E. of Nottingham. The town, which consists principally of one street, is generally well built and clean. Its parish church, which formerly belonged to an Augustine priory, is a fine old cruciform edifice, with two lofty towers, and containing several ancient monuments. The principal gateway is almost the only other portion of the priory that remains. There are places of worship for Independents, Methodists, and Roman Catholics; national and other schools, new town hall and market house, and an ancient moot hall in the town. The inhabitants are chiefly employed in the making of malt. There are several noblemen's seats in the vicinity, and this district is popularly known as the *Dukery*, from there having been at one time no fewer than four dukes' seats within a few miles of each other. Pop. (1851) 6058.

WORM, OLAF, or OLAUS WORMIUS, as he is called in Latin, a learned Danish physician, was born on the 13th of May 1588, at Arhusen in Jutland. After beginning his studies at home, he resided in several foreign universities, and travelled to various parts of Europe for improvement. After having taken the degree of M.D. at Basel, he returned to his native country in 1613, and was made professor of polite literature in the university of Copenhagen. In 1615 he was translated to the chair of the Greek professor, and in 1624 to the professorship of physic, which he held till his death. These occupations did not hinder him from practising in his profession, and from being the fashionable physician; the king and court of Denmark always employed him; and Christian IV., as a recompense for his services, conferred on him a canonry of Lund. He published some pieces on subjects relating to his profession; several works in defence of Aristotle's philosophy; and several concerning the antiquities of Denmark and Norway; for which latter he is principally esteemed, as they are very learned, and contain many curious particulars. He died on the 7th of September 1654.

WORMS, a city of Western Germany, Grand Duchy of Hesse, and province of Rhenish Hesse, near the left bank of the Rhine, 26 miles S.E. of Mayence. This is one of the oldest, and in the early history of Germany was one of the most important, towns in the country. It occupies the site of the Roman *Barbetomagus*, which subsequently took the name of *Augusta Vangionum*, from the Vangiones, in whose territory it was. After its destruction by Attila the Hun about the middle of the fifth century, it was rebuilt by Clovis in 496. It afterwards became the seat of many Frankish and Carlovingian kings. Charlemagne resided here for a time, and held in the vicinity those rude legislative assemblies, called, from the month in which they were held, *Mai Lager*. Worms was also the seat of many imperial diets, the best known of which is that of 1521, when Luther appeared before the Emperor Charles V. At this time the city contained about 40,000 inhabitants, and even at the end of the thirty years' war they amounted to about 30,000. In 1689, however, it was burned by order of Louis XIV.; and since that time it has never regained its former prosperity. Latterly, however, it has begun to improve, and its population is now about double what it was in 1800. The town is still surrounded by its old walls, flanked at intervals by handsome and massive towers. The most remarkable edifice is the venerable cathedral, founded here in the eighth century, but not finished till 1110. It is 470 feet in length, by 110 feet in breadth, and has two towers at each end,

Worthing ‖ Wotton.

Worms is the seat of a Protestant consistory, and has a gymnasium and other schools; manufactures of leather, tobacco, &c.; and some trade in agricultural produce, and the fine wines produced in the vicinity. It contained in 1852 9690 inhabitants.

WORTHING, a market town and watering place of England, county of Sussex, on the English Channel, 12 miles W. of Brighton, and 61 from London. It has risen from an obscure fishing village almost within the present century, having been first brought into notice by a visit of Princess Amelia in 1798. Since that time it has been frequently visited by members of the royal family. It is pleasantly situated, and sheltered on the land side by an amphitheatre of downs; while a long range of smooth sands extends for ten miles along the shore, and affords very pleasant walks and drives. An esplanade extends for nearly a mile along the shore, and the bathing machines and baths are of a superior description. The town possesses all the conveniences of a fashionable watering place, including assembly rooms, reading rooms, libraries, theatre, &c. The only building of note is the corn exchange, an elegant structure of recent erection. There are a parish church and a chapel of ease, an Independent chapel, a Wesleyan Methodist chapel, national and other schools, town-hall, and dispensary, in the town. The principal trade is in fishing. Pop. (1851) 5370.

WOTTON, Sir Henry, an eminent writer, was the son of Thomas Wotton, Esq., and was born on the 30th of March 1568. He studied for some time at New College, Oxford, whence he removed to Queen's College, where he made great progress in logic and philosophy; and wrote a tragedy for the use of that college, called *Tancredo*. According to Walton, he proceeded A.M. After leaving the university, he travelled into France, Germany, and Italy; and having spent about nine years abroad, he returned to England, and became secretary to Robert, earl of Essex, with whom he continued till that earl was apprehended for high treason. He then retired to Florence, where he became known to the Grand Duke of Tuscany, who sent him privately with letters to James VI., king of Scotland, under the name of *Octavio Baldi*, to inform that king of a design against his life. Some months after he went back to Florence; but King James coming to the possession of the crown of England, Wotton returned home, was knighted by his Majesty, and sent ambassador to the republic of Venice, and afterwards was employed in many other embassies to that and other courts; but the only reward he obtained for these services was his having the provostship of Eton College conferred upon him in the year 1623. He was ordained deacon, as the office could not be regularly held by a layman. He died in December 1639. After his decease, some of his manuscripts and printed tracts were published together in a volume, entitled *Reliquiæ Wottonianæ;* but he was the author of various works which are not included in this collection. His life by Isaac Walton is well known to the learned.

Wotton, *William*, a learned divine and writer, was the son of Henry Wotton, B.D., rector of Wrentham, in Suffolk, where he was born on the 13th of August 1666. He was educated by his father, a gentleman well skilled in the learned languages, under whom he made such amazing proficiency, that at five years of age it is said he could render several chapters of the gospels out of Latin and Greek, and many psalms in Hebrew, into his mother tongue. When he was very young he remembered the whole of almost every discourse he had heard, and often surprised a preacher by repeating his sermon to him. He was admitted into Catherine Hall in Cambridge some months before he was ten years old; when the progress he made in learning in that university engaged Dr Duport, then master of Magdalen College, and dean of Peterborough, to write an elegant copy of Latin verses in his praise. In 1679 he took the degree of A.B., when he was but twelve years and five months old; and the winter following he was invited to London by Dr Burnet, then preacher at the Rolls, who introduced him to most of the learned men in that city, and particularly to Dr Lloyd, bishop of St Asaph, to whom he recommended himself by repeating to him one of his sermons, as Dr Burnet had engaged he should. In 1691 he commenced B.D. The same year Bishop Lloyd gave him the sinecure of Llandrillo, in Denbighshire. He was afterwards made chaplain to the Earl of Nottingham, then secretary of state, who presented him to the rectory of Middleton Keynes, in Bucks, and to whom he dedicated his *Reflections upon Ancient and Modern Learning*, Lond. 1694, 8vo. This work is now chiefly famous for having called forth from Swift his *Battle of the Books*, and from Bentley his celebrated dissertation on the *Epistles of Phalaris*, which appeared as an appendix to the second edition of Dr Wotton's *Reflections*. In 1705, Bishop Burnet gave him a prebend in the church of Salisbury; and in 1707, Archbishop Tenison conferred upon him the degree of D.D. In 1714, the difficulties under which he laboured with respect to his private fortune obliged him to retire into South Wales, where he was treated with great kindness and humanity by the gentlemen of that country. He then wrote the *Memoirs of the Cathedral Churches of St David's and Llandaff*, and his *Miscellaneous Discourses relating to the Traditions and Usages of the Scribes and Pharisees*, which were afterwards printed. He died on the 13th of February 1726. Dr Wotton was remarkable for his humanity and friendliness of temper; the narrowness of a party spirit never broke in upon any of his friendships; and his time and abilities were at the service of any person who was making advances in real learning. He wrote, besides the above works, *A History of Rome; A Defence of his Reflections upon Ancient and Modern Learning; A Discourse concerning the Languages of Babel; Advice to a Young Student, with a Method of Study for the first Four Years;* and other learned pieces.

Wouwerman ‖ Wren.

WOUWERMAN, Philip, a very excellent Dutch painter, of whose personal history hardly anything is known, was born at Haarlem in 1620. He received his first lessons in painting from his father, who was an obscure historical painter, and from Peter Verbeeck, who aided him in composition and colouring. The Dutch biographers, and Houbraken among the number, who has written such a fabulous life of Wouwerman, all agree in making him a pupil of Jan Wynants, but it is difficult to see what he could have learned from that elegant landscape painter. Wouwerman's subjects are hunting, fighting, plundering, travelling and roadside parties, all in exceedingly picturesque attire. The skies, the water, the foliage, and the foreground of his pictures, are all exquisitely managed. They are fine in composition; transparent in colour; and the whole is admirably handled.

Wouwerman had wonderful powers of application and expedition. When we reflect that he painted every inch of between seven and eight hundred pictures with his own hand, we may be able to form some adequate idea of his amazing facility of touch, and of the extreme amount of labour which he must have bestowed upon the execution of his pictures. Some say that he led an obscure and poor life, selling his paintings to picture-dealers for what they would bring. Others, again, inform us that he was a modest man of genius, who husbanded his earnings, and gave his daughter a dowry of nearly L.2000. Unfortunately, there is no more luminous authority to cast those conflicting lights into the shade. Wouwerman died in 1668, at the age of forty-eight.

WREN, Sir Christopher, the greatest classic British architect, and the most eminent mathematician of his time, (with the exception of Newton), was the only son of Dr

Wren. Christopher Wren, dean of Windsor, and registrar of the Order of the Garter. His uncle was Dr Matthew Wren, bishop of Ely, who was impeached by order of the House of Commons in 1641, and imprisoned in the Tower, without hearing or trial, for twenty years, and at last liberated by the Restoration. The family is traditionally said to have been of Danish extraction; and must have been of considerable standing for years, for Geoffrey Wren was privy councillor to Henry VII., and VIII, canon of Windsor, and master of Sherborne Hospital; and Dugdale mentions a brass at Withibrook, in Warwickshire, inscribed to the memory of Christopher Wren, gentleman, in 1543. The mother of the subject of our biography was Mary, daughter and heiress of Robert Cox, who then held the important estates of Fonthill in Wilts. He was born on the 20th of October 1632.[1] It appears he was of very delicate health, and was educated by a private tutor, the Rev. W. Shepheard; and, before he was sent to the university, was a short time at Westminster School, under the famous Dr Busby. He seems very early to have given proofs of an extraordinary genius, particularly in mathematics; in which science, his son says, he was initiated by Dr W. Holder, subdean of the chapel royal.

When but thirteen years of age, he showed an extraordinary genius for mechanics. In 1646, being then only fourteen years of age, he was admitted a gentleman commoner at Wadham College, Oxford, and there seems to have acquired the friendship of the two most celebrated mathematicians of the day, Dr Wilkins, afterwards bishop of Chester, and Dr Seth Ward, Savilian professor of astronomy, afterwards bishop of Salisbury; an intimacy that ripened with time, and at last became the germ of the celebrated Royal Society. About this time he wrote a poem in Latin hexameters, which he calls *Zodiacus Reformatus*. It extends to nearly 400 lines, and, with the exception of the use of some few stock phrases—as "flammantia lumina mundi," "lucri insana libido,"—the lines might pass for those of a first-rate Latinist. At this period also he seems to have given great attention to medical science, particularly to anatomy. In 1650 he took his B.A. degree at Wadham, in 1653 that of M.A., and was immediately elected to a fellowship at All-Soul's. Here he became acquainted with the celebrated John Evelyn, who calls him "a miracle of a youth," and "a rare and early prodigy of universal science."[2] In 1657 he was elected Gresham professor of astronomy in London, and in 1660 Savilian professor of the science at Oxford. During this time the circle of his acquaintance had enlarged, and the chief part of them had formed themselves into a society, which they called "The Club," and which met sometimes at each other's houses, and sometimes at Gresham College. They were tolerated if not encouraged by Cromwell, but driven from their apartments in Gresham College by his successors. In 1660 came the Restoration, and in the latter part of this year the king approved of the establishment of the "Royal Society;" which may safely be said to have done as much or more for science, and to have numbered as great, or greater men among its members, than any society in the world. Wren.

We now come to the most extraordinary part of the life of this great man. Without any sort of previous theoretical study of which we have any account, and without any practical experience, which alone can make the successful architect, we find him suddenly occupied in the largest practice any one architect ever was employed in; and, apparently without the slightest difficulty to himself, executing an immense number of works of the most opposite nature, with a chastened, refined, and yet fertile fancy; an originality without extravagance or mannerism, an invention which no difficulties of site or construction could curb, and with a propriety of ideas and beauty of effect that went beyond all criticism. The only allusion in all his multitudinous early papers to anything like buildings, applies to harbours and fortifications. His works have been carefully perused for this purpose, and there is no mention of any architectural author, exept a short extract from a part of Vitruvius relative to the construction of sundials. It is said his father was skilled in architecture, but the proof is very defective. For all we know to the contrary, the results of the labour of a life in others was supplied to Wren by an intuition closely resembling inspiration.

During the reigns of Elizabeth, James, and the early part of that of Charles, architecture had indeed flourished in England. As the customs of the feudal system, both in peace and in war, faded and became changed before a gentler state of society in peace, and other and more deadly methods of destruction in war, the huge fortalices of the nobility were succeeded by the stately manor-houses; and such fair erections as Holland House, Burleigh, or Hatfield, arose in every district. And not only so, the simple squire in the country, and the representatives of the rising middle class in the cities, called in the assistance of the architect to impress something of the hand of taste on their dwellings. All this, however, seems to have been suspended during the civil war. Two architects alone are named as existing at the time. One bowed down by the weight of eighty years, and by persecution and trouble (he had been plundered of all the sequestrators could seize, and lived on a scanty stock of money he had buried),[3] yet he still wandered from Whitehall to St Paul's, to sorrow over the desecration of his two favourite works—the royal chapel and the unrivalled portico:[4] we mean of course the far-famed Inigo Jones. The other was the gay

[1] The principal events of the lives of himself, his father, and his uncle, were carefully collected by his son Christopher, and were published by his grandson Stephen Wren in a work which he entitled *Parentalia*, which for care of compilation and modesty of relation is entitled to the fullest credit.

[2] The *wheel barometer*, if not his invention, was undoubtedly perfected by him. *A register of the force and duration of the wind* by a clock and piece of paper wrapped round a roller. This was considered new by many when applied to gas registers a short time ago. *To write in the dark. To write two copies at once. New ways of engraving.* His son says expressly "he was the inventor of the art of graving in mezzo-tinto, which was afterwards prosecuted and improved by his Royal Highness Prince Rupert, upon the suggestion of the learned and ingenious John Evelyn, Esq." *Methods of drawing in perspective. To weave many ribbons at once*, by only turning a wheel. *A planting instrument*, from the description no doubt our drill machine. *A tropical hot-house. The box-hive for bees. A method to heat water* without fire under it, in a vessel that may be damaged by fire, no doubt by a circulation. *Instruments for respiration*, possibly our respirator. Besides, there are many papers he wrote on astronomy, particularly on the moon and her libration, on the hypothesis of Saturn and the comet of 1664; upon telescopes, and improvements in grinding lenses; on magnetic and pneumatic instruments; on writing in cipher; on improvements in shipbuilding, navigation, building forts, harbours, piers, &c.; on whale fishing; and, above all, the most useful of all problems, the easiest method of finding the longitude. It may also surprise our readers to find he practically and successfully carried out the difficult operations of the transfusion of the blood, and the excision of the spleen. In fact, there seems scarce a branch of science in which he had not written except (strange to say) that in which he afterwards excelled the most,—that of architecture.

[3] The parliament seem to have had an especial spite against him. There is a touching account of his burying his scanty property in Scotland Yard, and digging it up again on account of the fear of the treachery of a servant.

[4] At Whitehall his principal masques had been presented. The nave of St Paul's had been used as a sort of idle rendezvous for years; the new portico was intended to accommodate the loungers, and free the church. It was 120 feet by 42, and each column 46 feet high, nearly half as much again as those of the new Opera House. For its state at the time see infra.

Wren. courtier and elegant poet, the friend and rival of Cowley and Waller, Sir John Denham. He had the promise of the reversion of the post of royal architect—or, as it was then called, the "clerk of the works"—at Jones' death, which occurred four years before the Restoration. But, when the king came to his power, that which an old writer calls the "pain and sorrow of an evil marriage" had so disordered Denham's mind, that he was obliged for some time to be under restraint.

At this time (1661), and probably for this reason, Wren was sent for from Oxford, where he had just taken his doctor's degree, to assist Denham: nothing, however, seems to have been done for two years. Early in 1663 he received the commission for the first building he ever erected, the Sheldonian theatre at Oxford. This is especially famous for the scientific construction of its roof, which, in spite of the novelties in these days of railway engineering, is still considered a masterpiece of design.

About this time he visited Paris,[1] where architecture flourished under the auspices of the Grand Monarque, in a way scarcely to be rivalled even by the late imperial works. The Louvre was then in progress, and he obtained introductions to Bernini, Mansard, Gobert, and Le Pautre, among the architects; to Le Brun, Poussin, Bourdon, Mignard, and many others, among the painters; and to all the principal men in science and art through the country.

Coming home thus "with almost all France upon paper," as he expresses it, he again turned his attention to the restoration of St Paul's, which he had been commissioned to survey a short time before, and which was then in a deplorable state.[2] His designs for its restoration are carefully preserved in the library of All-Souls college. His idea was to convert the old Norman nave into a classic design, by casing the piers; to reduce the space under the great tower to an octagon and to carry it up, and crown the whole with a dome, leaving the fine decorated choir untouched. Then came innumerable squabbles on the subject, some wishing merely to patch up the walls (which really were not safe), and others to make a complete job of it. The matter, however, was taken out of their hands at once by the great fire, which swept the city very nearly from the Tower to the Temple, and from Smithfield to the river, and which left St Paul's, like the other churches, a total ruin. Several plans were submitted for rebuilding the city, by far the best and most practical of which was that by Wren.[3] It unfortunately could not be carried out on account of the determined opposition of those who clung to old sites, narrow streets, and ancient prejudices.

Our limits will not permit us to go into anything like detail as to the works of this great man. They are comprehended in the *Parentalia*, a folio volume of 400 pages, and in Elmes' *Life*, a thick quarto of 600 pages. An attempt, however, must be made to give some idea of their vastness and variety, and of the general character of the genius of their author. Consequent on the fire of London, first of all, was the building of that pride of the metropolis, St Paul's cathedral. The *Parentalia* then gives a list of fifty-four new churches erected by him in lieu of those so destroyed. The Royal Exchange, the Monument, Temple Bar, and the College of Physicians, have also to be added. Of other public works, we have the hospitals of Greenwich and Chelsea, large additions to the palaces of Hampton Court and St James's, and an immense palace at Winchester for Charles II., now the barracks; extensive works at Westminster Abbey, and some at Salisbury cathedral; the Sheldonian theatre at Oxford, already mentioned; the front at Christ Church, and the library at All-Souls; as also the fine library at Trinity College, Cambridge. Of private houses, that for the Duchess of Marlborough in Pall-Mall, houses for the Duchess of Buckingham, the Earl of Oxford, Lords Sunderland, Newcastle, Allaston, and Lady Cooper. We have also a list of works, of which the designs were completed, but not carried out, comprehending a magnificent tomb-house to the memory of Charles I., a building which, if erected, would have vied with the celebrated Medici Chapel at Florence; a tomb to Mary, queen to William III.; large additions to Whitehall and to Windsor Palaces; and many others we have not space to recapitulate. We will endeavour now to characterize these Herculean labours in the order they occur. Wren.

Beautiful as the great metropolitan cathedral is, and although it is considered next in rank[4] after that at Rome, the genius of Wren must not be estimated by it as it exists. His own plan was one in form of a Greek cross, and of a single order in height, with a dome as large as that at St Peter's. The form of the Latin cross and the screen wall were things forced on him, it is said, by the interference of James, duke of York.[5] Apart from these considerations, it is, however, a work of great beauty. Although hemmed in by shops and huge Manchester warehouses, and although there is no point whence we can get a proper view of its proportions, we see there is great elegance in the outline, especially of the cupola. There is also great art in the subdivision of its parts, which adds to the apparent magnitude of the pile.[6]

To treat of his churches would fill a volume. Some few are mere plain solid buildings, remarkable for nothing but excellence of execution; some few are clever restorations of those not entirely destroyed by the fire; many are remarkable for the great dexterity with which the building has been made to suit an awkward site; some, though small and blocked up by surrounding houses, are remarkable for exquisitely beautiful interiors, such as St Stephen's

---

[1] A very pleasing and amusing letter, giving an account of his visit to France, is given in the *Parentalia*, p. 261, &c. He writes, "I hope I shall give you a very good account of all the best artists in France; my business now is to pry into trades and arts. I put myself into all shapes to humour them; it is a comedy to me, and, though sometimes expenseful, I am yet loth to leave it."

[2] Dugdale says (*History*, &c.), "The body of the church was converted to a horse-quarter for soldiers; the beautiful pillars of Inigo Jones' portico were shamefully hewed and defaced for the support of the timber work of the shops, for seamstresses, and other trades, for which sordid uses that stately colonnade was wholly taken up and defiled. Upon taking away the inner scaffold [centering] which supported the arched vaults, in order to their late intended repair, the whole roof of the south cross [transept] tumbled down, and the rest in several places of the church did after fall, so that the structure continued a woeful spectacle of ruin till the happy restoration."

[3] There were to have been main streets connecting Aldgate and the Tower with Ludgate and Holborn, crossed by another main street from Cripplegate to Queenhythe. At one intersection St Paul's was to have stood. At another, as a sort of forum, the Exchange, Mint, Postoffice, Excise, &c., &c., were to have been; but the main feature was a fine quay from the Tower to the Temple, on which all the Companies' halls, and other public buildings, were to have been. For details we must refer to the various histories of London.

[4] We have no space nor inclination to enter into the dispute as to the preeminence of either of the great divisions of architecture, nor to exalt buildings of one style over those of the other, but must be understood as simply comparing classic with classic, and Gothic with Gothic, as they come in our way.

[5] He is said to have shed tears when the expedient of the unreal screen wall was forced on him.

[6] Though beauty and vastness have nothing abstractedly in common, yet the latter always impresses the mind of the spectator with ideas of costliness and stateliness. It is known that St Peter's always appears to be smaller than it really is. St Paul's, on the contrary, even to the practised eye of the architect, seems larger than its real dimensions would lead him to suppose.

Wren. Walbrook; and the remainder, for beauty both of interior and exterior, may challenge comparison with any in Britain, and very many churches abroad.[1] Wren was the inventor of that peculiarity of London, the classic spire, or what is more familiarly called steeple,—a feature which gives such effect to the old city when viewed by a stranger from the river. As the steamers shoot along from Blackfriars to the Tower, it meets the eye in a score of varied forms, and gives a life to what painters call the "sky-line," which is exceedingly pleasing.

To treat *shortly* of his other public buildings, would be to give a catalogue of them, with a well deserved word of praise to each, and our limits entirely prevent our doing this at the length they deserve. The finest undoubtedly is Greenwich Hospital,[2] but, as in the case of St Paul's, we must not judge of Wren's talent by the building as it exists. His intention was to have built a fine chapel in the centre, so as to join the two wings together, and make one complete composition; but the wise men of the day found it would interfere with the view from the old house in Greenwich Park, called "The Queen's House;" he was therefore obliged to compose his building as it were in two halves, with a considerable space between them. What would Blenheim be if the centre was knocked out? Chelsea Hospital is a plain building, but imposing from its simplicity. In the works at Hampton Court, he is said to have been so much interfered with, they can hardly be called his own. The palace at Winchester was never finished. The libraries at Trinity and All-Souls may vie with any, even perhaps with that built by Michael Angelo at Florence.

We believe there is no work of Wren's which betrays an exaggerated or a false taste. There is a harmony of parts, a justness of proportion, a judgment in the general design, and a propriety in the decoration, that disarm criticism, and that please even the uneducated. This arises no doubt chiefly from that quality we call genius, and which the ancients called *mens divinior*, that which animates the poet as well as the painter and architect; but in Wren's case this was strengthened and corrected by a profound mathematical as well as practical knowledge of construction, and a minute acquaintance with detail.[3] His great principles may be summed up in three words—utility, propriety, beauty; principles which have been the guide of every true architect in every age, and in every style. In Gothic architecture he was less successful. The spirit was extinct, and all its traditions departed, and forgotten both among architects and workmen. His detail therefore, as might be expected, offends us now; but if we look at the general arrangement of the masses of St Michael's Tower and St Dunstan's-in-the-East, the general idea of the gateway at Christchurch, and in fact many other attempts in the mediæval manner, even prejudice must concede, that had he lived in the present day, when styles are so well classified and defined, and when workmen abound who can execute groining, tracery, and carving, when all appliances and means are ready to the hand, he probably would have excelled as much in Gothic as in classic art.[4] Wren.

To relate the events of his private life will not take much space. He was twice married. Once, in about 1674, to Faith, daughter of Sir John Coghill of Blechington in Oxfordshire, by whom he had one son, Christopher,[5] who survived him. The lady died very shortly after. His second wife was Jane, daughter of Viscount Fitzwilliam, baron of Lifford, by whom he had a daughter, whom he is known to have loved very tenderly, and who died in 1703, and a son, who died unmarried in 1738. This lady seems to have been much respected, for we find the parishioners of Walbrook presented her with a testimonial on the completion of their church. It is curious we have neither the date of her death, nor of his two marriages. In 1673 he received the honour of knighthood at Whitehall. In 1685, was returned as member for the borough of Plymton, and afterwards represented first Weymouth, and then Windsor, till 1713, when he resigned his seat for the latter in favour of his son Christopher.

Of his private fortune we have no account. He may have inherited from his father (his uncle had children of his own), and he may have had some fortune with his wives; but his public remunerations were stingy beyond measure. For his services at St Paul's he had but a paltry L.200 a year, and for those as comptroller of the works at Windsor Castle the sum of L.9, 2s. 6d. per annum, the same salary as "the vermin-killer." His life, however, was passed in the pursuit of honour and fame rather than of wealth and fortune, and his success now began to attract great envy. It was pretended the works at St Paul's were protracted in order that he might still continue to receive his paltry salary; and his enemies were mean enough to get a clause into the act to suspend "a moiety of the surveyor's salary until the said church should be finished, thereby to *encourage him* to finish the same with the utmost diligence and expedition." Unmoved by this insult, he kept on quietly with the works, and in 1710, in the seventy-ninth year of his age, had the satisfaction of seeing the last stone laid by his son. The miserable persecution against him still went on; and as his detractors could not attack his designs nor ridicule his taste, they tried a baser and more venomous plan. An anonymous pamphlet was published, entitled *Frauds and Abuses at St Paul's*, charging falsified payments to workmen and peculation of materials; that the great bell was broken; that the clock did not go well; and a host of minor things. Wren replied in a dignified and temperate manner, showing the profits and charges of the master carpenter were merely those which were usual and regular; that the great bell was broken because the chapter made a show of it, and suffered people to thump it with heavy hammers on paying a fee; and that the rest of the charges were really frivolous. Jennings, the master carpenter, did not take it so

---

[1] In these churches, as indeed in all Wren's works, there is not the least mannerism, the designs are all varied, and there is but one circumstance in common to them all, and that of the greatest importance, the preacher can easily make himself heard in every church he built. Wren's philosophical studies had made him master of acoustics. In his later days he wrote a short practical tract on the building of churches, their dimensions, their acoustic qualities, their materials, in short, a summary of the whole subject, which is without doubt a complete masterpiece.

[2] A French traveller, after seeing St James's Palace and Greenwich, said the order of things was reversed, the palace was an hospital, and the hospital a palace.

[3] In a MS. letter preserved in the library at All Souls, he says, "I suppose you have good masons; however, I would willingly take a further paines to give all the mouldings in great, wee are scrupulous in small matters, and you must pardon us, the architects are as great pedants as criticks or heralds."

[4] Because it has been proved that Gothic architects went on the principle of "decorating construction," it has absurdly been supposed the classic architects did not. If any one will take the trouble to read the first few chapters of Vitruvius, he will find the same principles laid down at much greater length.

[5] He was a scholar, antiquary, and traveller, and succeeded his father as member of parliament for New Windsor; was author of a work on Greek medals, which he dedicated to the Royal Society; as well as the chief part of the *Parentalia*. He died in 1747, at the age of 72.

Wrexham. easily, for he justified himself in such sharp terms that the commission complained he "bullied them." The government, however, took up the matter, declared the charges groundless, and ordered Wren's salary and all arrears to be immediately paid him;[1] and the general voice of the nation supported the venerable old man against his cowardly persecutors.

They were, however, implacable. About this time the queen died, and was succeeded by the Elector of Hanover, a man equally ignorant of British feeling or of fine art, and who, like his hopeful son, hated "bainters and boets." What was then called "court favour" was brought into play, and an impudent, ignorant man, whose name would now be forgotten had it not been placed on the dusky roll of the dunces in Pope's immortal satire, was actually pitted against him. It seems difficult to credit it; but such was the effect of their intrigue, that Sir Christopher Wren, after serving the crown for more than fifty years, and though in the eighty-sixth year of his age, in the full vigour of his intellect, was unceremoniously—nay, almost ignominiously—turned out of his offices, and the dunce put in his place. The nation was indignant. Pope boldly expressed his feelings in lines that are well known; and Steele, who perhaps dared not speak out, veiled the harsh treatment of the "man who had saved the city" in one of his neatest apologues. The dunce, however, showed himself to be wretchedly incapable, and was dismissed in about a twelvemonth. In the meantime the good old man, who seems to have been much less affected by his persecutions than his friends, retired to Hampton Court, and passed the last few years of his life in calm retirement, quoting, his son says, the words of Seneca, "Nunc me jubet fortuna expeditius philosophari." But he had a better resource than the heathen philosopher had, the frequent study of the Scriptures, and the desire to benefit his country, by the discovery of better methods to facilitate the art of navigation.

His ninety-first year approached. Though his limbs grew weak, his mind still seems to have been fresh as ever, till one day, after his usual trip from Hampton Court to London,[2] he complained of having taken cold, and, as was his habit, determined to invite a quiet sleep in his easy-chair after dinner. It was his last rest. His servant coming in at the usual time, thought him still sleeping, but he was gone.[3] He lies in the crypt of his famous work, under the south aisle of the choir. A simple black marble slab covers his tomb, which is enclosed by a plain iron rail. He is said to have been of small stature, and of very delicate health, but active, and remarkable for the expression of his eyes and visage. His character may easily be gathered from what has before been said. In every point of view, morally or intellectually, whether for acuteness of talent or gentleness of spirit, the great architect Sir Christopher Wren is one of the worthies of whom Great Britain has indeed reason to be proud. (A. A.)

WREXHAM, a parliamentary borough and market-town of North Wales, Denbighshire, 12 miles S. by W. of Chester. It is a handsome and lively town, comprising several spacious and substantially built streets, crossing each other at right angles. The parish church is a large and handsome edifice, erected about 1472, upon the site of a previous one destroyed by fire. It is in the perpendicular style, and has a tower 135 feet in height, adorned with numerous statues of saints placed in niches of the buttresses. The interior is spacious and much decorated. There are several dissenting places of worship; a grammar, national, and other schools; a literary institute; county house of correction: town-hall, market-house, &c. It carries on no particular branch of manufacture, but derives its chief importance from its large and well-supplied markets and fairs; one of which, in March, is continued for fourteen days, and is attended by traders of all descriptions and from great distances. Coal, iron, and lead mines, are extensively wrought in the vicinity. Wrexham unites with Denbigh, Holt, and Ruthen, in sending a member to parliament. Pop. (1851), 6714.

Writ ‖ Wurtemberg.

WRIT, in *Law*, signifies, in general, the king's precept in writing under seal, issuing out of some court, directed to the sheriff or other officer, and commanding something to be done in relation to a suit or action, or giving commission to have the same done. And, according to Fitzherbert, a writ is said to be a formal letter of the king in parchment, sealed with his seal, and directed to some judge, officer, or minister, &c., at the suit of a subject, for the cause briefly expressed, which is to be determined in the proper court according to law. Writs, in civil actions, are either original or judicial. Original are such as are issued out of the court of chancery for the summoning of a defendant to appear, and are granted before the suit is commenced, in order to begin the same; and judicial writs issue out of the court where the original is returned, after the suit is begun.

WRITING, the art of communicating ideas by visible letters or characters. See BIBLIOGRAPHY, HIEROGLYPHICS, and LANGUAGE.

WÜRTEMBERG, a kingdom of Southern Germany, the sixth in rank of the states in the German Confederation, lies between N. Lat. 47. 35. and 49. 35.; E. Long. 8. 12. and 10. 20.; and is bounded on the N.W., W., and S.W., by Baden; S. by Baden, Hohenzollern, and the Lake of Constance, which separates it from Switzerland; E. and N.E. by Bavaria. Length, from N. to S., 140 miles; greatest breadth, 200; area, 7484 square miles. The kingdom may be considered as hilly, if not mountainous. It is estimated that 29 per cent. of the area is mountainous, 46 per cent. hilly, and 25 per cent. lowland. On the eastern part is the group of the Swabian Alps, and on the western the Black Forest, a continuation of the Swiss Alps. The highest point of the former of these groups is Oberhohenberg, 3160 feet; and that of the latter is Katzenkopf, 3610 feet. The latter is the highest point in the kingdom; the lowest being 420 feet, and the average elevation 1476 feet above the level of the sea. The eastern are not so lofty as the western ranges of hills, but they are more bleak and rugged. There are no plains, but some extensive and beautiful valleys, highly fruitful, of which that of the Neckar with its branches, and that of the Danube from Tutlingen to Ulm, are the most celebrated. The various smaller valleys, running between the hills, and terminating on the banks of the several rivers, present rich and beautiful prospects. The woods are extensive, and contain almost every kind of forest-tree; but the absence of hedgerows is a great drawback to the beauty of the country in most parts of the kingdom. The scenery is much indebted to the rivers and the several tributary streams which run through all the valleys. The Neckar rises in the southern extremity of Würtemberg, and, with many windings, leaves the kingdom on its northern frontier, in its course to join the Rhine. It collects the waters of the Kocher, the Jaxt, the Rems, the Enz, the Erms, and the Zaber. The Danube rises in this

[1] December 1711.

[2] Up to the time of his death he seems to have occupied himself by abstruse mathematical studies, and his recreation seems to have been occasional journeys to London, where he visited the scenes of his former labours, and more particularly the great cathedral.

[3] In the touching words of his son, *Parentalia*, p. 346, "It was the will of the Omnipotent Author and Dispenser of all Beings to release him from this mortal state, and to invest him with immortality, on the 25th dayof February, in the year of grace 1723, and in the ninety-first of his age."

Wurtemberg.

kingdom, in the mountains of the Black Forest, and leaves it at Ulm, on the frontiers of Bavaria. It is increased by the several streams of the Iller and the Brentz. The Tauber, in the north, is one of those streams which contribute to the waters of the Maine. The Schussen and the Argen are two small rivers that empty themselves into the Lake of Constance. That lake borders a small part of the kingdom. The Feder Lake, about three miles in length and breadth, and those of Laufen and Pfaffen, which are smaller, lie within its boundaries.

The climate is mild, temperate, and healthy; but it varies considerably in different parts of the country. The northern part is less elevated, and enjoys a higher degree of temperature than the southern. On the shores of the Neckar and the Lake of Constance, the air is very mild; but in the mountainous regions more cold and inclement. The mean temperature at Stuttgart is 54°, and at Tübingen 50°; while, on an average over the whole country, the highest temperature is 90°, and the lowest 9°. The character of the soil varies considerably in different parts; but on the whole it is highly fertile; and with the exception of a few swampy tracts in some places, there is none of the land that cannot be turned to good account. The distribution of the soil, in 1852, was as follows:—corn-land, 2,050,102 acres; gardens, 94,773; vineyards, 64,678; meadows, 687,653; pastures, 208,206; and forests, 1,497,062; the remainder is either waste or occupied by lakes, rivers, roads, railways, buildings, &c.

In no part of Germany is so much attention directed to agriculture as in this kingdom, and in no part of it are the practices so generally good. The cultivation of green crops is much diffused. Turnips and mangold wurzel are much grown, and beetroot is raised for the manufacture of sugar. Potatoes are very extensively cultivated, and form the chief food of the working classes. Hemp and flax are raised in abundance, the former chiefly in the circles of the Neckar and Black Forest, and the latter most extensively in that of the Danube. The harvests of corn are tolerably productive as wheat, rye, barley, oats, and, in some of the warmer districts, maize. The produce of grain, in 1852, was estimated for the whole kingdom at about 30,808,000 bushels; of which, as potatoes are extensively used for food, some is every year sent to supply the wants of the neighbouring states. The woods afford more fuel and building materials than are demanded for domestic consumption; and the surplus is, by means of the rivers, conveyed to the countries lower down the several streams. The vineyards produce abundance of wine, and much of it is of very good quality. The best wines usually comprehended in the general class of Neckar wine are those made in the valleys of the Neckar, Rems, and Tauber, and on the banks of the Lake of Constance. In 1852, the quantity of the wine produced was 5,822,180 gallons, and the value L.196,818; but in some previous years both the amount and value have been very much greater.

The cattle in Würtemberg have been carefully attended to, and the cows especially are of a very good description, which is attributed, in a great measure, to the care in improving the breed. The butter is excellent, and in many districts good cheese is made, but the last less extensively than with due pains it might be. The sheep have been much improved by constant crossings between the old races of the country and those of the Rousillon and Merino breeds, and now the greater part of the flocks are of the fine-wooled kind. The breed of horses was at one time very good, but afterwards became much deteriorated. Recently, however, much attention has been paid to the improvement of the breed, and the efforts made in this direction have been facilitated and encouraged by the establishment of several studs by the government. The number of live stock in the year 1853 was thus enumerated: horses 95,038; horned cattle 811,159; sheep 458,488; swine 143,524; goats 42,064; asses 351.

Würtemberg.

The fisheries are very productive both in the lakes and the rivers. The Lake of Constance affords abundance of salmon trout, perch, carp, and barbel; the other lakes and the rivers yield trout, eels, barbel, pike, and several other kinds of fish; and in the Feder Lake the shad is found of a very large size.

The only mines that are extensively worked are those of iron, the most productive of which are at Aalen and Wasseralfingen. The ore from these mines is prepared both by smelting and the hammer, and supplies the manufacturers of Friedrichsthal, Christophsthal, Ludwigsthal, Abtsgemünd, and Heidenheim, with materials for their cutlery and ironmongery. There are saline springs at Hall, Sultz, Offenau, Kochendorf, and Weisbach, from whence are annually made about 18,000 tons of culinary salt. The working both of iron and salt is monopolized by the crown. Würtemberg has also marble, building-stone, porcelain and potter's clay, silver, lead, and copper, in more or less abundance.

There are in the kingdom some valuable mineral springs, used for medicinal purposes; and accommodations have been provided in a style of elegance and convenience which attracts to them a great number of visitors in the summer months. The principal of these are at Kanstatt, on the right bank of the Neckar, a few miles from Stuttgart. There are more than thirty springs in and about the town. The waters are cold; they contain Glauber, Epsom, and common salts, mixed with a small portion of iron, and are found of great efficacy in curing disorders of the digestive powers. At Wildbad in the Black Forest, nearer to the capital of Baden than to that of Würtemberg, the springs are hot, varying from the temperature of 65° to 100° of Fahrenheit. The water is colourless, and has neither taste nor smell, but it gives out much carbonic acid gas. Few ingredients of a medicinal nature have been detected in it, but the use of the baths has been found by experience highly salutary in gouty and rheumatic complaints.

The chief manufacture of Würtemberg is that of linen. The inhabitants of the eastern Alps and of the Black Forest are employed in this branch of industry. In those districts almost all the women are occupied during the winter in spinning, and every peasant is a weaver. Both fine and coarse linen is produced, and also diaper and sail-cloth. The cloth manufactures are among the most considerable and flourishing in the kingdom. Cotton spinning and weaving have been introduced at several places, and form important and steadily improving branches of industry. Leather, glass, paper, snuff, hardware, cutlery, with oil, pitch, tar, and potash, are all made in different parts of the kingdom. The breweries, and especially the distilleries, are numerous. This is the country for making wooden clocks; and those works produced in Würtemberg, or from natives of it who have transferred their labour to other countries, are to be seen in almost every part of Europe.

The commerce of Würtemberg is important and active, especially the internal trade. The principal commercial towns are Heilbroun, Kanstatt, Ulm, Stuttgart, Friedrichshafen, Reutlingen, Calw, and Tuttlingen. Among the chief articles of export are corn, cattle, timber, wooden articles, wool and woollen stuffs, linen, leather, salt, stone, wine, vegetables, cast-iron, paper, gold, silver, and jewellery. The principal imports are colonial wares, dried fruits, oil, hops, hemp, tobacco, brandy and wines, iron, hides, silk, cotton, coal, glass, &c. The exports are usually in excess of the imports in value. The country is traversed in all directions by good roads, and trade is also facilitated by a railway extending from Heilbron, by Stuttgart and Ulm, to Friedrichshafen on the Lake of Constance.

The government of Würtemberg is at present an here-

Würtemberg.

ditary limited monarchy. The king is the sole sovereign, and acts without control by his ministers, in every executive department. He appoints to all offices, makes war and peace, commands the forces, distributes rewards, confers dignities and honours, executes justice, and dispenses pardons. Under the ancient dukes, within the original territories of Würtemberg there existed a feudal constitution. The states, consisting of fourteen prelates and seventy-one deputies from the cities, exercised some legislative authority; but on the assumption of the kingly dignity, and the addition of the acquired provinces in 1806, the monarch assumed unlimited power, until the termination of the war, and the end of the Congress of Vienna, when a new constitution was promulgated. Two legislative chambers were then instituted, and have since continued. The upper is composed of the princes of the blood, the high nobility, and a certain proportion of members appointed by the king. The lower consists of the prelates of the Protestant and Catholic churches, the deputies from the cities of Stuttgart, Tübingen, Ludwigsburg, Ellwang, Ulm, Heilbron, and Reutlingen, from the learned institutions, and from the several bailiwicks. The citizens and the peasants enjoy equal rights, and the feudal slavery of the latter is universally abolished. All have equal pretensions to public employments, and all the Christian sects enjoy the same rights. The feudal tenures are destroyed, and the estates formerly subject to them are converted into freehold properties.

The administration is executed by six ministers, whose departments are thus denominated: justice, foreign affairs, domestic affairs, war, finance, and ecclesiastical affairs. Each of these ministers is at the head of the board which regulates his own branch of the executive government. The law is founded upon the ancient feudal principles which prevailed in Würtemberg at the earliest period, but in some instances is tempered by the addition or intermixture of the Roman law. The administration of justice in smaller matters is executed by provincial judges. There are four superior courts for the four circles, and a supreme tribunal of appeal and revision is established at Stuttgart.

The income, according to the budget for 1860–61, amounted to L.1,139,494, of which L.476,275 are derived from the royal domains, L.304,833 from direct, and L.758,386 from indirect taxes. The expenditure was L.1,168,880, including the payment of the interest of the public debt. That debt amounted, 10th June 1858, to L.4,605,124. To the honour of the kingdom, it is to be observed, that the expenditure on the church and on education (chiefly for the latter object) is greater than for any other department except that of war; indeed, as respects education, it ranks among the first of the German states.

The army on the peace footing amounts, in all, to 9893 men; but in time of war, might be raised to 24,869. It consists of four regiments of cavalry, eight regiments of infantry, a corps of guards, of horse and foot artillery, and a small corps of sappers. The contingent to the German league is fixed at 23,259 men.

The inhabitants are partly of Swabian and partly of Franconian origin, and retain the peculiar pronunciation of the races from which they are descended. There are likewise some settlements of the Waldenses. The Swabians make use of many words very different from the other German people, and adopt many variations in the idioms not known elsewhere. These may be observed to alter at every 10 or 12 miles in travelling through the country.

The prevailing religion in old Würtemberg was the Lutheran, for which it suffered most severely during the thirty years' war. No toleration was granted to any other sect except to the Waldenses, and they were confined within prescribed limits, and even in those spots were under strict regulations, and excluded from the rights of citizenship. Since 1806, the three religious parties have enjoyed the free exercise of their modes of worship, and a participation in all civic rights, with eligibility to all public offices. The Lutherans and Calvinists, now united, are distinguished by the name of the Evangelical Church. Their number in 1858 was 1,158,324; and that of the Romish Church 519,913. There are some sectaries, such as Separatists, Baptists, Hernhutters, and others, who are neither favoured nor persecuted by the government; but these only amounted to 2229 at the above date. Through the whole of Protestant Würtemberg there are a great number of persons distinguished by the appellation of Pietists, who hold their private meetings for devotion, but do not in other respects separate from their churches. The Lutheran Church is under the direction of 6 superintendents, whose dioceses are divided into 49 deaconries, and supplied with 985 pastors. The Catholics are governed by a vicar-general, who is assisted by a council consisting of clerical and lay members; the priests under them are about 898. The Lutheran clergy are in general better supported, and taken from a somewhat higher class of people, than in most of the other parts of Protestant Germany. The Jews, who have established themselves chiefly in the new provinces of Würtemberg, amounted in 1858 to 10,432 persons.

Würtemberg.

Few parts of Germany have exhibited more or better specimens of knowledge and talent than have been produced from the institutions for education in Würtemberg. No state has, for its population, more means for acquiring learning. The university of Tübingen has long been considered one of the best in Germany. There are, besides, six gymnasiums, four lyceums and seminaries, for the Protestant clergy at Maulbronn, Schoenthal, Urach, and Blaubeuren; and for Catholics at Rothweil and Ehiegen. The endowed classical schools are fifty-five, from which the theological pupils are transferred to the university of Tübingen, where they are maintained from the funds of the institution. Schools for instructing the poorer classes of the people are amply provided in every part of the kingdom, so that the knowledge of reading, writing, and arithmetic is almost universal. No village is without its school, and scarcely a market-town without a classical instructor.

The nucleus of the present kingdom of Würtemberg was the ancient earldom of that name, which was originally included in the duchy of Swabia. It first rose to historical importance on the fall of the Swabian House in 1268; and Ulric I. (1246–65) is the first earl conspicuous in history; but his dominions only comprised small portions of the present circles of the Neckar and the Black Forest. His son Eberhard, and his grandson Ulric II., extended the limits of the earldom by annexing adjacent districts either by inheritance or by purchase. In the end of the fourteenth century, Mompelgard in Franche Comté was acquired by marriage; and in this way the earldom gradually increased to such an extent, that in 1495 Maximilian I. was induced to raise it to the rank of a duchy. At the Reformation both the people and the dukes embraced the Protestant religion; and in the wars of the succeeding century the country suffered very much; the reigning family being three times expelled by the Austrians. They were, however, finally restored by the peace of Westphalia in 1648. Würtemberg also suffered severely in the wars between France and Germany, about the end of the seventeenth and beginning of the eighteenth centuries. The last duke, Frederick II., at the peace of Luneville in 1801, ceded Mompelgard to France; but was more than idemnified for this in 1803, by the territories of several independent prelates and imperial cities, and by the title of Elector. By the treaty of Presburg, in 1806, he received further additions to his territories; and assumed the title of King. The country is divided into four circles, the area and the population of which are as follow:—

Würzburg ‖ Wyatt.

Circles.	Square Miles.	Pop. 1858.
Neckar	1280	486,700
Black Forest	1837	425,390
Jaxt	1957	369,006
Danube	2410	409,802
Total	7484	1,690,898

WÜRZBURG, a city of Bavaria, formerly the capital of an ecclesiastical principality, now sequestrated; but now the chief town of a circle, and of the province of Lower Franconia, on both sides of the Main, 70 miles S.E. of Frankfort. The river is here crossed by a splendid bridge, 200 yards long, and adorned with colossal statues of the twelve apostles. The city is surrounded with walls and ditches, and defended also by the citadel of Marienberg, built on a hill 400 feet high, which overlooks the city, and commands a fine view of its numerous towers and spires. Some of the streets are broad, and lined with handsome buildings; but others are narrow and gloomy; and the whole place has an air of quaintness and antiquity, many of the houses being interesting specimens of mediæval architecture. The most remarkable edifice is the former episcopal, now royal residence; a building of vast extent, and of some beauty, with grounds attached to it, which are laid out and preserved in good taste. The ecclesiastical edifices of the place are very numerous; and among these the cathedral occupies the first place. This building, originally dedicated in 1189, but materially altered in 1240, exhibits traces of a variety of styles, and contains little of any interest, except the monuments of the series of bishops of Würzburg. Close to the cathedral is the *Neumünster* church, founded in the eleventh century, and containing the tomb of St Kilian, who is said to have suffered martyrdom here in 687. The finest church in the town is that of St Mary, in the market-place, a beautiful Gothic building, with lancet windows and rich carvings. Würzburg has in all nineteen churches still used, besides many others now devoted to other purposes. The university was founded after the model of that of Bologna in 1403; and after suffering much in stormy times was renewed in 1582; and since that time it has numbered among its professors some of the most eminent men of Germany. It is now chiefly famous as a medical school, and had, in 1858-9, 45 professors and 667 students. The library contains 100,000 volumes; and there are various museums, and other scientific helps. The educational establishments of the city also comprise a gymnasium and various other schools. Of the religious establishments, the principal are Carmelite and Ursuline convents; and among the many charitable institutions, the most conspicuous is the large Julian hospital, which accommodates 600 inmates. Leather, mirrors, playing-cards, tobacco, and wool, are manufactured here; and an active trade is carried on, especially in wine and vegetables. Pop. 28,000.

WURZEN, a town of Saxony, circle of Leipsic, and 15 miles E. of the town of that name, stands on the right bank of the Mulde, and on the Leipsic-Dresden Railway. The river is here crossed by two bridges, one of which, the Railway Bridge, is 1350 feet long. Wurzen has an old castle, a cathedral founded 1114, and restored 1818; and manufactures of linen and woolien stuffs, beer, paper, and tobacco. Pop. 5621.

WYATT. The name of a family famous for having produced among its various branches a long list of names celebrated as artists or architects. The family is of old standing in the midland counties, and the various branches now in existence trace their descent from John Wyatt of Thickbroom, in the parish of Weeford, county Stafford, as a common ancestor. From him descended Benjamin of Blackbrook, in the same parish, who had four sons, Samuel, Joseph, Benjamin, and James, the latter of whom we name the first. Wyatt.

JAMES WYATT, the celebrated architect, was born at Burton Constable, 3d August 1746. Of his education little is known; but it is probable he displayed an early talent of an uncommon character, as we find him engaged, when only fourteen years of age, to accompany Lord Bagot to Rome, where that nobleman was sent as ambassador. Here probably, through the liberality of the latter, he studied architecture, and, among other things, is said carefully to have measured every part of St Peter's, having been lowered from above by ropes, that he might be enabled to get dimensions of parts otherwise inaccessible. After four years thus spent, he repaired to Venice, and there studied two years under the tuition of the famous Viscentini. He returned to London at the age of twenty, and there, whether his fame had preceded him, or through the influence of his noble patron, he designed the celebrated Pantheon, in what was then called the Oxford Road. Of this nothing now remains but the façade. The interior consisted chiefly of a very large circular room, crowned with a spacious dome, which was used for the same purposes as Ranelagh, for music, promenades, and other amusements. Sir John Soane, who was in general sparing of praise, speaks very highly indeed of the talent displayed in this building. It was certainly so much admired, that he was soon at the height of fashionable patronage, and immediately in a very large practice. Very shortly Catharine, the Empress of Russia, sent for him, offering him any terms if he would settle in her kingdom. This, however, by the advice of friends, he declined. Among the numerous works which he executed may be reckoned the palace at Kew, Lee Priory, Fonthill, Hanworth Church, extensive works at the House of Lords, Bulstrode, Doddington, Cashiobury, Ashridge, besides a host of minor works in all parts of the kingdom. At the death of Sir W. Chambers, he was appointed Surveyor-general, and, after some delay, was elected a Royal Academician. When the Royal Academicians quarrelled with West after his memorable journey to Paris, where the attention paid him by Napoleon I. and his court seems to have almost turned his head, the Academy elected Wyatt president in his room; but the tradition is, they could not get him to do their business, whether on account of habits of procrastination, or because of the multitude of his professional engagements, does not appear; but in a very short time he was in turn deposed, and West again assumed his place as president. He is well known as one of the revivers of Gothic architecture; and in pursuit of that study, went to great expense in procuring careful drawings and measurements of our best mediæval buildings. There is great boldness in the way in which most of his Gothic buildings are treated, and ideas of grandeur and magnificence, which won much praise at the time. He was killed by the accidental overturning of the carriage of Mr Codrington, near Marlborough, dying instantly of the concussion, on the 5th Sept. 1813, at the age of 70. He left a wife and four children, three of whom will be noticed below.

SAMUEL WYATT, third son of Benjamin of Blackbrook, and elder brother of the preceding, was engaged extensively as an architect and builder, occupations which, at that time, frequently went together. He is said to have designed Hooton Hall, Cheshire; Tatton Park, for the Egerton family; Doddington Hall, for Sir T. Broughton; and Kedleston, for Lord Scarsdale. The editors of the *Vitruvius Britannicus* attribute this last building to Adam. As the house, however, was but partly finished at the time they wrote, it is probable that the original plan was by Adam, and that the completion was by Wyatt. He also built the Trinity House on Tower Hill. He was a man of great ability, and was engaged on an immense number of important works. His nephew, afterwards Sir Jeffrey Wyatville (see below), was his pupil and assistant. He was buried at Chelsea College, on the 16th February 1807.

BENJAMIN WYATT was the eldest son of James Wyatt, and grandson of Benjamin of Blackbrook; was educated at Eton, and obtained the appointment of private secretary to Sir Arthur Wellesley (afterwards the celebrated Duke of Wellington), in Ireland, and afterwards in India. On his return, he was offered public employment by Lord Sidmouth, which for some reasons he declined, and lived in retirement a short time. After the burning of Drury Lane, he sent in designs for erecting the new theatre, and was successful in the competition, principally through the advocacy of the well known Samuel Whitbread. The erection of this building brought him into a large practice, and he joined his brother *Philip* in partnership, but outlived him. His principal works are Holderness House, and Wynyard, in Durham, for Lord Londonderry; Sutherland House, Apsley House, Crockford's Club-house, the Duke of York's Column, and a great number of buildings through the country. He retired into private life, and died at Camden town about ten years ago.

Wyatt. MATTHEW COATES WYATT, the third son of James, was born in 1806,—a sculptor of great eminence. His principal work is the monument to the Princess Charlotte, at the Royal Chapel at Windsor; the group of St George and the Dragon, also at that place; the bronze equestrian statue of George the Third, at Pall Mall East, statue of Nelson at Liverpool, and the large bronze statue of Wellington on the marble arch at Hyde Park. One of his sons is Sir MATTHEW WYATT, the Standard-bearer to the Gentlemen-at-Arms. Another, JAMES WYATT, also a sculptor, whose chief works are, a Nymph, with Festoon of Flowers, in the possession of the Marquis of Westminster; a Nymph coming out of a Bath, for Mr Wyld; Flora and Zephyrus, for Lord Wenlock; and a Nymph of Diana, in the possession of the King of Naples.

LEWIS WILLIAM WYATT was the second son of Benjamin Wyatt of Limegrove, who was fifth son of Benjamin Wyatt of Blackbrook, and, of course, nephew to James Wyatt, whose pupil he was. He was an architect of eminence, and held that appointment to the crown and board of ordnance, and executed many works at Hampton Court, Kew, and Richmond. He built houses for Lord Forrester, for Mr Legh, at Lyme; for Mr Egerton, at Tatton; Lord Wilton, at Heaton, &c. He retired early in life to his estate, at Park Pool, near Ryde, in the Isle of Wight, and died there, in February 1851, aged 76.

Sir JEFFREY WYATVILLE was the son of Joseph, and grandson of Benjamin Wyatt of Blackbrook. He was born on the 3d August 1766, at Burton-on-Trent, where his father practised as an architect, and is said to have been possessed of much talent, though of an indolent temperament. His son, however, was of a very different spirit. He was educated at the public school at Burton; but at twelve years of age, he ran away to sea. Being pursued and brought back, he did the same again shortly after. It is said he made another ineffectual attempt to get to sea, when his uncle Samuel took him under his protection, and he was in his office for seven years, during which time the buildings we have before mentioned were executed. In fact, he always claimed a large share in the designs of the Trinity House. After this time, the other and more celebrated uncle, James, also took him into his office, where he remained a considerable time, and where he is said first to have attracted the notice of the Prince of Wales, afterwards George IV. About the year 1799 he seems to have been engaged, like his uncle, both as builder and architect in a very extensive way. In the year 1824, he was successful in a limited competition for the new works at Windsor Castle against Nash and Smirke, and immediately relinquished any share in the building business. About this time, also, he was elected a Royal Academician. The works at Windsor, the cost of which ultimately exceeded three quarters of a million of money, now occupied the greater part of his time. Four years after their commencement, however, his Majesty, in taking possession of his private apartments, conferred the honour of knighthood on his architect, changing his name to Wyatville, and giving him an honourable augmentation to his arms. Besides large alterations to Badminton, Woburn Abbey, Endsleigh, Chatsworth, Longleat, Sidney Sussex College, &c., he built the houses at Lillieshall, Golden Grove, Nonsuch, Wimborne, Claverton, and a large number of others; in fact, he is said to have left some remarkable work behind him in thirty-five out of the forty English counties, without reckoning Wales. He died in London, 18th February 1840, and is buried at Windsor, in St George's Chapel. A splendid edition of his favourite work was published after his decease, edited by Henry Ashton, in large folio.

Returning now to another branch descending from the common ancestor, John Wyatt of Thickbroom, through William of Scarny Park, and Thomas of Bole Hall, we must now notice MATTHEW WYATT, of the Inner Temple, the well known active magistrate of the Lambeth Street Police Court.

His sons are, first, THOMAS HENRY WYATT, the eminent architect, whose principal works are, the fine basilican church at Wilton, the Adelphi Theatre, the Lunatic Asylums for Wilts and Bucks, the Law Courts at Devizes, Brecon, and Cambridge; the Birkenhead Training College; the Railway Terminus at Florence; a large Palace in the Crimea for Count Woronzow, and very many other works. Another son is MATTHEW DIGBY WYATT, architect to the East India Company, Fellow of the Royal Society, of the Society of Antiquaries, of the Institute of Architects (of which he was secretary); that of the Engineers, the Society of Arts, and many other societies. His principal works are, the Post-office at Calcutta, several bridges in India; that in St James's Park; the new Museum for the India Company; the Pompeian, Byzantine, Mediæval, Renaissance, and Italian Courts at the Crystal Palace. He is also the author of many valuable treatises, the last of which is the beautiful work, *The Art of Illuminating*.

In another collateral branch, we find the name of RICHARD JAMES WYATT, perhaps one of the most distinguished of the artists of the day. He was born on the 3d May 1795, and, having shown great talent, was articled as pupil to Charles Rossi, R.A., and studied also at the Royal Academy, where he obtained two medals. He appears to have had an early veneration for the works of Canova. When that distinguished sculptor was in England, he was introduced to him by Sir Thomas Lawrence, who had a warm admiration for Wyatt's talent. A friendship grew up between the two sculptors, and the great Italian pressed him to come to Rome, where he promised he should have the use of his studio, and any help he could afford him. After studying some little time at Paris under Bosio, he proceeded to Rome, where he remained for thirty years, only visiting England once during the whole time. His principal works are, Penelope, with the Bow of Ulysses, now in possession of her Majesty; the Statue of the Queen, at Windsor; Musidora, for the Duke of Devonshire; Ino, with Bacchus, for Sir Robert Peel; Glycera, Flora, and Venus; a Shepherd Boy protecting his Sister during a Storm, &c. &c. His sculpture has a life and grace about it that few English chisels have attained to, and has done much to raise the character of English art in the eyes of the world. He died, almost suddenly, at Rome, on the 28th of May 1850, and was interred there, the funeral being attended by all the lovers of art, both English and Italian. (A. A.) Wycherley.

WYCHERLEY, WILLIAM, a comic dramatist of high reputation in the seventeenth century, was born at Clive, near Shrewsbury, about the year 1640. His father was a gentleman of fortune and of old family, who afterwards became one of the tellers of the Exchequer. He was, we may presume, a cavalier and royalist, for instead of sending his son to study at Cambridge or Oxford, then under the sway of Cromwell and the Puritans, he despatched him when only fifteen to France. On the banks of the Charente, young Wycherley, remarkable for his handsome appearance, was introduced to the brilliant society of the Montausiers and Rambouillets, and was induced to conform to the Church of Rome. The immediate agent in his "conversion" is said to have been the beautiful and accomplished Duchess de Montausier, best known as Julie d'Angennes de Rambouillet, the favourite of wits and poets, and a special object of commemoration in the letters of Voiture. Her husband, the duke, seems to have been a man of a different stamp. He was the prototype of Molière's *Misanthrope* and Wycherley's *Plain Dealer*, and as tutor to the dauphin was as stern as George Buchanan was to his royal pupil, James the Sixth. Returning to England about the period of the Restoration, Wycherley was entered of Queen's College, Oxford, but only, as Anthony Wood says, in the character of *Philosophiæ Studiosus*, living with the Provost, and neither matriculating nor taking a degree. Dr (afterwards Bishop) Barlow reclaimed the student to Protestantism, but at no period of Wycherley's life was his religious profession more than nominal. According to Pope he died a Papist. From the university Wycherley went to the temple as a student of law. He does not seem to have seriously entertained any idea of following the legal profession, and while still a minor he is said to have betaken himself, like Fielding, to theatres and dramatic composition. His own statement, made to Pope, was, that he wrote his first play, *Love in a Wood*, at the age of nineteen, or in the year 1659. The vanity of Wycherley, however, was always greater than his love of truth, and in his latter years his memory was singularly defective. It is certain that his first play was not published before 1672, and it contains distinct references and allusions which show that it could not have been written as printed in 1659. There is an allusion, as Lord Macaulay has pointed out, to gentlemen's periwigs, which first came into fashion in 1663; an allusion to guineas, which were first struck in 1663; an allusion to the vests which Charles the Second ordered to be worn at court in 1666; and two allusions to the great fire of London in 1666. Wycherley's comedy was acted at the Theatre-Royal with great applause. Among its admirers was the Duchess of Cleveland, and the manner in which this abandoned but beautiful mistress of the king

Wycherley

introduced herself to the dramatist is curiously characteristic of the times. "One day," says Pope, "as he (Wycherley) passed that duchess's coach in the ring (in Hyde Park), she leaned out of the window and cried out loud enough to be heard distinctly by him, 'Sir, you're a rascal; you are a villain!' Wycherley from that instant entertained hopes. He did not fail waiting on her the next morning, and with a very melancholy tone begged to know how it was possible for him to have so much disobliged her Grace. They were very good friends from that time." And "good friends" they unquestionably must have become if Voltaire's statement be true, that the duchess used to go to Wycherley's chambers in the Temple dressed like a country maid, in a straw hat, with pattens on, and a box or basket in her hand. Wycherley dedicated his play to the duchess, lauding her for perfection of beauty, generosity, spirit, wit, and judgment, and presenting his "humble acknowledgments" to her grace for the "favours he had received from her"—qualifying, though only seemingly, the last phrase by stating that the duchess had gone two successive nights to see his play. The successful dramatist was introduced at court, and soon rose to high favour. The Duke of Buckingham, as Master of the Horse, made him one of his equerries, and gave him a commission in his regiment; and the king on one occasion, when Wycherley was confined with a fever, visited him in his lodgings in Bow Street, and, recommending him to try the air of Montpellier, presented him, it is said, with L.500 to defray the expenses of the journey. It is probable, however, that the royal generosity—a rare virtue at Whitehall—has been exaggerated, for Pope says that Charles only gave Wycherley a hundred pounds now and then, not often, and selected him to travel with the young Duke of Richmond (the king's son by Louise de Querouaille), which journey, we know, was never undertaken. During his intimacy with the Duke of Buckingham and the court, Wycherley performed what Macaulay considered "the only good action of his life;" he endeavoured to serve the poet Butler. He represented to the duke how well the author of Hudibras had deserved of the royal family, and that it was a reproach to the court that a person of his loyalty and wit should suffer under obscurity and want. Buckingham consented to meet Butler and Wycherley in a tavern. They met accordingly, but the door of the room in which they sat was open, and the duke observing a knight of his acquaintance—a worthless pimp—pass by with a couple of ladies, he ran after them, leaving Butler and his friend Wycherley to moralise on poetry and patronage. "From that hour to the day of his death," says Major Pack, to whom Wycherley related the story, "poor Butler never found the least effect of his (the duke's) promise."

> "Yet think what ills the scholar's life assail,
> Toil, envy, want, the patron, and the jail!"

"Poor Butler," however, found a generous friend, if not a patron, in a private individual, Mr Longueville, who supported him in his old age, and defrayed the expenses of his funeral.

Wycherley followed up his first dramatic success by three other comedies, *The Gentleman Dancing Master*, 1673; *The Country Wife*, 1675; and *The Plain Dealer*, 1677. About this time it was common for young men of rank and fashion to take a trip to sea, and serve on board the king's ships. "All gentlemen must pack to sea," says Wycherley, and he himself followed the prevailing mode. He was present at a naval engagement, which he has commemorated in a copy of wretched verses entitled, *On a Sea Fight which the Author was in betwixt the English and Dutch*. There is nothing in the lines to indicate the name or date of the battle, the author contenting himself with stating that

> "Each side, like fiends, in fire and smoke did fight,
> And put the devil himself into a fright."

Wycherley

Whether the Dutch or English gained is left unrecorded, and Lord Macaulay conjectures that it was a drawn battle, one of those between Rupert and De Ruyter in 1673. The next memorable event in Wycherley's career was his marriage. Like Dryden and Addison, he married a titled lady, and like them also his experience was such as to offer little encouragement to poets to form ambitious alliances. Wycherley happened one day to be in a bookseller's shop at Tunbridge Wells, accompanied by a friend, Mr Fairbeard, when a lady entered and asked the bookseller for the *Plain Dealer*. "Madam," said Mr Fairbeard, "since you are for the *Plain Dealer*, there he is for you," pushing Wycherley towards her at the same time. Some complimentary *badinage* took place, and the result of the dramatic exordium, as Mr Leigh Hunt says, was the usual termination of comedy—matrimony. The lady was a widow, the Countess of Drogheda, previously one of the Mesdemoiselles Robartes, mentioned in Grammont, daughter of Lord Robartes, afterwards Earl of Radnor and Lord-Lieutenant of Ireland. The Earl of Drogheda died (without issue) June 18, 1679, so that the marriage of his widow with Wycherley must have been subsequent to that date. It proved a troublesome if not unhappy union. The lady was of an imperious, suspicious temper; she had been a maid of honour, and knew something of the license of men of fashion, as well as of Wycherley's past life, and she became uneasy or infuriated whenever her husband was absent from her sight. He was permitted sometimes to dine with his old friends in the Cock Tavern in Bow Street, which was directly opposite her house; but on such occasions Lady Wycherley insisted that the tavern windows should be thrown open, that she might be assured there was no woman present! The marriage is also believed to have lost Wycherley the favour of the king, as it frustrated his plans with respect to the Duke of Richmond, to whom he had designed Wycherley to act as travelling tutor. But the enmity or alienation of Charles is more likely to have been caused by the dramatist's sympathy with his early patron the Duke of Buckingham, who had been committed to the Tower for uncourtly expressions used in debate. "Your late disgrace was but the court's disgrace," wrote Wycherley; and in a second copy of verses on the duke, when Villiers was "reduced to a little fortune," he celebrated his equanimity:—

> "To thee external accidents are sport,
> Who fear'st not fate and dost disdain to court."

This language of the *Plain Dealer* was not suited to Whitehall. Wycherley's jealous but not unloving wife did not long trouble him, and on her death she left him the whole of her fortune. The result, however, was only to add to his misery. The title under which he claimed the property was disputed, and the costs of a long litigation, added to his personal debts, were so heavy that he was unable to meet them, and was thrown into jail. He languished in the Fleet prison for seven years! His father refused to help him—the case was probably too desperate—and the bookseller who had profited largely by the copyright of his *Plain Dealer* would not even lend him twenty pounds. The gay world had forsaken and forgotten him, when fortunately James II., who had succeeded to the throne, happening to witness the representation of his last popular comedy, made inquiries concerning the author, and generously resolved to pay his debts and settle upon him a pension of L.200 a-year. But even this windfall did not release him from difficulties. Ashamed to state the full amount of his debts, Wycherley named a much lower sum, and thus left a considerable balance, which he had no means of liquidating. At length

Wycherley his aged father died, and he was put in possession of the family estate. His circumstances were now made easier, but he seems never to have been free from incumbrances. His estate was strictly entailed, so that he could not borrow largely on it, and he was at variance with the heir-at-law, his nephew. He appears to have lived mostly in town, frequenting theatres and coffeehouses—a veteran rake, and decayed wit. Dryden wished him to join in writing a comedy, but he declined the honour in an encomiastic copy of verses. The great poet in turn spoke of

"The satire, wit, and strength of Manly Wycherley."

Rochester termed him "Slow Wycherley," and other contemporaries represent him as careful in composition. He had apparently exhausted his powers of invention before he had completed half of his term of existence. Lely had painted his portrait in his twenty-eighth year, and now in his sixty-third he had it engraved, affixing to the engraving the Virgilian motto, *Quantum mutatus ab illo* (how changed from *him!*)—words which Pope says he used to repeat with melancholy emphasis.

"Thus fares it still in our decay,
And yet the wiser mind
Mourns less for what age takes away
Than what it leaves behind."

So says Wordsworth, but Wycherley had not the "wiser mind." The literary ambition of the dramatist still remained, and in 1704 he published a folio volume of *Miscellany Poems,* remarkable only for bad rhymes and profligate sentiments. About the same time he made the acquaintance of Pope, then a youth of sixteen, immured amidst his solitary studies in Windsor Forest, but longing eagerly for personal and literary distinction. Pope courted the society of Wycherley, running after him in town, he says, like a dog, and trying, but in vain, to get him to visit the young poet's "paternal cell" at Binfield. Lady Mary Wortley Montagu attributed this to a sordid motive —to Pope's anxiety to secure a legacy, but it seems to have been prompted solely by his passion for literature and his desire to escape from rustic obscurity. A correspondence was opened between the dramatist of sixty-four and the pastoral poet of sixteen, in which, reversing the order of nature, the youth appears as preceptor and critic. The manner in which Pope "cooked" his letters for publication renders it difficult to tell what is genuine and what fabricated, but Wycherley appears to have asked the young student to correct his verses, and Pope set about the task vigorously. Some passages he lopped off, "as we take branches from a tree to add to the fruit," and others he "entirely new expressed and turned more into poetry." "Let them undergo your purgatory!" exclaimed the mortified senior, but at the same time hoping that his critic's "great mind" might not destroy his "little, tender, and crazy carcase." The result might have been foreseen: mutual dissatisfaction and aversion ensued; Pope returned the manuscripts, and the intercourse between the parties was broken up. It was afterwards partially renewed, Pope seeming to repent of his critical honesty, but there never was any cordiality between them. The correspondence closed in 1710. Wycherley lived five years afterwards, and when he saw that death was at hand he resolved to marry, in order to burden and injure the heir-at-law, his nephew! "Some hundred pounds which he had with the lady," says Pope, "discharged his debts. A jointure of four hundred a-year made her a recompense; and the nephew he left to comfort himself as well as he could with the miserable remains of a mortgaged estate." He survived his marriage eleven days, and the evening before he expired he called his young wife to his bedside, and entreated her not to deny him one request. "My dear," he said, "it is only this, that you will never marry an old man again"—a truly dramatic and characteristic close to his dramatic life! The woman married a Captain Shrimpton, who sold Wycherley's papers, and from these a volume of *Posthumous Works* was published in 1728, edited by Theobald, the original hero of the Dunciad. The manuscripts were much interlined, and scarce legible, thus supporting the *sobriquet* of "Slow Wycherley;" and in point of literary merit, or rather demerit, they fully justified Pope's depreciatory and contemptuous criticism. A few of the prose maxims are tersely expressed, and evince the observation of the man of the world, but the verses, which form the bulk of the volume, are utterly despicable. More of Wycherley's papers Theobald said remained behind, waiting publication if readers demanded further remains of the deceased wit, but no more was heard of them. Wycherley had outlived his fame. In his own walk of the drama Congreve had eclipsed him; the essays of Addison and Steele, and the masculine satire of Swift, had introduced a purer taste and higher standard of literary excellence, and in poetry Pope reigned supreme. Wycherley died in December 1715, and was buried in the vault of Covent Garden Church (St Paul's), where are also the remains of his contemporaries Butler and Lely.

As a dramatist, Wycherley is now known only to critics and literary students. The general reader and playgoer have long since lost sight of him. No manager would venture to reproduce any one of his comedies on the stage, and even his style of dialogue, once so popular, appears forced and unnatural to the present generation. It is often pointed and witty,[1] and it served as a model for Congreve and Farquhar, who in turn were the dramatic fathers of Sheridan and Colman; but all of these improved upon the original. They had equal or more wit, with greater variety and brilliancy. Their jests and epigrams are less laboured in appearance; they have fewer oaths and expletives; and if they are not more moral in tendency they are at least greatly more decent in discourse. Wycherley has only one character that has any pretensions to originality—the litigious and bustling Widow Blackacre. His Manly, the *Plain Dealer,* is an Anglicised copy of Molière's Misanthrope; and his *Gentleman Dancing Master* is borrowed in part from the "École des Femmes." Indeed, most of his plots, intrigues, and *contretemps* are taken from the Spanish or French drama. And whatever Wycherley borrowed he debased. His taste was radically coarse and depraved, and his standard of morality never rose above that of Whitehall under Charles the Second. Of that period his plays afford a good illustration. We may also discover in them here and there a clever epigrammatic sentence or a lively comic illustration, but no one ever found in them a scene that touched his heart or elevated his imagination. (R. C—S.)

---

[1] Moore has noticed a sentiment of Wycherley's (*Plain Dealer*, act i. sc. 1, not the *Country Wife*, as by a slip of the pen Moore writes), which he thinks Burns may have copied. "Counterfeit honour," says Manly, "will not be current with me; I weigh the man, not his title; 'tis not the king's stamp can make the metal better or heavier." Burns has

"The rank is but the guinea's stamp,
The man's the gowd for a' that."

In the same scene Manly makes a just and an acute observation. "Speaking well of all mankind is the worst kind of detraction, for it takes away the reputation of the few good men in the world, by making all alike." And in a subsequent act, "He that distrusts most the world, trusts most to himself, and is but the more easily deceived, because he thinks he can't be deceived. His cunning is like the coward's sword, by which he is oftener worsted than defended." Sentiments of this kind are scattered through Wycherley's dialogues, but his knowledge was more of evil than of good.

Wycliffe. WYCLIFFE, JOHN, who was born about the year 1324, derived his name from the place of his nativity, a village six miles from Richmond in Yorkshire. From the era of the Norman conquest, the family to which he is supposed to have belonged had been lords of the manor, and patrons of the rectory of Wycliffe; and it is to be inferred that his parents were able and willing to give him the best education which the kingdom then afforded. In due time he became a commoner of Queen's College, Oxford, a seminary of very recent institution; but he speedily removed to Merton College, which then enjoyed a higher reputation than any other house of learning: the scholastic celebrity of Duns, Ockham, and Bradwardine, was alone sufficient to consecrate its walls. Having been duly initiated in logic and rhetoric, he directed his attention to other branches of knowledge. His proficiency in the civil, the canon, and the municipal law, has been noticed by Lewis, and other biographers; but his greatest efforts were devoted to the study of theology, not merely that barren art which was then taught in the schools, but that divine science which is derived from the spirit as well as the letter of the Scriptures. In the prosecution of his inquiries, he had to contend with numerous and formidable difficulties: the genius of the age was hostile to any plan of study or mode of investigation which the church had not sanctioned; the text of the sacred writings was in a great measure neglected, while its place was supplied by systems of scholastic divinity; the original language of the New, as well as the Old Testament, was almost totally unknown in the kingdom; the inhabitants of the western world had almost universally surrendered their understanding to the control of a body of priests, who reduced spiritual tyranny and delusion to a complete system; and the student eagerly bent on the search of divine truth, was left without encouragement and without a guide. But in spite of all these disadvantages, Wycliffe pursued his course with alacrity and perseverance. He arrived at a degree of scriptural knowledge which had not been equalled for many centuries; and his veneration for the sacred writings procured him the honourable appellation of the Evangelic Doctor.

His earliest publication, entitled *The last Age of the Church*, appeared in 1356, when he is conjectured to have attained the age of thirty-two. In 1347, England had been visited by a pestilence, which first made its appearance in Tartary, and after ravaging various countries of Asia, proceeded by the shores of the Nile to the islands of Greece, and carried devastation to almost every nation of Europe. So prodigious was the waste of human life, that this quarter of the globe is supposed to have lost a fourth part of its inhabitants.[2] The direful distemper was even communicated to the brute creation, and the land was covered with putrid carcasses. These portentous signs of the times filled the pious mind of Wycliffe with gloomy apprehensions, and led him to indulge in speculations respecting the last age of the church. He arrived at the conclusion that the day of judgment was not to be deferred beyond the close of the century in which he himself lived. Many individuals of a visionary turn of mind, and some possessed of the most vigorous understanding, have in various ages hazarded similar predictions. It is stated by Dr Vaughan, that "the opinions and the feeling disclosed in this production, though but imperfectly developed, are such as to prepare the reader to anticipate in Wycliffe a devout opponent of the corruptions which it describes with such solemnity and pathos. It is important to know, that even at this period of his history, the nefarious practices connected with the appointment of the clergy to the sphere of their duties, had so far shocked his piety, as to dispose him to expect a speedy and signal manifestation of the displeasure of heaven." Wycliffe. After an interval of a few years, he distinguished himself by his strenuous opposition to the mendicant orders, who then infested the best parts of Europe, and, under the pretext of betaking themselves to a life of poverty and devotion, consumed the fruits of the earth, and too often set an example which did not tend to edification. In 1360 he published his Objections to the Friars, which were long afterwards committed to the press by Dr James. The errors and vices of the mendicants, it has been remarked, had never been so generally or so forcibly assailed; and while those who preceded aimed only at the removal of particular abuses, he perceived that the institution itself was unnecessary and pernicious. The friars were a class of men whom it was dangerous to provoke; nor is it to be doubted that he thus made a large addition to the catalogue of his enemies. His friends however were likewise numerous. In 1361 the society of Balliol College presented him to the rectory of Fillingham, in the diocese of Lincoln; and he became master of that college in the course of the same year. In 1368, he exchanged this living for Lutgershall, in the archdeaconry of Bucks; a benefice of inferior value, but situated at a more convenient distance from Oxford. After retaining his mastership for the space of four years, he was appointed warden of Canterbury Hall, recently founded in the same university by Simon Islep, archbishop of Canterbury, with a provision for twelve scholars, eight of whom were to be secular clerks, and the remaining four, including the warden, were to be chosen from the monks of Christ Church, Canterbury. The warden first nominated by the founder, was one Wodehall, a fierce and turbulent monk, whom he soon found it necessary to remove from his office. Wycliffe was invited to supply his place, and the archbishop did not long survive. His successor in the primacy was Langham, bishop of Ely, who had previously been abbot of Westminster, and still retained the spirit of a monk. Wodehall appealed to this new visitor, and found the support which he expected. The appointment of Wycliffe having, with little regard to law or fact, been pronounced null and void, a person named Radyngate was first substituted in his place, and in the course of a few weeks Wodehall resumed the office of warden. From this arbitrary sentence, Wycliffe appealed to the sovereign pontiff; and, after an interval of several years, found it was vain to expect that justice should flow from so polluted a fountain. The decision of the pope was confirmed by the authority of the king, who did not however pronounce an unbribed judgment.

About the time when Wycliffe was appointed warden of Canterbury Hall, a controversy had arisen between Urban the Fifth and Edward the Third, in consequence of the renewed demand of an annual tribute of a thousand marks, as an acknowledgment of the feudal superiority of the pontiff over the kingdoms of England and Ireland. The payment of this degrading tribute had never been regular, and it had been entirely discontinued for thirty-three years; but on the renewal of the papal claim, the king thought it necessary to consult both houses of parliament. "The prelates solicited a day for private deliberation; but assembling on the morrow, the lords spiritual and temporal, and the members of the commons, were unanimous in stating, that neither King John, nor any other sovereign, had power thus to subject the realm of England, without consent of parliament; that this consent was not obtained; and that, passing over other difficulties, the whole transaction, on the part of the king, was in violation of the oath

[1] *The Last Age of the Church, by John Wycliffe;* now first printed from a manuscript in the University Library, Dublin. Edited, with notes, by James Henthorn Todd, D.D., &c. Dublin, 1840, small 4to.

[2] *The Black Death in the fourteenth Century,* from the German of I. F. C. Hecker, M.D., translated by B. G. Babington, M.D., p. 77. London, 1833, 12mo. "It may therefore be assumed, without exaggeration, that Europe lost, during the Black Death, 25,000,000 of inhabitants.

Wycliffe. which he had taken on receiving the crown. By the temporal nobility, and the popular representatives, it was farther determined, that should the pontiff commence his threatened process against the monarch of England, as his vassal, the strength of the nation should be instantly called to the king's aid."[1] But the most gross and scandalous usurpations will always find a sufficient number of defenders, when the usurpers have the power of bestowing a sufficient number of rewards. The claims of the pope were maintained by some nameless monk, who on this subject published a tract, in which he called upon Wycliffe to refute his arguments. In this appeal to him by name, we discover an obvious proof that his character had already become very conspicuous; and although it was apparently the writer's intention to do him an injury rather than an honour, he did not decline the challenge which had thus been given. He published a work in which he endeavoured to circumscribe the arrogant claims of the church, and to fix the legitimate extent of civil authority: he maintained the right of the king and his parliament to refuse the tribute claimed by the court of Rome, to subject all ecclesiastics to the secular jurisdiction in all civil cases, and even to alienate the property of the church. Some of his opinions are so much at variance with the doctrines of the canon law, that he had evidently made no inconsiderable progress in his retrograde motions from the popish standard of orthodoxy.

The question respecting the wardenship was finally decided in the year 1372, when the king confirmed the sentence of the pope. Wycliffe now found other employment in the university. Having taken the degree of D. D., says Lewis, he "publickly professed divinity, and read lectures in it; which he did with very great applause, having such an authority in the schools, that whatever he said was received as an oracle. In these lectures he frequently took notice of the corruptions of the begging friars, which at first he did in a soft and gentle manner, till finding that his detecting their abuses was what was acceptable to his hearers, he proceeded to deal more plainly and openly with them." It is more than probable that the influence which he exercised over his own age, is in some degree to be ascribed to the circumstance of his occupying a theological chair in this university, which about that period was frequented by a great multitude of students. The invention of printing had not yet afforded the means of disseminating knowledge with great facility, and with great rapidity: books, which could only be multiplied by the slow process of transcription, were necessarily sold at a high price; and the number of individuals capable of reading them was surprisingly small. But the voice of the public teacher was raised with living energy; and his opinions, inculcated with learning and fervour, could not fail to influence those who in their turn were to become public teachers.

In the year 1374, he was employed in an embassy to the pope, Gregory the Eleventh, whose residence was at Avignon. The first person named in the commission is the bishop of Bangor, and the second is Dr Wycliffe. Their mission had a reference to one of the flagrant abuses of that period, the papal reservation of benefices in the English church. The ecclesiastical revenues, to a very great amount, were appropriated in this manner, and in many instances were most unworthily bestowed upon foreigners who were entirely unacquainted with the language of the country, and who were sometimes of too tender an age to be intrusted with the cure of souls. Against this branch of pontifical usurpation, the statute of provisors had been enacted in the year 1350. The embassy was not received at Avignon, but at Bruges; and with most of the pontiffs it would have been an act of wisdom to keep all strangers at a distance from their ordinary place of residence, which was too commonly the fountain-head of all iniquity. John of Gaunt, duke of Lancaster, had at the same period repaired to Bruges on another diplomatic mission; nor is it improbable that Wycliffe may thus have had a favourable opportunity of recommending himself to his powerful protection. The duke, as Dr Vaughan has remarked, is "the only son of Edward the Third, whose name is connected with the religion of that period, and who is known as the patron of Chaucer and Wycliffe." It is not certain that the latter returned to England before the year 1376; but in the mean time he received different marks of the royal favour. He had formerly been nominated one of the king's chaplains. In the month of November 1375, the king presented him to the prebend of Aust, in the collegiate church of Westbury, in the diocese of Worcester, and about the same period to the rectory of Lutterworth in Leicestershire, the presentation to this benefice having devolved upon the crown, in consequence of the minority of the patron, Lord Ferrars. Wycliffe.

Wycliffe had now risen to high distinction, and if his views had been directed to the ordinary objects of a mere churchman's ambition, it is probable that he might have obtained much higher preferment. Many individuals of the middle classes were gradually added to the number of his converts; nor was the duke of Lancaster the only man of rank and influence who regarded his person and doctrines with a favourable eye. But his proceedings must for a long time have excited the watchful jealousy of those who enjoyed the principal emoluments of the church, and were suspicious of all spiritual innovations, lest they might eventually lead to some encroachment on their own temporalities; for it has been remarked in every age, that those well-beneficed clergymen who, by the general tenor of their conduct, indicate the most perfect indifference as to the vital interests of religion, are yet the most loud and vehement in proclaiming the danger to which their "excellent establishment" must be exposed by the slightest change or concession. Being accused of heresy, he was summoned to appear before the convocation, which commenced its sittings in the month of February 1377, and in which Courtenay, bishop of London, made the most conspicuous figure. This prelate was son to the earl of Devonshire, by a grand-daughter of Edward the First, and added the pride of royal descent to the arrogance of priestly elevation. Wycliffe made his appearance at St Paul's on the 19th of the same month, and, to the no small dissatisfaction of the bishop and his partisans, was accompanied by the duke of Lancaster, and by Lord Percy, earl-marshal of England. So great was the concourse of people, that it was not without considerable difficulty that the marshal could procure him an avenue to the presence of his judges, Archbishop Sudbury, and other prelates, who were assembled in our Lady's chapel, behind the high altar. "Dr Wicliffe, according to custom, stood before the commissioners, as one cited to appear there to hear what things they had to lay to his charge; but the earl-marshal, out of tenderness for Dr Wicliffe, and having but little regard to a court which owed all its authority to a foreign power, bid him sit down, telling him he had many things to answer to, and therefore had need of a soft seat to rest him upon during so tedious an attendance. The bishop of London, hearing that, answered, 'he should not sit there;' for, says he, 'it is neither according to law nor reason, that he who was cited here to answer before his ordinary, should sit downe during the time of his answer;' adding, 'that if he could have guessed

[1] Vaughan's *Life and Opinions of John de Wycliffe*, D.D., vol. i. p. 280, second edition, London, 1831, 2 vols. 8vo; third edition, 1853. See the *Edinburgh Review*, vol. li. p. 221.

Wycliffe. that the earl-marshal would have played the master there, or been so troublesome, he would not have suffered him to come into the court.' On which many angry words passed betwixt the bishop and the earl-marshal. The duke of Lancaster took the earl-marshal's part, and told the bishop that 'the earl-marshal's motion was but reasonable, and that as for him, who was grown so proud and arrogant, he would bring down the pride, not only of him, but of all the prelacy of England; that he depended upon the greatness of his family, but that they should have enough to do to support themselves."[1]

The duke of Lancaster did not then stand high in the popular favour; and his magnificent palace of the Savoy was attacked during the tumults which followed this stormy discussion. A clergyman, who had the misfortune of being mistaken for Lord Percy, was put to death by the populace. The decease of the aged king ensued on the 21st of June 1377, and he was succeeded by his grandson Richard, who had not completed the twelfth year of his age. A parliament was summoned soon after his accession, and the subject of the papal encroachments was again resumed. By this parliament, a question was submitted to the judgment of Wycliffe, whether a kingdom might not, in a case of necessity, prevent its treasures from being conveyed to a foreign country, although it should even be demanded by the pope himself. Here we have a sufficient proof that the charge of heresy, however it might expose him to resentment from the rulers of the church, had not diminished his credit with the rulers of the state. What answer the professor of divinity returned to this question, no reader can fail to anticipate. His opinions as to the temporalities of the church must have been thought fully as dangerous as his theological doctrines; and on the same day no fewer than four different bulls had been issued against him by Gregory the Eleventh; three of which were directed to the archbishop of Canterbury and the bishop of London, and a fourth to the chancellor and university of Oxford. All these documents, together with an apostolical epistle addressed to King Edward on the same subject, are dated on the 22d of May. The bulls of this "servant of the servants of God," enjoin the parties to whom they are addressed to commit John Wycliffe to prison, and, having transmitted to Rome a full account of his heretical tenets, to detain him in custody until they should receive further instructions; but should they fail in their endeavours to seize his person, they are required to affix in suitable places a citation for his appearance before the pontiff within three months from the date of such citation. These pastoral mandates were not however very effectually executed; but during the earlier part of the year 1378, he appeared before a meeting of papal delegates in the archiepiscopal chapel at Lambeth. His doctrines were rapidly extending their influence, not merely among the people, but even at court. The populace were now alarmed for his personal safety, and, having surrounded the chapel, many of them forced their way into it, and gave sufficient indications of the part which they were prepared to act; nor was the mortification of the delegates diminished by the appearance of Sir Lewis Clifford, who, in the name of the queen mother, the widow of the Black Prince, prohibited them from proceeding to any definite sentence respecting the doctrine or conduct of Wycliffe.

He therefore returned to his former occupations, and by his pulpit discourses, his academical lectures, and his various writings, laboured to promote the cause of truth. The Wycliffe. great and glorious labour of his declining years was his complete version of the Bible. It has always been one of the chief arts of priestcraft to keep mankind in a state of ignorance; and it may easily be conceived that an attempt to render the sacred books intelligible to every person capable of reading his mother-tongue, could not fail to kindle the fiery rage of the old Red Dragon. In our own time, we have heard divers denunciations from high-churchmen as to the danger of circulating the Bible without the Book of Common Prayer. According to their estimate, it is better to withhold the one, unless it can be duly qualified by the other. Are we then to conclude that there is no safety beyond the precincts of their own church; that the religion of protestants is only a safe way to salvation, when that way is paced in certain trammels, and swept with a white surplice? Or is the spiritual improvement of mankind of real importance in so far only as it may be circumscribed within the boundaries of episcopacy? The spirit of popery is not confined to professed papists. To translate the Bible was in Wycliffe regarded as an act of heresy, and his version continued to be a proscribed book till the era of the Reformation. Being ignorant of the Hebrew and Greek languages, which he had no opportunity of learning, he was under the necessity of translating from the Vulgate.[2] What aid he may have received from others in the prosecution of his laborious undertaking, it is impossible to ascertain; but it is commonly understood that he was not without coadjutors. In a theological point of view, the value of his translation is far from being inconsiderable, and its value is still more conspicuous in illustrating the history of the English tongue. Wycliffe may indeed be regarded as the father of English prose. His version affords a very ample specimen of the language, as it existed in the fourteenth century; nor is it a little curious to remark, in very many instances, how immaterially his phraseology differs from that of the authorized version executed in the reign of King James. Of his translation of the New Testament, an edition was published by Mr Lewis in the year 1731, and another by Mr Baber in the year 1810; but it is not very creditable to his countrymen, who have derived so much benefit from his pious labours, that his translation of the Old Testament still remains in manuscript. This great deficiency however is at last to be supplied: Mr Forshall and Sir Frederic Madden, both of the British Museum, are now engaged in preparing an edition, which is to issue from the university press at Oxford. Of the influence of Wycliffe's biblical labours, no person seems to have obtained a clearer view than Dr Lingard. He made, says this historian, "a new translation,[3] multiplied the copies with the aid of transcribers, and by his poor priests recommended it to the perusal of their hearers. In their hands it became an engine of wonderful power. Men were flattered with the appeal to their private judgment; the new doctrines insensibly acquired partisans and protectors in the higher classes, who alone were acquainted with the use of letters; a spirit of enquiry was generated; and the seeds were sown of that religious revolution, which, in little more than a century, astonished and convulsed the nations of Europe."

Wycliffe had at first exposed the discipline of the church, and the scandalous lives of churchmen; but he at length raised his voice against several of its doctrines, and particularly against the doctrine of transubstantiation. Wher-

[1] Lewis's *History of the Life and Sufferings of the reverend and learned John Wicliffe*, D.D., p. 53, Lond. 1720, 8vo. See however p. 57 of the last edition, Oxford, 1820, 8vo, which contains various additions.

[2] Jablonski has described Wycliffe as "vir excellenti ingenio, magno animo, et pietate solida præstans, sed quem linguarum sacrarum peritia, literarumque elegantiorum studia deficiebant." (*Institutiones Historiæ Christianæ*, tom. i. p. 329.)

[3] From the researches of Mr Baber, who has bestowed much attention on the subject, it clearly appears that no entire translation into the English language had preceded that of Wycliffe. This editor has prefixed memoirs of the translator, including a long catalogue of his works. See likewise Dr Vaughan's *Life of Wycliffe*, vol. ii. p. 379.

Wycliffe. ever the understanding of mankind can be so completely debased as to admit this portentous doctrine, the dominion of the priest must be absolute: he is thus invested with a creative power; after the admission of such a dogma, no other can be found of very hard digestion; and he who exercises so much influence over a future world, must not be left without an ample share of what belongs to this. A persecution was again excited against the reformer; and the duke of Lancaster, who had hitherto befriended him, and who was well aware of the secular corruptions of the clergy, was not however prepared to support him in his attack on what was considered as a fundamental doctrine of the church. Courtenay, who had now become archbishop of Canterbury, was endowed with the spirit of an inquisitor, and appears to have wanted no inclination to confer upon Wycliffe the honour of martyrdom. This venerable man was summoned before a convocation held at Oxford; but although he made no recantation of his supposed errors, they did not venture to treat him as an obstinate heretic. A letter was however procured from the king, commanding him to banish himself from the university. About the same period, he was cited to appear before the pope; but, in return, he gave his holiness some salutary advice, and informed him that he neither felt strength nor inclination for so long a journey. His constitution was indeed exhausted by his multifarious exertions, and he had already been affected with a paralysis, which at length proved fatal. But after his final retirement to Lutterworth, he still continued to labour in the same great cause. He died on the last day of December 1384, when, according to the computation of his biographers, he had attained the age of sixty.

The grain of mustard-seed which was now sown became a great tree. The doctrines which Wycliffe propagated with so much zeal and ability, could not again be suppressed: the seat of Antichrist was gradually shaken from its old foundation; and the impulse which he gave to religious enquiry is apparently destined to reach the distant ages of futurity. His theological opinions cannot be detailed in this brief and imperfect notice. It may however be remarked, that he clearly anticipated the most distinguishing doctrines of the protestants, and that his opinions on certain points present an obvious coincidence with those of Calvin. Of the simplicity of primitive times, he was too devoted an admirer to secure the unqualified approbation of modern churchmen; and one biographer is not a little scandalized, because it seems perfectly clear that he did not consider the episcopal order as at all essential to the legitimate constitution of a Christian church. We find Wycliffe "zealously inculcating the lessons of inspiration on the fall of man, and the consequent depravity of human nature; on the excellence and perpetual obligation of the moral law; on the exclusive dependence of every child of Adam, for the remission of his sins, on the atonement of Christ; and for victory over temptation, and the possession of holiness, on the aids of divine grace." We have already had occasion to state, that the influence of his opinions extended to persons of various ranks and denominations. Lord Cobham, the most illustrious of his followers, sealed his testimony with his blood, and many individuals of inferior condition were likewise brought to the stake. The religion of the people was to be purified by fire and fagot; and Henry the Fifth, endeavouring to atone for the follies of his youth by the bigotry of his manhood, rendered himself a willing instrument of persecution in the hands of an unholy and unrelenting priesthood. Wycombe

The influence of Wycliffe's doctrines soon extended from England to the continent, and their connexion with the subsequent progress of the reformation may very easily be traced. The next conspicuous stage was the kingdom of Bohemia. The king of Bohemia's sister was the consort of Richard the Second, and she came to England in the year 1382. She was a religious princess, and constantly studied the four gospels in English, explained by the expositions of the doctors. The Bohemians who had frequented her court, returned to their own country, and carried along with them some of the works of the great reformer, which, being written in Latin, were intelligible to the learned of all the European nations. Jerom of Prague, who had studied in the university of Oxford, is said to have translated many of his works into the Bohemian language; but, according to another and a more probable account, he only copied some of them in England, and carried the transcripts to Bohemia.[1] By this eminent person, and by his pious leader John Huss, the writings and character of Wycliffe were held in the highest veneration; and they endeavoured to follow his footsteps, by contributing to remove the corruptions of the church. Their earthly career was however terminated in a more tragical manner. The council of Constance, which condemned them both to the flames, added gross perfidy to inhuman cruelty, by violating the safeconduct which Huss had obtained from the emperor Sigismund, and which that prince had not the honour or the resolution to enforce.[2] The same council, a miserable assemblage of those who acted as the representatives of the Christian community, pronounced sentence of condemnation on the whole of Wycliffe's writings; and having decided that he had died an obstinate heretic, and that his memory should be held as infamous, they further decreed that his bones, which had now reposed in the dust for the space of thirty years, should be removed from consecrated ground, and scattered on the dunghill. But the cardinals, archbishops, bishops, abbots, and doctors, who were permitted to play such fantastic tricks before high Heaven, are themselves mingled with the vilest earth, while the name and memory of John Wycliffe continue to be held in unimpaired veneration. (D. I.)

WYCOMBE, CHIPPING or HIGH, a municipal and parliamentary borough and market-town of England, Buckinghamshire, pleasantly situated on the Wick, a small affluent of the Thames, 29 miles W. by N. from London. It is a neat and well built town extending for about a mile and a half along the valley in which it is situated. The parish church is a fine old structure in the perpendicular and decorated styles, with a highly ornamental tower, 108 feet high at its west end. The town-hall is a large brick edifice, erected in 1757, and supported on stone pillars. There are also places of worship for Methodists, Independents, Baptists, and Quakers; a free grammar and other schools; and numerous paper and corn mills on the Wick and its affluent the Rye. The making of chairs is the chief branch of industry carried on. Its market is important for corn and other agricultural produce. Adjoining the town is Wycombe Abbey, the seat of Lord Carrington. Wycombe is governed by a mayor, four aldermen, and twelve councillors; and returns two members to parliament. Pop. (1851) of municipal borough, 3588; of parliamentary borough, 7179.

---

[1] Lenfant, *Hist. du Concile de Constance*, tom. i. p. 110. Gilpin, who is not very critical in his inquiries, has stated that "he translated many of them into his native language, having with great pains made himself master of the English." (*Lives of John Wickliff, and of the most eminent of his Disciples*, Lord Cobham, John Huss, Jerome of Prague, and Zisca. Lond. 1765, 8vo.)

[2] If the reader has any inclination to see how perfidy and cruelty can be justified by a true Jesuit, we beg leave to refer him to the elaborate publication of Heribertus Rosweydus, "*De Fide Hæreticis servanda ex decreto Concilii Constantiensis Dissertatio cum Daniele Plancio Scholæ Delvhensis Moderatore; in qua, quæ de Husso Historia est excutitur.* Antverpiæ, 1610, 8vo.

Wye ‖ Wyttenbach.

WYE, a river of England and Wales, rises on the south side of Plinlimmon, Montgomeryshire, about 2 miles from the source of the Severn. Its course is generally S.E. through Radnor, then between Radnor and Brecknock, afterwards through Hereford, and finally between Monmouth and Gloucestershires, to its mouth in the estuary of the Severn, about 2 miles below Chepstow. It has a total length of about 125 miles, and it is noted for its highly picturesque scenery. Large vessels cannot ascend above Chepstow; but small vessels of 30 to 40 tons may go up as far as Hereford. Besides Chepstow and Hereford, the chief towns on its banks are Monmouth, Ross, Hay, and Builth. Its principal affluents are the Caerwen and Irfron on the right, and the Ithon and Lug on the left.

WYMONDHAM or WYNDHAM, a market-town of England, county of Norfolk, 10 miles W.S.W. of Norwich. It is pleasantly situated, and has a fine old parish church, which formerly belonged to a monastery founded here in the time of Henry I. There are several dissenting places of worship; a free grammar and other schools; and various charities. The inhabitants are chiefly employed in weaving bombazines, crapes, and other Norwich goods. Pop. (1851) 2970.

WYNDHAM, SIR WILLIAM, descended of an ancient family, was born about the year 1687, and succeeded young to the title and estate of his father. On his return from his travels, he was chosen member for the county of Somerset, which he represented during the rest of his life. After the change of the ministry in 1710, he was appointed secretary at war; and in 1713 was raised to be chancellor of the exchequer. Upon the breach between the Earl of Oxford and Lord Bolingbroke, he adhered to the interests of the latter. He was removed from his employment on the accession of George I., and falling under suspicion on the breaking out of the rebellion in 1715, was apprehended. He made his escape; a reward was published for apprehending him; he surrendered, was committed to the Tower, but never brought to a trial. After he regained his liberty, he continued in opposition to the several administrations under which he lived, and died in 1740.

WYTTENBACH, DANIEL, one of the most distinguished of modern philologists, was born at Bern in 1746. His father, the clergyman of the town, was a good theologian, and superintended his early education with care. After a careful domestic education, he was sent to study philology at the universities of Marburg, Gottingen, and Leyden, where he was a pupil of the famous Ruhnken. So high was his reputation as a critical scholar, that, in his twenty-fifth year, he was appointed professor of Greek and philosophy in the college of the Arminians at Amsterdam, and subsequently in the Athenæum of the same city, which out of compliment to him was afterwards styled the Wyttenbach Athenæum. In 1779, he was advanced to the chair of eloquence at Leyden, a position which he held till blindness and old age rendered him incapable of discharging its duties, when he resigned, and went to live at Heidelberg. It was in 1816, in his seventieth year, that he removed to Heidelberg; and two years afterwards he took the extraordinary step of marrying the famous Johanna Gallien. For this eccentric proceeding an excuse may be found partly in the advanced age of Wyttenbach, and principally, perhaps, in the fact that the object of his affections was a distinguished philologist, the only lady, in all probability, in Europe, who could appreciate the studies by which the professor had obtained his reputation. In acknowledgment of her acquirements in philology, the degree of Ph. D. was conferred on her, in 1827, by the University of Marburg. Wyttenbach did not long survive his marriage, as he died at Oegs in 1820. He was a man of great learning, and possessed in perfection the discriminating skill of the critic. He wrote always in Latin, and his Latinity is considered the purest which has been written in recent times; that of his *Vita Ruhnkenii*, being usually reckoned the best. He was the author or editor of numerous other works, including an excellent edition of the *Opera Moralia* of Plutarch; *Præcepta Philosophiæ Logicæ*, which has been very generally adopted as a text-book on the science of which it treats; *Selections from Herodotus, Thucydides, Xenophon, Polybius, and Plutarch, with Notes;* and the *Bibliotheca Critica*, which was published under his superintendence from 1779 to 1808.

Wyttenbach.

X.

X
||
Xavier.

X, or x, is the twenty-fourth letter of our alphabet, and a double consonant. It was not used by the Hebrews or ancient Greeks; for, as it is a compound letter, the ancients, who used great simplicity in their writings, expressed this letter by its component letters *c s*. Neither have the Italians this letter, but express it by *ss*. X scarcely begins any word in our language but such as are of Greek origin; and is in few others but what are of Latin derivation, as *perplex*, *reflexion*, *defluxion*, &c. We often express this sound by single letters, as *cks* in *backs*, *necks*; by *ks*, in *books*, *breaks*; by *cc* in *access*, *accident*; by *ct*, in *action*, *unction*, &c. The English and French pronounce it like *cs*, *ks*; the Spaniards like *c* before *a*,—viz., *Alexandro*, as it were *Alecandro*. In numerals it expresses 10, whence in old Roman manuscripts it is used for *denarius*. When a dash is added over it, thus, $\bar{X}$, it signifies 10,000. (See ABBREVIATIONS.)

XALAPA. See JALAPA.

XALISCO. See MEXICO.

XANTHUS, a celebrated ancient city of Asia Minor, the largest in Lycia, on the river of the same name, about 8 miles above its mouth. It is chiefly memorable in history for its two sieges, and the desperate but unavailing resistance made by its citizens on both occasions. The first was by Harpagus, a general under Cyrus, when the inhabitants, with all their possessions, were buried beneath the ruins. The city was afterwards rebuilt; and, in the time of the Roman civil war, B.C. 42, was besieged by the republican army under Brutus. It was taken by storm and set on fire; and the inhabitants, refusing to surrender, all perished in the flames. During its prosperity, Xanthus contained many beautiful temples and other buildings, extensive remains of which, in excellent preservation, have been recently discovered. A large number of these remains are now in the British Museum.

XAVIER, FRANCIS, a distinguished Indian missionary of the Church of Rome, was born of a noble family at the Castle of Xavier, in Navarre, on the 7th of April 1506. His talents, and his devotion to study, induced his parents to send him, at the age of eighteen, to the college of St Barbe at Paris. It was while resident in that city that he made the acquaintance of the founder of the Jesuits, Ignatius Loyola. (See JESUITISM.) Xavier joined Loyola in Rome, and actively assisted him in his scheme of collecting a band of devoted men for the special service of the Church. Govea, a Portuguese envoy of King John III., at Rome, spoke in terms of high commendation to his royal master of the new society which had just sprung up under the care of Loyola. The king at once applied to the founder of the Jesuits for missionaries to go and christianize his distant Portuguese colonies in Asia. Francis Xavier and Simon Rodriquez were the men who were ultimately fixed upon to go to India. They set out from Rome on the 15th of March 1540, and, after a very tedious voyage, they reached Goa, the Portuguese seat of government in India, on the 6th of May 1542. Xavier set to work with singular devotedness to reform the character of the Christian community of the place, who were living almost as loose a life as the professed heathens. From the Christians his zeal extended to the heathen. After a short residence among the pearl-fishers of Cape Comorin and the island of Manar, he proceeded to the kingdom of Travancore. He tells us he there baptized 10,000 Indians in a single month! This was, in truth, quite miraculous; too much so, we fear, to gain for the statement universal credence at the present day. Xavier visited Malacca, the islands of Banda, and Ceylon, where he converted the King of Candy. After revisiting the scenes of his former labours in Goa and Malacca, he set sail for Japan, and reached Cangoxima on the 15th April 1549. He met with little encouragement at first in the Japanese empire, but proceeding to Miaco, their capital city, his Jesuitism stood him in good stead. At first the inhabitants slighted him for his mean attire and wayworn appearance; but returning a second time with a rich suit, and followed by gorgeous attendants, it is said that he baptized no fewer than 3000 persons in that city! Leaving other Jesuits to carry out the good work which he had begun, he returned again to Malacca, whence he set out on a voyage of exploration to the Chinese seas. Balked in his endeavours to effect a landing on the Chinese coast, he fell sick, and died on the 2d of December 1552. His body was removed to Goa, where it was deposited in the church of St Paul, on the 15th of March 1554. Francis Xavier was beatified by the pope in 1619, and canonized as a saint in 1622. His festival is observed by the Romish Church on the 3d of December of each year.

Xenocrates.

XENOCRATES, a celebrated ancient Grecian philosopher, was born at Chalcedon in the ninety-sixth Olympiad. At first he attached himself to Æschines, but afterwards became a disciple of Plato, who took much pains in cultivating his genius, which was naturally slow and heavy. His temper was gloomy, his aspect severe, and his manners little tinctured with urbanity. These material defects his master took great pains to correct, frequently advising him to sacrifice to the Graces; and the pupil was patient of instruction, and knew how to value the kindness of his preceptor. As long as Plato lived, Xenocrates was one of his most esteemed disciples; after his death, he closely adhered to his doctrine, and, in the second year of the 10th Olympiad, he took the chair in the academy, as the successor of Speusippus. Xenocrates was celebrated among the Athenians, not only for his wisdom, but likewise for his virtues. So eminent was his reputation for integrity, that when he was called upon to give evidence in a judicial transaction, in which an oath was usually required, the judges unanimously agreed that his simple asseveration should be taken, as a public testimony to his merit. Even Philip of Macedon found it impossible to corrupt him. The following are some of the stories told in Diogenes Laërtius and elsewhere regarding the simplicity and quaintness of the manners of Xenocrates. So abstemious was he with respect to food, that his provision was frequently spoiled before it was consumed. His chastity was invincible. Phryne, a celebrated Athenian courtesan, attempted without success to seduce him. Of his humanity the following incident is a sufficient proof. A sparrow, which was pursued by a hawk, flew into his bosom; he afforded it protection till its enemy was out of sight, and then let it go, saying that he would never betray a suppliant. He was fond of retirement, and was seldom seen in the city. He was discreet in the use of his time, and carefully allotted a certain portion of each day to its proper business. One of these he employed in silent meditation. He was an admirer of the mathematical sciences; and was so fully convinced of their utility, that when a young man, who was unacquainted with geometry and astronomy, desired admission into the academy, he refused his request, saying that he was not yet possessed of the handles of philosophy.

Xenocrates was eminent both for the purity of his morals and for his acquaintance with science, and supported the

Xenophanes ‖ Xenophon.

credit of the Platonic school by his lectures, his writings, and his conduct. He lived to the first year of the 116th Olympiad, or the eighty-second of his age, when he lost his life by accidentally falling, in the dark, into a reservoir of water.

XENOPHANES, the virtual founder of the Eleatic sect of philosophy among the Greeks, was born at Colophon, probably about the sixty-fifth Olympiad (B.C. 520). From some cause or other he left his country early, and took refuge in Sicily, where he supported himself by reciting, in the court of Hiero, elegiac and iambic verses, which he had written in reprehension of the theogonies of Hesiod and Homer. From Sicily he passed over into Magna Græcia, where he took up the profession of philosophy, and became a celebrated preceptor in the Pythagorean school. Indulging, however, a greater freedom of thought than was usual among the disciples of Pythagoras, he ventured to introduce new opinions of his own, and in many particulars to oppose the doctrines of Epimenides, Thales, and Pythagoras. Pythagoras maintained the doctrine of an absolute and infinite Unity, who was the producer of the universe. Xenophanes denied the possibility of such a production, and had little difficulty in demonstrating the tenability of his assertion. Creation being accordingly impossible, it follows that there is but one Being in the universe, self-existent and intelligent, but without personality and without responsibility. Hence pantheism of the purest kind. (See Aristotle, *Met.* i. c. 5, § 7; also PANTHEISM.) Xenophanes possessed the Pythagorean chair of philosophy about seventy years, and lived to the extreme age of 100 years, that is, according to Eusebius, till the eighty-first Olympiad. See the works of Karsten, of Ch. A. Brandis, and of Cousin, regarding the writings and life of this distinguished philosopher.

XENOPHON, an illustrious philosopher, commander, and historian, was the son of Gryllus, an Athenian, and is supposed to have been born in the fourth year of the eighty-third Olympiad, 445 B.C. When he was a youth, Socrates, struck with his personal appearance, determined to admit him into the number of his pupils. Meeting him by accident in a narrow passage, the philosopher put his staff across the path, and stopping him, asked where those things were to be purchased which are necessary to human life. Xenophon appearing at a loss for a reply to this unexpected salutation, Socrates proceeded to ask him where honest and good men were to be found. Xenophon still hesitating, Socrates said to him, "Follow me, and learn." From that time Xenophon became a disciple of Socrates, and made a rapid progress in that moral wisdom for which his master was so eminent. Xenophon accompanied Socrates in the Peloponnesian war, and fought courageously in defence of his country. He afterwards entered into the army of Cyrus as a volunteer in his expedition against his brother. This enterprise proving unfortunate, Xenophon, after the death of Cyrus, advised his fellow-soldiers to attempt a retreat into Greece. They listened to his advice; and having had many proofs of his wisdom as well as courage, they gave him the command of the army, after the death of their generals. In this command he acquired great glory by the prudence and firmness with which he conducted them back, through the midst of innumerable dangers, into their own country. The particulars of this memorable service are related by Xenophon himself in his *Anabasis*, frequently called the Retreat of the Ten Thousand. After his return into Greece, he joined Agesilaus, king of Sparta, and fought with him against the Thebans in the celebrated battle of Chæronea. The Athenians, displeased at this alliance, brought a public accusation against him for his former conduct in engaging in the service of Cyrus, and condemned him to exile. The Spartans upon this took Xenophon, as an injured man, under their protection, and provided him a comfortable retreat at Scillus. Here, with his wife and two children, he remained several years, and passed his time in the society of his friends, and in writing those historical works which have rendered his name immortal. A war at length arose between the Spartans and Eleans; and Xenophon was obliged to retire to Lepreum, where his sons had taken refuge. He afterwards removed, with his whole family, to Corinth, where he is supposed to have died, towards the age of ninety; but the chronology of his life is involved in obscurities from which it cannot easily be extricated.

Xenophon ‖ Xeres.

Of the works of Xenophon there are many editions. The *editio princeps* was printed by Junta, Florent. 1516, fol. An edition more correct, and containing some works omitted in the first, issued from the press of Aldus, Venet. 1525, fol. After several intervening impressions appeared that of H. Stephanus, 1561, fol. Another important edition, several times reprinted, was that of Leunclavius, Basil. 1569, fol. After a long interval, this was followed by the edition of Wells, Oxon. 1703, 5 tom. 8vo. The editor, who is not commended for his fidelity, has added Dodwell's *Chronologia Xenophontea*. This edition of Dr Wells was republished with considerable improvements by Thieme, Lipsiæ, 1763–64, 4 tom. 8vo. A valuable edition with a commentary was afterwards published by Weiske, Lips. 1798–1804, 6 tom. 8vo. We shall only mention another edition, that of J. G. Schneider, Lips. 1815, 6 tom. 8vo. A very useful accompaniment of any edition is Sturz's *Lexicon Xenophonteum*. Lips. 1801–4, 4 tom. 8vo. The materials had partly been collected by Thieme. Of several works of Xenophon there are many separate editions, some of them very elaborate. Several of them have likewise been translated into many different languages. Gail published *Œuvres complètes de Xénophon, traduites en Français, accompagnées du texte de la version Latine, et de notes critiques*. Paris, 1797–1804, 6 tom. 4to. A supplementary volume, in three parts, containing various appendages, was subsequently published. The French version is not entirely new. The translations of the *Cyropædia*, *Anabasis*, and *Memorabilia*, by Dacier, Larcher, and Levêque, have been adopted with some slight modifications. Some of Xenophon's works have been repeatedly translated into English; but we shall only specify the version of the *Cyropædia*, by the Hon. Maurice Ashley Cooper; of the *Anabasis*, by Edward Spelman; of the *Memorabilia*, by Sarah Fielding; of the *Symposium*, by Dr Wellwood; and of the *History*, by Dr Smith, dean of Chester. Bohn has recently published English translations of the *Anabasis* and *Memorabilia*, by Watson, and of the *Cyropædia* and *Hellenics*, by Watson and Dale.

XENOPHON, a native of Ephesus, is supposed to have written towards the close of the second century. His romance, *De Anthia et Habrocome Ephesiacorum Libri V.* was first edited by Cocchi, Lond. 1726, 4to. An Italian translation had previously been published by Salvini, Lond. 1723, 8vo. The original work appears in the collection of Mitscherlich, *Scriptores Erotici Græci*. Biponti, 1792–94, 3 tom. 8vo. It was about the same time edited by Polyzoes, Viennæ Aust. 1793, 8vo. A much better edition was soon afterwards published by Baron Locella, Vien. Aust. 1796, 4to. Another edition was published by Peerlkamp, Harlemi, 1818, 4to; and the last is by F. Passow, Leipsic, 1833. This romance of Xenophon the Ephesian has repeatedly been translated into French and German, as well as Italian; and an English version was published by Rooke, Lond. 1727, 8vo.

XERES, or JEREZ DE LA FRONTERA, a city of Spain, Andalucia, near the right bank of the Guadalete, 12 miles N.N.E. of Cadiz. It is situated in the lap of two rounded hillocks, which shelter it to the E. and the W.; and it covers a considerable extent of ground. The city, properly so called, is embraced by an old crenated Moorish wall, which, though enclosing a labyrinth of narrow, ill built, and worse drained streets, is of no great circuit, and is so intermixed with the suburbs as to be visible only here and there. The limits of the old town are however well defined by a number of antique gateways. Some of the buildings are of a unique kind of architecture. It has an old castle, eight churches, one of which is collegiate, and four hospitals. The environs afford abundant supplies of

Ximenes. corn, especially wheat, of oil, and of cattle. It was long celebrated for its breed of horses, reared by a well endowed convent of Carthusian monks, now robbed and deserted; but the chief produce is the white wine so generally known by the name of Sherry. This wine is collected by the merchants of the city from the neighbouring vineyards; but some of them are also wine-growers. The quantity annually produced is about 30,000 butts, of 108 gallons each. Of these, more than two-thirds are sent to England. There is always on hand a large stock of old wines, which are mixed with the new in such a proportion as to suit the various markets. The storehouses are above ground, and are vast piles of building, having lofty roofs supported on arches; their walls are pierced with numerous windows, and thus admit a free circulation of air. Some of these storehouses are so large as to be capable of containing 4000 butts. The oldest wines are kept in huge casks, little inferior to the celebrated tun of Heidelberg, and some of them have wine nominally 120 years old; but the quantity withdrawn is every year supplied from casks of a later growth; and when wine is mixed for shipping, a small portion of the oldest is mingled with the new. Much brandy is mixed with all the wine for exportation, and the merchants are commonly the distillers. Pop. 34,988.

XIMENES DE CISNEROS, Francisco, a celebrated cardinal, was born at Torrelaguna, in Old Castille, in 1437, and studied at Alcala and Salamanca. He then went to Rome; and being robbed on the road, brought nothing back but a bull for obtaining the first vacant prebend; but the Archbishop of Toledo refused to grant it, and threw him into prison. Being at length restored to liberty, he obtained a benefice in the diocese of Siguença, where Cardinal Gonzales de Mendoza, who was the bishop, made him his grand-vicar. Ximenes some time after entered among the Franciscans of Toledo; but being there troubled with visits, he retired to a solitude named Castanel, and applied himself to the study of divinity and the oriental tongues. At his return to Toledo, Queen Isabella of Castille chose him for her confessor, and in 1495 nominated him archbishop of Toledo, which, next to the papacy, is the richest dignity in the Church of Rome. His first care was to provide for the necessities of the poor; to visit the churches and hospitals; to purge his diocese of usurers and places of debauchery; to degrade corrupt judges, and place in their room persons whom he knew to be distinguished by their probity and disinterestedness. He erected a famous university at Alcala; and in 1499 founded the College of St Ildephonso. Three years afterwards he undertook the Polyglott Bible; and in order to carry on this great work, invited many learned men to Toledo, purchased seven copies of the Old Testament in Hebrew for 4000 crowns, and gave a great price for Latin and Greek manuscripts. The edition of the *Biblia Sacra Polyglotta*, &c., Compluti, 1514–7, 6 tom. fol., was begun in 1502, and although completed in 1517, was not published till 1522; the court of Rome having during that interval remained in suspense whether it ought not to be entirely suppressed. The cardinal himself was but a doubtful friend of sacred literature; for when it was proposed to translate the Bible into Spanish, in order to convert the Saracens, he opposed it on the ground that men might become Christians without reading the Bible. The Complutensian or Alcala Polyglott contains in the first four volumes the Hebrew, Greek, and Vulgate texts of the Old Testament in parallel columns; and the Chaldee paraphrase at the bottom of the page, with a Latin translation. The fifth volume contains the Greek text of the New Testament, with the Vulgate version. The last contains a Hebrew and Chaldee vocabulary, a Hebrew grammar, and a Greek dictionary. In this Polyglott appeared the first edition of the New Testament in Greek.

In 1507, Pope Julius II. gave Ximenes a cardinal's hat, and King Ferdinand the Catholic intrusted him with the administration of affairs. He was from this moment the soul of everything that passed in Spain. He distinguished himself at the beginning of his ministry by discharging the people from the burdensome tax called *acavale*, which had been continued on account of the war against Granada; and laboured with such zeal and success in the conversion of the Mohammedans, that he made 3000 converts, among whom was a prince of the blood of the kings of Granada. In 1509 Cardinal Ximenes extended the dominions of Ferdinand, by taking the city of Oran, in the kingdom of Algiers. He undertook this conquest at his own expense, and marched in person at the head of the Spanish army, clothed in his pontifical ornaments, and accompanied by a great number of ecclesiastics and monks. Some time after, foreseeing an extraordinary scarcity, he erected public granaries at Toledo, Alcala, and Torrelaguna, and had them filled with corn at his own expense; which gained the people's hearts to such a degree, that to preserve the memory of this noble action they had an eulogium upon it cut on marble, in the hall of the senate-house at Toledo, and in the market-place. King Ferdinand dying in 1516, left Cardinal Ximenes regent of his dominions; and the Archduke Charles, who was afterwards the emperor Charles V., confirmed that nomination. The cardinal immediately made a reform of the officers of the supreme council and of the court, and put a stop to the oppression of the grandees. He vindicated the rights of the people against the nobility; and as by the feudal constitution the military power was lodged in the hands of the nobles, and men of inferior condition were called into the field only as their vassals, a king with scanty revenues depended on them in all his operations. From this state Ximenes resolved to deliver the crown, and issued a proclamation, commanding every city in Castille to enrol a certain number of its burgesses, and teach them military discipline; he himself engaging to provide officers to command them at the public expense. This was vigorously opposed by the nobles; but by his intrepidity and superior address he carried his point. He then endeavoured to diminish the possessions of the nobility, by reclaiming all the crown-lands, and putting a stop to the pensions granted by the late King Ferdinand. This addition made to the revenues enabled him to discharge all the debts of Ferdinand, and to establish magazines of warlike stores. The nobles, alarmed at these repeated attacks, uttered loud complaints; but before they proceeded to extremities, appointed some grandees of the first rank to examine the powers in consequence of which he exercised acts of such high authority. Ximenes received them with cold civility; produced the testament of Ferdinand, by which he was appointed regent, together with the ratification of that deed by Charles. To both these they objected; and he endeavoured to establish their validity. As the conversation grew warm, he led them insensibly to a balcony, from which they had a view of a large body of troops under arms, and of a formidable train of artillery. "Behold,' says he, pointing to these, and raising his voice, "the powers which I have received from his Catholic Majesty: with these I govern Castille; and with these I will govern it, till the king, your master and mine, takes possession of his kingdom." A declaration so bold and haughty silenced them, and astonished their associates. At length, from the repeated entreaties of Ximenes, and the impatient murmurs of the Spanish ministry, Charles V. embarked and landed in Spain, accompanied by his favourites. Ximenes was advancing to the coast to meet him, but at Bos Equillos was seized with a violent disorder; and receiving a letter from the king, in which, after a few cold and formal expressions of regard, he was told he might retire to his diocese. Ximenes expired a few hours after reading it, on the 8th of November 1517, and in the 81st year of his age.

Ximenes

Y.

Y or y, the twenty-fifth letter of our alphabet. Its sound is formed by expressing the breath with a sudden expansion of the lips from that configuration by which we express the vowel *u*. At the beginning of words, it is commonly taken for a consonant, being placed before all vowels, as in *yard, yield, young*, &c., but before no consonant. At the end of words it is a vowel, and is substituted for the sound of *i*, as in *try, descry*, &c. In the middle of words it is not used so frequently as *i*, unless in words derived from the Greek, as in *chyle, empyreal*, &c., though it is admitted into the middle of some pure English words, as in *dying, flying*, &c. The Romans had no capital of this letter, but used the small one in the middle and last syllables of words, as in *coryambus, onyx, martyr*. Y is also a numeral, signifying 150, or, according to Baronius, 159; and with a dash over it, as $\bar{Y}$, it signified 150,000. (See ABBREVIATIONS.)

YAKUTSK, a town of Asiatic Russia, capital of an extensive territory of the same name in Eastern Siberia; in N. Lat. 62. 2., E. Long. 129. 43. It is situated on a plain, on the left bank of the Lena, which is here about 5 miles broad, and forms numerous islands; and is enclosed by mountains at the distance of 10 or 12 miles. Though a small place, and notwithstanding the severity of its climate, it carries on a great trade, and is the emporium of the furs collected in this extensive region as far as the coasts of the Frozen Ocean, Behrings Straits, and the Sea of Ochotsk, in exchange for which it receives European and Asiatic commodities. The cold is excessive in winter, the thermometer frequently falling as low as 56° below zero; while the heat in summer is sometimes not inferior to that of the torrid zone. Pop. (1856) 2823. The territory of Yakutsk extends northward from N. Lat. 54 to the Frozen Ocean, and from E. Long. 105. to 164. It has on the north the Frozen Ocean; south, Manchooria; west, the governments of Yeniseisk and Irkutsk; and east, Kamtschatka and the province of Ochotsk. Area, 1,071,374 square miles. Its principal rivers are the Olonek, Lena, Indigirda, and Kolyma. In some parts rye, barley, and other grains are raised, and large herds of cattle, horses, and sheep are reared; but the great part of the territory is a barren desert. Wild animals and game of various kinds abound, and fish are plentiful in the rivers. The chief mineral products are iron, salt, and excellent talc. Coal is said to exist in some parts on the Upper Lena. Pop. (1856) 214,208.

YANG-TSE-KIANG, or BLUE RIVER, one of the largest in the world, watering the north-east part of Tibet and the centre of China. It rises by three branches on the southern slope of the Kuen Lun Mountains in the north-east of Tibet. Below the confluence the united stream is known by the name of Murui Ussu or Murus Ussu, signifying the winding river; and it flows in a very irregular course towards the south-east, until a branch of the Bayan Khara Mountains, on the east, forces it to flow almost due south. It crosses the Chinese frontier a short distance above Batang, and here takes the name of Kin-cha-kiang, or river of golden sands. Further down, about 28° N. lat., it escapes from the mountains, and turns to the east; and, after receiving from the north the Ya-long-kiang, takes the name of Yang-tse-kiang, although for a part of its course below this it is often called simply Kiang, the river, or Ta-kiang, the great river. Shortly below its confluence with the Ya-long-kiang it turns to the north, and after flowing for some distance in that direction, bends again to the east; and flowing through the centre of China, with great sinuosities and irregularities, at length falls into the Pacific below Nankin. Besides the Ya-long-kiang, it receives from the north the Minkiang, Kialing, and Hankiang; and from the south, the Ninkiang, Hengkiang, and Kiakiang. Its whole length is estimated at 2500 miles; and the area of its basin at 700,000 square miles. The tide reaches 115 miles up the river, and it is navigable as far as Nankin, 225 miles from the sea. The upper parts of this river are very imperfectly known. Its mouth forms a large estuary with several low islands at its entrance.

YANINA. See ALBANIA.

YARD OF A SHIP, a long piece of timber suspended upon the masts, to extend the sails to the wind.

YARKAND, or YARKIANG, the capital of Chinese Turkestan, in a fertile plain on the river of the same name, 140 miles S.E. of Kashgar; N. Lat. 38. 19.; E. Long. 76. 7. It is enclosed by earthen walls, about 2 miles in circuit, and entered by five gates; but outside the walls there are extensive suburbs. The town is supplied with water from the river by numerous canals and aqueducts, which intersect it in different directions. The houses are for the most part meanly built of stone and clay, and are only one story in height. The principal buildings are two large bazaars, numerous caravansaries and mosques, and ten or twelve large Mohammedan colleges. Yarkand is the residence of a Chinese governor, a large number of merchants from that country, and others from Persia and India. A very important trade is carried on, as Yarkand is now the chief centre of the traffic between the Chinese empire and the countries to the west of it. This commerce is chiefly carried on by traders from independent Turkestan, as the Chinese authorities do not allow the people of this province to leave it, nor Europeans to enter. European goods, slaves, and horses from the Kirghiz steppes are brought here, in exchange for tea, silk, fruits, shawl-wool, and other Chinese goods. According to Chinese accounts the annual amount of customs paid here is about L.10,200, and the city pays annually to the government 35,400 sacks of corn, 57,569 pieces of linen, and 15,000 lbs. of copper. The inhabitants are principally Turks or Uzbeks, and profess the Mohammedan religion; but there is here, besides a large number of foreign merchants, a Chinese garrison of about 7000 men, located in a fort in the suburbs. Yarkand is the principal military post in the west of the Chinese empire. Pop., including the garrison, stated at 200,000.

YARMOUTH, a municipal and parliamentary borough and seaport town of England, county of Norfolk, 19 miles E. of Norwich, with which it is connected by railway, and 124 miles from London. The old town, or Great Yarmouth, is situated on the eastern bank of the Yare, and is connected with the new town, called Little Yarmouth, by means of a bridge over that river. The old town, which is still surrounded by walls, consists of four principal lines of streets running nearly parallel with the river, and of about 150 narrow lanes called rows, which are impassable for wheel-carriages, except a few that have been recently widened. The principal streets are well built and wide, opening in some places to the spacious quay, market-places, and squares. The best dwelling-houses are situated along the quay, which is considered one of the finest in the kingdom, being upwards of a mile in length, and having in the centre a noble promenade, planted on each side with trees. The part of the town beyond the walls consists of extensive warehouse premises and inferior dwelling-houses. The new town principally consists of substantial private residences; and the space between them and the river is occupied by docks, timber-wharves, building-yards, and other premises connected with the

Yaroslav ‖ Yarrel.

trade of the port. The streets are well lighted with gas, and well supplied with water. Among the principal public buildings are the town-hall, a handsome edifice, with a Tuscan portico; the church of St Nicholas, a large cruciform building, with four octagonal towers at the W. end, and a tower and spire 168 feet high, in the centre. There are two other churches, and a number of dissenting chapels, a Jewish synagogue, grammar school, custom-house, jail, house of correction, hospital, theatre, and barracks. The river Bure is here crossed by a suspension bridge; and in the vicinity of the town is a fluted column, 144 feet high, in memory of Nelson. There is an extensive manufactory for crapes and other silk goods, which is said to be in a thriving condition, and which gives employment to about 500 persons, principally women. Shipbuilding, and the various trades connected with it, are also carried on to some extent in Yarmouth; nevertheless, it cannot be considered as a manufacturing town, but derives its importance and prosperity from the trade and commerce which it owes to its situation and port. The rivers Yare, Waveney, and Bure, which unite in Braydon Water, contiguous to the town, are navigable; the first to Norwich, the second to Bungay, and the third to Aylsham; and secure to Yarmouth an extensive inland trade in the exportation of the agricultural produce of the districts that are traversed by these rivers, and in supplying them with coals and other heavy goods. The exportation of grain and malt from this port is considerable; but the principal business of Yarmouth is the herring and mackerel fisheries, and the curing and exportation of this staple commodity to foreign countries, particularly to the states bordering the Mediterranean. It is the principal seat of the English herring-fishery, and is famous for its "bloaters." An extensive timber-trade with the Baltic is also carried on. Yarmouth Roads, between the coast and a line of outer sandbanks marked by buoys and floating lights, have long been the principal rendezvous for the collier-trade; and the town derives some advantages from the supply of fresh provisions to the numerous shipping employed in this trade. The harbour of Yarmouth, formed by the river Yare, has an awkward entrance, which, as is always the case in harbours of this description, is obstructed by a bar. Great attention, however, is bestowed on the remedying of these defects, and on the general improvement of the port. Vessels drawing about twelve feet of water, or of about 200 tons burden, can cross the bar, and proceed to the town at spring-tides. Yarmouth has two weekly markets, on Wednesday and Saturday; the latter is much frequented. The town is divided into six wards, and is governed by a mayor, twelve aldermen, and thirty-six councillors. It returns two members to the House of Commons. On 31st December 1858, 631 sailing-vessels, having in all 38,425 tons, and 10 steam-vessels, having 687 tons, were registered as belonging to the port. During that year 1709 sailing-vessels, having 128,000 tons, and 241 steam-vessels, having 44,371 tons, entered, and 533 sailing-vessels, with 32,923 tons, and 242 steam-vessels, having 44,497 tons, left the port in the coasting trade; while 246 vessels, with 27,610 tons, entered, and 104, with 10,944 tons, left in the colonial and foreign trade. Pop. (1851) 30,879.

YAROSLAV. See JAROSLAV.

YARRELL, WILLIAM, one of the most popular of modern naturalists, was born at Westminster in 1784. His father was a newspaper agent, and he himself succeeded to the business on his father's death, and prosecuted it till within a few years of his own. Like many others of those confined to town by their profession, he availed himself of any interval of relaxation to enjoy such sport as the neighbourhood of London afforded; and had the reputation of being the best shot and the first angler in the metropolis. Wisely he did not confine himself to the mere pleasure of sport, but examined with care the trophies of his skill, and soon became an expert naturalist, his knowledge being derived from the best of all sources, the actual study of nature. In 1824 he became a fellow of the Linnæan Society, and was a diligent contributor to their *Transactions*, which contain many of his papers, especially on questions of ornithological interest. He was one of the earliest members of the Zoological Society, and always took a lively interest in the gardens which the society established in Regent's Park. His contributions to their proceedings are said to evince a skill in dissection rarely attained by one who is not a practical anatomist. Among other discoveries for which the naturalist is indebted to Mr Yarrell is the interesting one that whitebait is a distinct species of fish, and not the young of some other species, as was so long believed. The greater part of his leisure towards the end of his life was devoted to his two great works, *The History of British Fishes*, 2 vols., 1836; and *The History of British Birds*, 2 vols., 1843. These works are compiled on the same plan; they contain accurate figures, with accompanying descriptions, of every known variety of British fish or bird; and they have from the first taken their position as the standard authorities on the subject in our language. Few books on natural history are more agreeable to the general reader; the style is ever pleasant, and the truth with which he describes the habits of the birds is such as might have been expected from the keen sportsman who had so often watched their motions when at liberty in their native haunts. In 1856 he had an attack of paralysis, of which he died at Yarmouth in September of the same year.

Yarrow ‖ Yeniseisk.

YARROW. See SELKIRKSHIRE.

YASSY. See JASSY.

YEAST. See BREWING.

YEDDO. See JEDDO.

YELL. See SHETLAND.

YELLOW RIVER, or HOANG-HO, a large river of the Chinese empire, rises in the Kuen Lun Mountains, not far from the Yang-tse-kiang, in the Koko Nor country. It flows at first N.E., across the Chinese province of Kansu, and enters Mongolia, in which country it continues its N.E. course, till past 41° N. Lat. It then re-enters China, and bends to the S., in which direction it flows for a long distance. About 35° N. Lat. it takes an abrupt turn, and for the remainder of its course flows eastward, falling into the Yellow Sea about 150 miles N. of the Yang-tse-kiang. Most of its affluents are of small size; the chief of them being, from the left, the Huang-tshu and the Fen-ho, and from the right the Wei-ho and the Hoey-ho. Its whole length is estimated at not less than 2000 miles, and it drains an area of more than 700,000 square miles.

YELLOW SEA, a large inlet of the Pacific Ocean, on the N.E. of China, between N. Lat. 32. and 40., E. Long. 120. and 127. It is bounded by the peninsula of Corea on the east, and the Chinese provinces of Kiang-su and Shan-tung on the west, and in the north-west it opens into the two gulfs of Chi-li and Leao-Zong, the latter of which is separated from the Yellow Sea by a peninsula called the Regent's Sword. It receives the Hoang-ho and most of the rivers of Corea.

YEMEN. See ARABIA.

YENISEISK, a town of Asiatic Russia, formerly the capital, and still the largest town of the government of the same name, stands in a fertile plain on the left bank of the Yenisei, 180 miles N.N.W. of Krasnoiarsk. It is an ancient place, and is enclosed by a rampart. It has four churches and two convents, and is a place of considerable trade, especially in furs. A market is held here annually in August, which lasts for more than three weeks, and is fre-

Yeovil ‖ Yonne.

quented by merchants from all parts of Siberia. Pop. (1856) 5119.

The government, which lies between N. Lat. 51. and 78. E. Long. 80. and 107., is bounded on the N. by the Frozen Ocean, E. by Yakutsk and Irkutsk, S. by the Chinese empire, and W. by Tomsk and Tobolsk. Its length from north to south is about 1800 miles, its breadth about 800, and its area 971,295 square miles. This vast region has a gradual slope from the Altai Mountains, which form its boundary on the south to the ocean, into which the north part of the government projects, forming the extreme northern point of the Asiatic continent. It belongs entirely to the basin of the Yenisei, from which it takes its name. This river is formed by numerous streams from the Altai Mountains in the north of Mongolia. After entering the Russian dominions, it flows northwards with many bendings and deviations, and enters the Arctic Ocean by a long estuary, after a course estimated at 2300 miles. Its principal affluents are the Angara, which issues from Lake Baikal, and the Tunguska, both from the right. The basin of this river, which lies between that of the Lena on the east and that of the Obi on the west, is estimated to have an area of 1,000,000 square miles. Besides the Yenisei, the only rivers deserving notice in the government are the Piasina and the Chatanga in the north-east. Except in the less elevated parts of the south of the country, no cultivation can be carried on; and even in these districts, though agriculture flourishes to some extent, the chief wealth of the land consists in cattle. Iron and salt are the most important minerals, and the former is worked in some places. In the north the scanty population live chiefly by hunting and fishing. Besides the native tribes, there are some Russians in the government, the most of whom are convicts banished to Siberia. The capital is Krasnoiarsk. Pop. (1856) 271,500.

YEOVIL, a market-town of England, Somersetshire, on the left bank of the Ivel or Yeo, an affluent of the Parret, here crossed by a stone bridge, 36 miles S.S.W. of Bath, and 123 from London. The town is rather irregularly laid out, and comprises a great number of streets and lanes, but the houses are generally good, and many of them are of a superior description. The parish church is a handsome Gothic structure with a large plain tower at the west end. There are also a chapel of ease, and several dissenting places of worship, a neat town-hall, a grammar and other schools, and several alms-houses. Yeovil was at one period celebrated for its woollen manufactures, but these have been superseded by the making of leather gloves, which now forms the chief occupation of the inhabitants. Pop. (1851) 7751.

YESSO. See JAPAN.

YEZD, a city of Persia, capital of a district of the same name in the province of Khorasan, 245 miles E. of Ispahan. It stands on a large sandy plain, mostly surrounded by hills, in the south-west corner of the province. The surrounding desert has no streams; but in spite of the great scarcity of water, Yezd yields fruits of the best flavour, a good deal of silk, and as much corn as would last its inhabitants for about forty days. The rest is imported from Ispahan. The city is large, and consists of two parts, one of which, the old town, is fortified. It owes its prosperity to its situation, being a convenient resting-place for caravans from India and Afghanistan on the one hand, and western Persia on the other. The silk stuffs manufactured at Yezd are very famous; as also are the felts of Taft, a village close by. Near it are some remarkable caverns or excavations in a hill, which are called the "Prison of Alexander." The population has been estimated at 50,000, among whom are 3000 families of fire-worshippers.

YONNE, a department in the N.E. of France, lying between N. Lat. 47. 20. and 48. 24., E. Long. 2. 47. and 4. 20., bounded on the N. by the departments of Seine-et-Marne and Aube, E. by that of Côte d'Or, S. by that of Nièvre, and W. by that of Loiret. Length, from N.W. to S.E., 82 miles; breadth, 53; area, 2868 square miles. The face of the country is undulating, consisting of valleys extending between hills of moderate height. The greatest elevation is in the south-west, where the department is traversed by the low range of hills that separate the basin of the Seine on the north-east from that of the Loire on the south-west. These hills are here of very inconsiderable height, and form part of the chain which, farther to the south-east, is known by the names of the hills of Morvar and of Nivernais. With the exception of a small portion in the extreme south-west watered by the Veille, an affluent of the Loire, the whole department belongs to the basin of the Seine; and the principal river is that from which it takes its name. The Yonne rises at the foot of Mont Beuvray, one of the Morvan hills, in Nièvre, and flows north-west as far as Clamecy, near the borders of Yonne. It there turns to the north, and with many windings traverses the centre of the department generally in that direction. It leaves the department near Villeneuve, and enters that of Seine-et-Marne, where it joins the Seine at Montereau. Its whole length is 150 miles; and it is navigable as far as Auxerre, 64 miles above its confluence with the Seine. Its principal affluents in this department are, from the right, the Cure, Serein, Armançon, and Vannes; and from the left, the Tholon. The Loing, an affluent of the Seine, has its source and a small part of its course in Yonne. The geological structure of the country is for the most part oolitic and calcareous, except towards the south-east, where some granite occurs. The soil is on the whole fertile. In the south and east, it is somewhat stony; and in the west, it consists chiefly of clay, which is much covered with wood, and has many marshes and pools; but in the north there is a great deal of fine rich loam. The climate is mild, and the air pure and healthy, except in some of the marshy tracts. The chief occupation is agriculture; and the corn grown is more than sufficient to supply the wants of the inhabitants, so that much is exported, especially for the supply of Paris. In the east and south, the cultivation of the vine is the most profitable employment; and much excellent wine is made, especially in the districts adjoining Côte d'Or. The wines are those known as Lower Burgundy; and upwards of 19,000,000 gallons are made annually, of which a large part is exported. The extent of arable land in the department is 1,125,000 acres; of forests, 362,500 acres; of vineyards, 95,000 acres; and of meadows and pastures, 80,000 acres. Besides corn and wine, various kinds of vegetables, hemp, and flax, &c., are raised here. Fruit-trees are very abundant, and yield good crops, and chestnuts are exported. Notwithstanding the excellence of the pastures, comparatively little attention is paid to grazing; and the horses and cattle are of inferior breeds. The mineral riches of the country are not very great; but there are some iron mines and stone quarries, and potters' clay is also obtained here. The principal branches of industry are the working of the mines and quarries, the making of bricks and tiles, glass, pottery, beet-root sugar, coarse woollen cloth, and leather. A considerable trade is carried on, chiefly in the exportation of the produce of the country, including corn, wine, vinegar, wood, charcoal, cattle, wool, and iron. The internal means of communication are numerous. Besides many roads, the department is traversed by the railway from Paris to Lyons, which has a branch to Auxerre. The canal of Burgundy, which connects the Seine with the Rhone, lies partly in this department. This great work, which was projected by Henry IV., but not begun till 1775, joins the Yonne at its confluence with the Armançon, extends along the latter river, crosses the Côte d'Or Mountains, and joins the Saône in the de-

Yonne.

 partment of Côte d'Or. Its whole length is about 185 miles, of which 57 are in this department; and its total descent is 1070 feet, accomplished by 115 locks. A considerable part of the canal of Nivernais, which begins at Auxerre, on the Yonne, and extending southwards to the Loire, is in the department. Yonne forms the see of the archbishop of Sens; and contains 5 courts of law, 6 colleges, a normal seminary, 5 upper and 509 elementary schools. The capital is Auxerre; and the department is divided into 5 arrondissements, as follows:—

Arrondissements.	Cantons.	Communes.	Pop. (1856.)
Auxerre	12	131	117,896
Avallon	5	71	44,959
Joigny	9	108	97,267
Sens	5	90	65,689
Tonnerre	5	82	43,090
Total	36	482	368,901

YORK, the second city of the kingdom in respect of rank, the capital of Yorkshire, and the seat of an archbishopric, is situated upon the river Ouse (which is navigable for small vessels), and contained according to the last census 36,303 inhabitants. Before the invasion of the Romans it formed one of the chief cities of the Brigantes, the most powerful of British tribes; and it is supposed that on their subjugation by Agricola, he founded here about the year 79 the Roman city of Eboracum, which became the great "Colonia" of the Romans in Britain, the seat of imperial government, and the "Altera Roma."

During the Roman sway in Britain, many important events happened in this city, where Hadrian and Severus resided, and where the latter died; also where Constantius Chlorus died, and where, it is highly probable, his celebrated son Constantine the Great was born. From the remains which have been found, it is evident that under the Romans the city was a place of great grandeur and considerable extent. On the departure of the Roman cohorts, about 409, it became a prey to the wars which prevailed between the Picts and the Britons, and between the latter and the Saxons; and also to the invasions of the Danes; but under these vicissitudes it still maintained its distinction as one of the chief cities of the kingdom. Even soon after the Conquest, when it suffered so much, it still continued a place of considerable extent and population, as is evident from Domesday Book. From that time it has ever held a proud position in English history, as the residence of kings, the seat of parliament, and the centre of civilisation in the north of England. In early ages William of Malmesbury relates in glowing language the extent of its shipping and commerce, but from some cause it is clear the navigation of the Ouse has since much deteriorated. Now only craft of 80 or 100 tons burthen can come up to the city.

York is a corporation by prescription, but its first charter dates back to the reign of Henry II., who granted important privileges to it. Under the Municipal Reform Act it is divided into six wards, and is governed by a mayor, recorder, 12 aldermen, and 36 councilmen. The mayor has, like that of the city of London, the title of lord mayor, which was conferred by Richard II. From the time of Henry III. York has returned two members to parliament. The walls are about three miles in circumference: that is the outline, for in many places they have totally disappeared. Such parts of them as remain were repaired a few years since, and form an agreeable promenade. From the surrounding country the city has an imposing appearance, and of late great improvements have been effected in its internal appearance. A great number of old houses, some of them of timber and very picturesque, have been demolished and replaced by handsome buildings. The narrow streets, also, in many places have been widened, and in others new ones formed. One especially in the centre of the city, Parliament Street, is of considerable length, wide, well paved, and surrounded by good shops. The city is full of public buildings, some of great architectural merit. The mansion-house, erected in 1726, is a fine and capacious structure, situated in St Helen's Square. Behind it stands the Guildhall, a noble gothic hall of the fifteenth century. Handsome and commodious assize-courts were built, along with the prison, on the site of the ancient castle of York, of which little remains except the dilapidated but still majestic Clifford's Tower. The assembly and concert rooms in Blake Street are convenient and capacious structures. The theatre was first erected in 1769, by Tate Wilkinson, and much enlarged and improved in 1822. York can boast of an excellent museum, erected by the Yorkshire Philosophical Society, which contains a most valuable collection in natural history and antiquities, especially of local objects. There is likewise an excellent subscription library, well stocked with books. There are also many charitable institutions in and about the city; for instance, the County Lunatic Asylum, also the Retreat for lunatics founded by the Quakers in 1796; the County Hospital, endowed by Lady Hastings in 1749, besides many hospitals for poor persons.

York Minster is unquestionably the finest Gothic pile in the world, and is alike the boast and pride of England as well as Yorkshire. It was originally founded in 626 by Edwin, king of Northumbria, soon after his conversion by Paulinus, the first archbishop of the see of York. The present edifice was, however, built in the thirteenth and fourteenth centuries. In 1291 John le Romaine, then archbishop, laid the foundation of the present nave, which was completed by Archbishop Melton about forty years afterwards, who also erected the west front and two west towers. In 1361 the celebrated Archbishop Thoresby rebuilt the choir, and in 1370 the central tower was taken down and soon afterwards rebuilt. The whole length of the building (internally) is 524 feet; length of nave, 264 feet; breadth, 109 feet; length of choir, 131 feet; height of nave and choir, 99 feet; length of transept, 222 feet; height of great tower, 234 feet; height of west towers, 196 feet. A gorgeous stone screen of beautiful workmanship separates the choir from the nave, which, on the side facing the nave, is divided into fifteen compartments, in which are placed, under elaborate ornamented canopies, statues of the kings of England, from the Conqueror to Henry VI. The minster is the longest of any cathedral in England except Winchester, but beyond that particular the latter cannot vie with the former. The west front, divided into three compartments, is highly embellished with statues and ornamental devices, and has been compared to the west front of the famous cathedral of Rheims. The western towers are of a light and graceful style, and agree in tone with the front, whilst they contrast with the massive square central tower. Although the north and south sides are much plainer than the rest of the edifice, yet their very simplicity gives them a noble and imposing appearance. They are supported by buttresses, surmounted by pinnacles, and have a delicately pierced parapet. Like the west end, the east is also divided into three compartments; in the middle one is a magnificent window of painted glass. Passing to the interior, the nave is separated from the side-aisles by a range of finely clustered columns, over which is a clere story of great beauty. The choir is fitted on the west and sides with prebendal stalls of elaborately carved oak, with canopies of tabernacle work. At the east end stands the archbishop's throne and the pulpit.

Few cathedrals have suffered so much from fire. In 1069 it was burnt down, and again in 1137, when it re-

Yorkshire. mained for many years in ruins. On the 2d of February 1829, it was set on fire by Jonathan Martin, a lunatic, and the whole of the wood-work and roof of the choir were burnt. Through the negligence of a workman employed in repairing the clock, another fire broke out on the 20th May 1840, in one of the west towers, whereby the roof of the nave and a fine peal of ten bells were destroyed. On these two last conflagrations the gentry of the county subscribed most liberally towards renovating the fabric, and the late Earl of Scarborough presented a splendid organ. Since the days of Paulinus, the first archbishop, there have been eighty-five archbishops.

York, like Norwich, is filled with parish churches. At the Reformation there were forty-one parishes, and now there are twenty-two consolidated out of the former, but the livings are, with an exception or two, of small value. Many of the churches are in a most dilapidated state, but some of them are large and elegant, with lofty towers and spires. The Roman Catholics and dissenters have several chapels in York, and the former have also a nunnery.

The trade of York has for many years been very inconsiderable. There is a small manufacture of linen, and also of glass, carpets, gloves, and combs. It is, however, a large market for corn, wool, and cattle; and since the increase of railway accommodation, the trade of the place has considerably improved. But the principal source of wealth in York arises from the great number of provincial gentry who take up their abode there on account of the salubrity of the situation, and for the benefits of society, also from the number of clergymen connected with the cathedral and other churches, and gentlemen engaged in the law, who reside at York in large numbers. (J. J.)

YORKSHIRE, the largest county in Britain, is bounded on the N. by the county of Durham, on the E. by the German Ocean, on the S. by the Humber and the counties of Lincoln, Nottingham, and Derby, on the W. by Cheshire, Lancashire, and Westmorland. It is divided into three divisions, the West, North, and East Ridings, which have existed since the days of the Saxons. Each has its own civil and military jurisdiction, and each its own lord lieutenant and public buildings. Those connected with the West Riding, consisting of clerk of the peace's office, registration of deeds' office, and house of correction, are situated at Wakefield, which may be said, for all purposes except those of the assizes, to be its county town; those of the North Riding are at Northallerton, those of the East Riding at Beverley. Formerly there was also a separate district called the City of York and Ainsty; but the Ainsty has been united by act of parliament with the Riding; York still retains its own independent jurisdiction as before. The whole county contains 5983 square miles, or 3,829,286 statute acres, with a population according to the last census of 1,797,995 persons, thus distributed:—West Riding, 1,708,026 acres, and 1,325,495 inhabitants, of whom 659,619 were males, and 665,876 females; North Riding, 1,350,121 acres, and 215,214 inhabitants, of whom 106,710 were males, and 108,504 females; East Riding, 768,419 acres, and 220,983 inhabitants, of whom 109,443 were males, and 111,540 females; and the City of York, 2720 acres, and 36,303 inhabitants, of whom 16,977 were males, and 19,326 females. Since the year 1801, so great has been the increase of manufactures, that in fifty years, the population of the West Riding had nearly trebled itself, and within the last nine years the increase has been very great.

With the general history of England, that of Yorkshire is so intimately blended, that it would be superfluous to enter more into the subject than to give a few of the more salient points. Before the time of the Roman invasion, the whole of this county formed part of the territory of the Brigantes, the most powerful of the British tribes, whose dominions extended from the Humber to the Tweed. On their final subjugation by Agricola about the year 71, we learn from his son-in-law, Tacitus, that he civilized them, taught them the arts of peace, and they, in the end, became intermingled with the Romans and formed with them one people. On the withdrawal of the Roman legions from these northern parts, about the year 409, so effeminate had their sons become, that they fell an easy prey, first to the Picts, and then to the Saxons. Under the rule of the latter, almost all the vestiges of this tribe as a distinct race were lost; the language was changed, the villages received Saxon names, and little remained as landmarks of the former possessors, except the names of the rivers, mountains, and remarkable natural objects, which, to this day, retain their ancient British names. The Saxons at first called what is now Yorkshire, Deira, the country of Deer. Afterwards, they gave it the name of Eurewicscire, and the city of York, Eurewic, evidently pointing to the root of the Eure, or Ure, which, with its continuation, the Ouse (a more modern name), is the most considerable river in Yorkshire. The Saxons fought bravely against the Conqueror, but were finally subjugated, and in revenge he ravaged the country in a frightful manner: for we find in *Domesday Book*, that the greater part, before fruitful, was recorded as waste. After this period, the events of Yorkshire are especially those of the general history of the kingdom, and it is impossible for us to enumerate more of them than that the memorable Battle of the Standard, the great conflict between the Scots and the English, took place on Cowton Moor, near Northallerton, in the reign of Stephen; that the Pharsalia of England, the Battle of Towton-field, between the rival Roses, was fought near Tadcaster on Palm Sunday, 1461, when 40,000 Lancasterians were slain, and the fate of the House of Lancaster decided; and lastly, the Battle of Marston Moor, near York, where Prince Rupert and his army fled before the Ironsides of Cromwell, and the liberties of England were sealed. Since then, in parliamentary reform, in every act tending to promote the freedom and welfare of the nation, and in all the social arts, this county has ever been in the van. Yorkshire.

It has been justly observed, that Yorkshire is an epitome of the whole kingdom, so varied is its surface, its climate, soil, productions, and even the manners and language of its inhabitants. The lands of Yorkshire rise in masses towards the west, where they form a portion of what has been called the English Penine chain of mountains, extending from Scotland to Derbyshire. It seems as if by some great convulsion of nature these highlands of Yorkshire had been uplifted, so that the strata, thrown out of the horizontal position, incline to the east, or south-east; and the rocks are as a rule inclined in that direction.

The West Riding may be divided into three grand districts, distinguished by peculiar features. *First*, The elevated lands of Craven and Dent, where the mountains of Whernside, Ingleborough, and Penyghent, rear their lofty heads. These mountains are composed of a basis of limestone, surmounted by a series of shales, limestones, and sandstone, interspersed with thin seams of coal. The prevalent character of this division is the limestone formation, and, towards the east, low-copped hills covered with excellent herbage. The district is bare in wood; it is watered by three rivers, the Aire, Wharfe, and Ribble, the two former running east to the Humber, the latter west into the Irish Sea. *Second*, The shelving land, reaching from about Bradford and Halifax to Doncaster. The character of this middle portion of the West Riding is varied, combining alternate hill and valley, intermingled with woods, the country inclining with gentle undulations to the east. The characteristic features of the *third division* is the low land forming part of the Vale of York, of rich quality, and the marshy country about Thorne and Snaith, watered by the sluggish Don and Ouse. For the greater

Yorkshire. portion of its length, the West Riding is traversed by three valleys running parallel to each other from west to east, namely, the Vales of Calder, Aire, and Wharfe, which for richness of soil and beauty of scenery have few superiors.

The North Riding is undoubtedly the most beautiful and picturesque part of the county, and a large portion of its land cannot be surpassed either for grazing or arable purposes. The general aspect of the Riding towards the west is similar to that of Craven, and presents confused masses of mountains, interspersed with secluded valleys, only the lower hills are not copped like those of Craven, but of sharper outline, for the limestone formation here has a tendency to form perpendicular "scars." The landscape, especially in Wensleydale, the Piedmont of Yorkshire, is in the lower parts rich and well wooded, whilst lofty Penhill, whose sides are fringed with hanging woods, and the sweetest of villages, rears his mighty head in the foreground. From the base of Penhill, the land stretches with gentle slope to the rich vale of Mowbray. Standing on the turrets of Richmond or Middleham Castle, the views over this tract are most extensive, and have been often praised. This wide-spreading vale, or rather champaign, is not excelled even by the far-famed Vale of Exeter, either in beauty or fertility. To the east of the Vale of Mowbray (comprising what in recent times are known as the Vales of Cleveland and York) rise the Hamilton Hills, which intersect the Riding as it were in two halves. These hills are of much lower elevation than the western ones, but still they rise to a considerable height. Behind them lies the elevated country of Cleveland, much broken in its surface; and also, to the east, a vast expanse of moorland, such as Blackmore. But on the eastern slope of these moorlands are charming little valleys of great fertility, such as Ryedale, where stands, secluded in woods, the far-famed Rievaulx Abbey. Beyond these moors lies the Vale of Pickering, where again the country opens out. Towards the River Derwent the lands become flat and marshy.

The East Riding may be divided into two tracts very dissimilar. The first consists of the Wolds, a series of hills of chalk. Until of late years, the greater part consisted of comparatively unproductive sheep-walks; but now they are mostly arable, sheltered by wood judiciously planted, and enriched by tillage, and have become a great corn-growing district. The other great tract of land is constituted of the level and marshy district running eastward from the Wolds, and forming the neck of alluvial land called Holderness; and another district named the Levels, extending from the west of the Wolds to the West Riding levels, of which, it in truth, forms a part.

Yorkshire is a county abounding in majestic, picturesque, and beautiful scenery, which is not sufficiently known to even the English tourist. The valleys of North Yorkshire, Wensleydale, and Teesdale especially, are rich in natural marvels. High Force, in the upper part of Teesdale, is considered the largest waterfall in South Britain, being 69 feet in perpendicular height, over which, at one bound, the Tees, then a considerable river, rushes, amidst high and beetling cliffs. Aysgarth Force, in Wensleydale, forms, when the river Ure is flushed with floods, a sublime spectacle, surpassing, according to the testimony of the celebrated traveller, Dr Pococke, the cataracts of the Nile. Indeed, the upper portions of these two valleys are filled with waterfalls, rapids, and romantic scenery. In the eastern valleys of the North Riding—for instance, Ryedale—many lovely and interesting landscapes are to be found. Nor is the West Riding deficient in beautiful and romantic scenes. Witness the upper part of Wharfedale, in the neighbourhood of Bolton Abbey; nor in the terrible and sublime, as those can testify who have visited Kilnsey Crag, a huge overhanging rock 165 feet high, jutting out abruptly from the side of the valley of Wharfe; also Gordale Scar, a terrific chasm in the rock, and its companion, Malham Cove, a noble amphitheatre of rocks rising perpendicularly 286 feet at the head of Airedale. The caves of Clapham and Ingleton also demand the attention of the tourist as remarkable caverns (the former filled with stalactites), which, in Craven as in Derbyshire, are mostly found in the limestone mountains. In short, it may fearlessly be stated that three of the northern valleys of Yorkshire, Wharfedale, Wensleydale, and Teesdale, cannot be surpassed, whether we consider the beauty and softness of features in some parts, or the sublimity and picturesque appearance of others. There are three small lakes in this county, viz., Semer Water, at the upper end of Wensleydale; Malham Tarn, at the head of Airedale; and Hornsea Mere, in the East Riding. Yorkshire.

As before stated, the highest mountains in Yorkshire form part of the Penine chain, viz.:—Mickle Fell, in the north-west angle of Yorkshire, rising to the height of 2600 feet, according to the observations of Professor Phillips; Whernside and Ingleborough, both near Ingleton, the former 2384 feet, and the latter 2361 feet high, according to the Ordnance Survey.

Owing to the general aspect of the country, shelving from west to east, most of the Yorkshire rivers rise in the Penine chain, and run in an eastern direction. If we represent the quantity of water arising from springs and surface-water at 100, then about 80 parts of it run to the Humber, 13 parts direct to the German Ocean, and 7 parts into the Irish Sea. The average annual fall of rain on the whole area of Yorkshire may be estimated at 30 inches, but on the east coast it is not more than 20, whilst in the west parts it approaches to about 50. Craven is especially noticed for the quantity of rain which falls there, owing to the vapours arising from the Irish Channel being intercepted in their course and precipitated by the high range of hills; but this gives great freshness and verdure to what would otherwise be a comparatively barren country.

The rivers of Yorkshire are, to begin with the North Riding,—the Tees, which is a very picturesque river, and divides Yorkshire from Durham. It is navigable for a considerable way from its outlet (in the German Ocean), where has sprung up of late years the thriving port of Middlesborough. The Swale rises on the confines of Westmoreland. Its banks are bare and uninteresting until it reaches Richmond. The Ure has its source in close proximity to the Swale, and, traversing Wensleydale, passes Ripon, and receives the Swale. At its junction with the Ouse, an insignificant river, it takes that name, and, joined by the small river Nidd, traverses York; and, after being augmented with the waters of the Aire, and forming a conjunction with the Trent, it falls into the estuary of the Humber. The Esk falls into the German Ocean at Whitby, and the Derwent into the Ouse. The rivers of the West Riding are:—The Wharfe, rising from the base of Whernside, and running through Wharfedale, passes Tadcaster, and falls into the Ouse. The Aire rises at Malham Cove, in Craven; passing down Airedale and through Leeds, it receives the Calder and falls into the Ouse. The source of the Calder is in the hills separating Yorkshire from Lancashire, and, running near Halifax and past Wakefield, it joins the Aire at Castleford. On the south of the Riding rolls the lazy Don, which rises on the Penistone Moors, passes Sheffield and Doncaster, and falls into the Aire near Snaith. Besides these West Riding rivers, there is the Ribble, which springs in Craven, and bends its way through Ribblesdale into Lancashire, where it falls into the Irish Sea. In the East Riding, the river Hull traverses the Riding from north to south.

The geology of Yorkshire would of itself form a volume; therefore, on that subject we must be brief, and select the district which is the most important in a mineralogical point

Yorkshire. of view. The West Riding has been divided into four well defined geological divisions. 1st, The levels, or marsh lands in the vicinity of Snaith and Thorne, which rest on a stratum of red clay and sand, with gypsum intermixed. 2d, The range of magnesian limestone, which, rising from the levels, forms an extraordinary narrow ridge of dry land, of slight elevation, and runs north from Rotherham to the Tees. In some parts of its course great quantities of lime are burnt from the laminated upper part of the rock. 3d, The great coal-field of Yorkshire, which seems to have been formed in a vast estuary whose outlet was to the east, of which the strongest evidence is the thinning of the strata in that direction. In this, one of the greatest and richest coal-fields in the kingdom, extending from Bradford on the west, to Sheffield in the east, upwards of thirty miles, and running forward to Nottingham, are numerous thick seams of various quality of coal, interspersed with ironstone, some of it being among the purest produced. Vast quantities of these coals, the best and thickest seams of which are in the neighbourhood of Barnsley, Wakefield, Leeds, and Bradford, are consumed in the furnaces of the numerous iron-works of the West Riding; of late years London has received from this quarter large supplies, which are yearly increasing. In this coal-field, at its upper end, there is an excellent bed of flagstone, which is worked extensively at Bradford, Idle, and Bramley Fall; most of the causeways of London are formed of this stone. 4th, The mountain-limestone of Craven and the high ground of Nitherdale. From this limestone capital lime is made, and sent in large quantities to Lancashire and the lowlands of Yorkshire. The rock, in some places, is also exceedingly rich in lead. At Grassington and Greenhow Hill the chief mines are worked. From the laminated limestone of Dent, a dark grey marble is produced. The geology of the North Riding is in the western moorlands similar to that of Craven. From the limestone a prodigious amount of lead is produced. The new lead-mines near Wensley are, in particular, exceedingly rich. Swaledale was, in the earliest times, and until recently, a great lead-mining district, but its mines are now nearly exhausted. Cleveland, of late years, has grown into fame as a mineral district, owing to the discovery of a great and prolific bed of coarse ironstone, which is worked very extensively, and the produce fused at Middlesborough, and other places. The mineralogy of the East Riding is quite unimportant.

Agriculture has within the last twenty years very much improved in this county, by means of draining, irrigation, new systems of culture, rotation of crops, and the use of artificial manures, in addition to the natural ones. With the exception of Lincolnshire and Northumberland, there are few, if any, districts, where farming is conducted upon better principles, or attended with more success. In Craven and other upper parts of the West Riding, the country is purely pastoral, with scarcely any arable land in cultivation. Vast numbers of lean cattle brought from Scotland and Ireland, to pasture upon the alluvial lands and hills of Craven, covered with a sweet and quickly fattening grass, are speedily ready for the fortnightly fairs of Skipton, where they are disposed of for consumption in Lancashire, Keighley, Bingley, Bradford, and the adjoining district. Likewise, large numbers of sheep from the north are yearly fed on Craven pastures and the western moorlands, and brought to the same market. The breed of sheep in those districts has been much improved of late by the introduction of Cheviot sheep and judicious crossing of breeds. What are called lonk sheep, and crosses between southdown and northern sheep, have to some extent been introduced into Craven. In the middle parts of the Riding, there is a fair proportion of arable land, but pasturage prevails. The farms are in general small, and often held at high rents by the manufacturers of the locality, not merely for farming purposes, but for their accommodation. Considerable quantities of excellent barley is produced in that portion of the Riding called the Vale of York, extending from Pontefract to Boroughbridge, where the soil upon the magnesian limestone is light and porous. In recent years husbandry has been much improved in the West Riding by a larger growth of turnips. In the lower parts of the Riding, immense crops of potatoes of good quality are grown for the London market. The low alluvial lands to the east of the Riding grow wheat to great perfection. Most of the upper lands and dales of Yorkshire are grazing land of the best quality; and from this district vast quantities of butter and cheese are collected by factors for the great manufacturing towns, especially Leeds and Bradford, and the surrounding neighbourhood. Yorkshire.

In the lower portions of the North Riding, stretching to and including the Vale of Cleveland, there is a large tract of excellent corn-land, the produce whereof is brought to the extensive corn-markets of Richmond, Bedale, and Leyburn, whence it is forwarded by rail to other parts of the kingdom, as well as supplying the grazing-districts of the Riding, and also much of Craven. North Yorkshire hams and bacon are celebrated for their excellence. An improved system of husbandry prevails in the low lands of North Yorkshire, and nowhere is to be found a more enterprising, intelligent, and persevering class than the farmers of that district, whether as regards breeders or tillers of the ground.

The East Riding farms are large, and consist, in a great proportion, of arable land. In no part of England has the soil been more improved, within the last few years, than in Holderness, chiefly by extensive underdraining. It is undoubtedly one of the best wheat-producing tracts in the kingdom. In the elevated lands of the Riding, the Wolds, formerly barren sheep-walks, the chalky soil, by a most judicious system of sowing clover along with the corn, and after harvest turning the land into sheep-pasture, has become firm and rich, and converted into good arable land. In the lower portions of the East and also West Ridings, a system of warping the land with the silth of the sluggish rivers of the locality prevails, and is an eminently fruitful process. The North and East Ridings are distinguished for fine breeds of horses, which are held in high repute. Buyers from the continent attend the periodical fairs at Howden and Northallerton, and purchase large numbers of these horses for the cavalry of their respective governments. The Cleveland breed for carriage-horses is especially in much request, and is spread over a large district.

Almost the whole of the manufactures of Yorkshire are confined to the West Riding, and chiefly consist of the woollen, worsted, and linen manufactures; also of the manufactures of iron and cutlery. Leeds is the principal centre and emporium of the woollen manufacture, and every Tuesday its market is crowded with manufacturers and merchants for the disposal of various kinds of woollen cloths; of late years these have attained high repute. Huddersfield is also largely engaged in manufacturing trouserings, waistcoatings, and fancy goods; whilst Dewsbury, Heckmondwike, and the surrounding neighbourhood, make great quantities of carpets, blankets, and coarse cloths. The value of the woollen goods and yarn manufactured in the West Riding may be estimated at about thirteen millions sterling. The whole value of the manufactures in England has been set down by Mr Baines, M.P., in an excellent paper read before the British Association in 1858, at about twenty millions, thus showing that about 66 per cent. of it belongs to the West Riding of Yorkshire. Even more important is the worsted manufacture, which, like that of woollen, has its chief seat in the West Riding, viz., at Bradford. The neighbouring towns of Halifax, Keighley, Bingley, Otley, and the surrounding villages, are also engaged in it as their staple business. There were, accord-

Yorkshire.

ing to the parliamentary return of 1857, 445 worsted factories in the West Riding, possessing 12,723 horse-power, moving 1,212,587 spindles and 35,298 power-looms, and employing 78,984 persons. Mr James, in his *History of the Worsted Manufacture*, shows that the total value of that manufacture in Yorkshire amounts to L.13,100,000, viz,—manufactured stuff pieces L.10,000,000; and yarn exported and sent to Glasgow, Norwich, and Manchester, 3,100,000. Then there is the flax manufacture, largely carried on at Leeds, and also at Barnsley, which has of late years become an important branch of Yorkshire trade. Hull is also engaged in that trade. All these branches of textile art are much indebted for their immense increase to the vast quantities of iron and coal of excellent quality found in close proximity. Very large ironworks are carried on at Low Moor, Bowling, and Bierley, near Bradford, where the ironstone is of first-rate quality, and is fused by means of limestone brought from Skipton rock. There are extensive ironworks near Rotherham, Leeds, and Holmfirth, and also the Milton ironworks. In the North Riding, at Middlesborough, ironworks upon a very large scale, have lately been erected for manufacturing iron from the Cleveland ironstone. Another of the distinguished manufactures of Yorkshire arises from the use of iron,—the casting, forging, and manufacturing articles therefrom. The manufactories of this class, for all kinds of implements, from a steam-engine to the smallest article, decidedly rank among the most important in this country. Sheffield is the great centre of the cutlery trade, and there are made every description of edged-tools, knives, and surgical instruments. Silver-plated goods are also manufactured there, of choice patterns; also articles from Britannia metal, and recently type-founding has been added to to the numerous branches of Sheffield trade. In truth, it is impossible to give any satisfactory account of the immense and multifarious manufactures of this large thriving town. The alumworks at Whitby may also be mentioned.

Among many causes of the prosperity of this county, beyond its general fertility, its abundance of excellent coal, ironstone, and lead, may be noticed the numerous navigable rivers, canals, and railways, which intersect the country in all directions, and render the means of inter-communication easy and cheap. Likewise the excellence of its seaports has contributed to this end. Hull is the great entrepôt of the West Riding, whence its manufactures are shipped abroad, and whence it derives some of the raw materials which are worked up here. For the North Riding, the ports of Scarborough and Whitby are available.

Regarding the Doric dialect of Yorkshire, on which much has been written, it is similar in the North Riding to the lowland Scotch, and like it is mainly compounded of Saxon, with a considerable intermixture of Danish. In the West Riding there are many words and modes of pronunciation which betray traces of the Flemish clothiers who settled there in the middle ages. The inhabitants, particularly those of North Yorkshire, are a vigorous race, of simple manners, and little changing with the times, whilst those of West Yorkshire are a more progressive race, largely intermixed with settlers from all quarters. Their characteristics are, much intelligence, especially in trade and manufactures, perseverance in the pursuit of gain, great hospitality, and frankness of manners, and an indomitable will.

For ecclesiastical purposes the county lies partly in the diocese of York, and partly in the recently created diocese of Ripon, and contains 613 parishes, many of them of great extent, especially those of Halifax, Bradford, Aysgarth, and Romaldkirk. By the Reform Act the representation of Yorkshire in parliament was much altered. Now the West Riding sends two members, and Leeds, Sheffield, Bradford, Halifax, Ripon, Pontefract, and Knaresborough, return each two members, but Huddersfield and Wakefield only one each. These boroughs (with the exception of Ripon, Pontefract, and Knaresborough) are according to the order in which they stand, the largest towns in the Riding; the other towns therein possessing a population of above 10,000, according to the last census, are Barnsley, Keighley, and Doncaster. The North Riding also returns two members to parliament; and Scarborough, Richmond, and Malton send two each; Whitby, Northalterton, and Thirsk one each. Scarborough and Whitby are the only towns in this Riding which have a population amounting to 10,000. The East Riding is represented by two members, and Hull and Beverley by two each. Beverley is the capital of the Riding, but Hull is the only large town in it. The city of York sends two members, making for the whole of Yorkshire thirty-seven members of parliament.

The ruins of the castles of the former baronial owners of Yorkshire are numerous; some of them are in considerable preservation, and others rendered more venerable and picturesque by the hoary hand of time. We can only enumerate the most interesting. In the West Riding, Pontefract Castle stands conspicuous, the scene of many a bloody story in our history; Conisburgh Castle, with its Norman keep, in fine preservation, is also historical, and will ever be regarded with interest by the reader of Scott. Not much remains of Knaresbrough Castle; but that little is on many accounts of deep interest: it stands on one of the most picturesque spots in Yorkshire, overhanging the sullen Nidd. Skipton Castle is still very perfect, and used as a residence. Many portions of it remain nearly in the same condition as when its owner, the Black-faced Clifford, forfeited his ill-spent life at Towton field. The North Riding, however, possesses some of the grandest specimens of the feudal residences of the great lords of Yorkshire. First and foremost stands Richmond Castle, the seat of a vast barony in the middle ages, and the capital of Richmondshire, an ancient division of Yorkshire. Perhaps the ruins of Richmond Castle are the most imposing in England. The Norman keep is certainly the finest specimen of its class in the kingdom. The castle and town of Richmond and surrounding country offer a view which, altogether, cannot be found elsewhere in England; nor, as Swinburne the traveller observes, nowhere except at New Grenada in Spain. Next in order is Middleham Castle, the heritage of Warwick the king-maker; the prison of Edward IV., and the regal court of Richard III. The ruins are magnificent, and cover a large space. At Bolton Castle, within a few miles of Middleham, Mary Queen of Scots was imprisoned, and received those attentions from the Earl of Norfolk, which cost him his life. Scarborough Castle is a majestic ruin, standing upon a high hill. Wressle Castle, in the East Riding, demands a passing notice, as being once the princely mansion of the Percies, earls of Northumberland. It was dismantled by order of parliament in 1650. Of York Castle, built it is supposed by the Conqueror to keep his northern subjects in awe, nothing of moment remains except Clifford's Tower, which is built upon a high mound.

In no quarter of the kingdom are there so many monastic ruins, nor of such grandeur. Fountain's Abbey, near Ripon, and that of Rievaulx, near Helmsley, stand pre-eminent in their class, and are amongst the noblest remains of antiquity. Bolton Abbey, in Wharfedale; Jervaulx Abbey, in Wensleydale; Kirkstall Abbey, in Airedale; Whitby Abbey, and St Mary's, York, are also noble specimens of architectural skill, and objects of unceasing interest to the antiquary. Yorkshire, especially the West Riding, is distinguished for the number of noblemen and gentlemen's seats which it contains. We cannot afford space for more than an enumeration of a few of the chief ones. In

Youghal ‖ Young.

the *West Riding*, Wentworth House, Earl Fitzwilliam; Harewood House, Earl of Harewood; Wortley Hall, Lord Wharncliffe; Grimston Park, Lord Londesborough; Gisburn Park, Lord Ribblesdale; Sondbeck Hall, Earl of Scarborough; Womersley Hall, Lord Hawke; Studley Park, Earl of Ripon; Stourton Hall, Lord Stourton; Methley Hall, Titus Salt, Esq., late earl of Mexborough. *North Riding*—Castle Howard, Earl of Carlisle; Duncombe Park, Earl of Feversham; Aske Hall, Earl of Zetland; Bolton Hall, Lord Bolton; Mulgrave Castle, Marquis of Normanby. In the *East Riding*—Escrick Park, Lord Wenlock. Most of these seats are of great architectural beauty, and are surrounded by extensive parks and the wide domains of their owners. (J. J.)

YOUGHAL, a parliamentary borough and seaport town of Ireland, Munster, Cork County, 28 miles E. from Cork, and 157 S.W. from Dublin. It is situated on the acclivity of a hill on the W. side of the estuary of the Blackwater, over which there is a wooden bridge 1787 feet long. The harbour is safe and commodious but has a bar at its mouth with only 5 feet water at low tides and 13 at high-water of neap tides. A harbour lighthouse has recently been erected at the south end of the town, and a fort is to be erected at the entrance to the harbour. The port is a dependency of that of Cork, and the exports are chiefly grain, flour, and provisions. The town is to some extent visited in summer for sea-bathing, for which it is well adapted. The salmon-fishery of the Blackwater is extensive. The chief manufactures are coarse earthenware and bricks. The principal public building in the town is the parish church, a large Gothic edifice, which formerly belonged to a monastery, of which some more remains still exist. The other public buildings are a chapel of ease, a Roman Catholic chapel, a convent, Independent Methodist and Quaker meeting-houses, fever hospital and dispensary, town-house, prison, barracks, &c. Sir Walter Raleigh was at one time mayor of this town, and according to tradition the first potatoes brought by him from America were planted here. Myrtle Grove, the house occupied by him, is still preserved in nearly its original state. The borough returns one member to parliament. Pop. (1851) 7410.

YOUNG, ARTHUR, an agricultural writer of some note in his day, was the third son of Dr Young, prebendary of Canterbury, and was born on the 7th of September 1741. After various changes, now as a merchant, anon as a student, and ultimately as a writer of books which would not sell, Young at last became a farmer in Essex, and instructed himself in the art of agriculture. In 1770 he published the results of his experiments in farming in two thick volumes. These works, although not eminent for their judiciousness and sagacity, yet possessed a certain degree of freshness and sparkling vivacity, and had at least the merit of being original, if they wanted the power to interest intelligent agriculturists. More popular were his *Tour through the Southern Counties of England*, his *Six Weeks Tour*, and his *Eastern Tour*. But the theoretical farmer and the parliamentary reporter to the *Morning Post* were found not to agree, and he was glad to give up his farm to a man who knew how to work it to advantage. In 1772, he commenced his useful work *The Farmer's Calendar*, and wrote besides, one or two political works, among others his *Political Arithmetic*, which has been translated into several foreign languages. In 1784 he published his *Annals of Agriculture* which reached some 45 vols. in all. He went over to France about 1788 and composed his *Agricultural Survey* of that country, and his *Example of France a Warning to Britain*, which had both a large sale. The agricultural works of Arthur Young were collected by order of the French Directory of 1801 and translated into French, and published in 20 vols. under the title of *Le Cultivateur Anglais*. After receiving various medals from numerous agricultural societies, and gold snuff-boxes from one great personage and another, Young died on the 12th of April 1820 in his eightieth year.

Young.

YOUNG, *Edward*, born at Upham in Hampshire, in June 1681, was the son of Dr Edward Young, who afterwards became dean of Salisbury. The son was educated on the foundation at Winchester, but he did not succeed to a fellowship at New College, Oxford. In 1703, he was invited by the warden of that college, a friend of his father's, to live at his lodge until he should be qualified to stand for a fellowship at All Souls. He had scarcely availed himself of this acceptable offer, when death deprived him of his host; but he was not long in finding a second patron. From the president of Corpus Christi College, another of his father's friends, he received a summons to join that society, in which he remained until he was nominated by Archbishop Tenison, in 1708, to a law-fellowship of All Souls. His father had now been dead for three years.

In 1712, Young commenced his poetical career as a dauber of greatness, a branch of the art which he pursued with unabated ardour until its close. His first poem was entitled *An Epistle to the Right Honourable George Lord Lansdowne;* one of the twelve worthies whom Queen Anne raised in one day to the dignity of the peerage. If his lordship had half of the talent and virtue ascribed to him by the poet, the nation ought to have been reconciled, upon the catholic principle of supererogation, to the whole batch; but Young became ashamed of this lavish panegyric, as he did of many succeeding ones, and suppressed it. In the same year appeared *The Last Day*, part of which had been previously printed in the *Tatler*. This poem was inscribed to Queen Anne, but the dedication does not now appear. About the same time he produced *The Force of Religion, or Vanquished Love*, founded on the history of Lady Jane Grey and Lord Guilford. An entire poem on the death of the queen and the accession of George II. he also suppressed. In 1714 he took the degree of LL.B., and five years afterwards that of LL.D. When the Codrington Library was founded in 1716, Young was appointed to deliver a Latin oration, which he dedicated to the ladies of the Codrington family. The selection of Young to compose this harangue speaks favourably of his academical attainments; but it is said that his moments of relaxation were passed in such a manner that he reflected upon them afterwards with little complacency. Young's next patron was the Duke of Wharton, "the scorn and wonder of his days." His grace was stained with every vice but that of avarice, which, however, in the eye of Young, was probably the most heinous of all. From a passage in his letter to Richardson on original composition, it is conjectured that Young accompanied the duke to Ireland in 1717. Two years afterwards was brought upon the stage at Drury Lane the tragedy of *Busiris*.

About this time, Young entered the family of the Earl of Exeter as tutor to Lord Burleigh. This employment he quitted at the solicitation of Wharton, who, among other unequivocal tokens of his favour, paid him the compliment of accompanying him to Oxford, where, at his recommendation, he defrayed the expense of a range of buildings then unfinished at All Souls College. In 1721 was acted *The Revenge*, the most successful of Young's three tragedies, and the only one that retains possession of the stage. The *Revenge* is dedicated to the duke of Wharton, whom the poet acknowledges to have suggested the most beautiful incident in the play. His debt of gratitude to Wharton, which he became studious to conceal, he was compelled to divulge in the Court of Chancery under the solemnity of an oath. After the duke's death, it was found that his estates, already sufficiently involved, were threatened with additional perplexity by some unsatisfied claims of Young. The other creditors submitted it to the decision of Lord

Young. Hardwicke, whether the arrears of two annuities of L.100 each, granted to Young by the duke, as tokens of his friendship for the poet and esteem for letters in general, considerations not recognised by law, ought not to be regarded as gratuities only, and postponed to their demands, many of which were for money advanced to the deceased nobleman. The chancellor, however, directed the arrears of his annuities to be paid out of the funds remaining in the hands of the trustees.

In 1719 he published *A Paraphrase on a part of the Book of Job.* Of his seven satires, entitled *Love of Fame, the Universal Passion*, we have not seen the original editions, but they probably appeared between the years 1725 and 1728. The satires were followed by *Ocean, an Ode* occasioned by the new king's speech, which recommends the encouragement of seamen to enter the service voluntarily. This production he wisely excluded from the collection of his works. In 1728 he entered into holy orders, and was soon afterwards appointed chaplain to George II. His ode was preceded by some stanzas addressed to the king, and this preferment was probably the reward of his loyalty. If his lyrical poetry improved his fortune, it added nothing to his reputation, for Young's dithyrambics are the worst of all his writings. He now thought it suitable to his new character to withdraw from the players a tragedy entitled *The Brothers*, which was already in rehearsal. This play he suffered to be performed many years afterwards, for the benefit of the Society for Propagating Christianity in Foreign Parts; but it met with little success, and he made up the profit to L.1000. Soon after he assumed the character of a clergyman, he published a prose work, entitled, *A true Estimate of Human Life*, and a sermon preached before the House of Commons on the anniversary of King Charles's martyrdom. The title of this discourse is, *An Apology for Princes, or the Reverence due to Government.* In 1730, Young produced *Imperium Pelagi, a Naval Lyric, written in imitation of Pindar's spirit.* He did not escape the fate of Icarus; and this nautical Pindaric, one of the many productions which the author refused to acknowledge as his offspring, was justly ridiculed by Fielding in *Tom Thumb.* During this year he was presented by his college to the rectory of Welwyn in Hertfordshire. In 1731, he married Lady Elizabeth Lee, daughter of the Earl of Lichfield, and widow of Colonel Lee. If he received any fortune with this lady, which is probable, he must have been rendered very easy in his circumstances; for, in addition to the emoluments of his living, it is inferred from the following couplet in Swift's *Rhapsody on Poetry*, which was written soon after this period, that he had an allowance from the court,

> "Where Young must torture his invention
> To flatter knaves, or lose his pension."

Wycherley and Addison found little felicity in splendid alliance; but Young was more fortunate in that respect, if we are to estimate the value of his wife by the vehemence of his lamentations for her loss. That mournful event, which happened after ten years of married life, and some other family afflictions that befell him, gave rise to the *Night Thoughts*, the occasion of which poem, he says in his preface, "was real, not fictitious." Of this work the different portions were published from 1742 to 1744. *The Centaur not Fabulous*, in six letters to a friend on the life in vogue, appeared in 1754. This performance is very rhapsodical and declamatory, and there appears in it a prose Lorenzo, who is called Altamont,—a proceeding which, to use an illustration of Jeremy Collier, seems like cutting a diamond in two in order to double its value. The *Centaur* was followed, in 1759, by *Conjectures on Original Composition*, in a letter addressed to Richardson, in which are displayed all the fire and fancy of youth. In 1761, he was appointed clerk of the closet to the princess dowager of Wales; and in the year following he published a collection of what he considered the best of his works, in four volumes duodecimo. In the same year, when he was past fourscore, appeared *Resignation.* *Resignation* was written to console Mrs Boscawen for the death of the admiral, but he has dedicated several stanzas to the memory of the novelist. It is touching to hear the veteran poet complain, in the postscript to this production, that some critics had upbraided him with the failure of his powers. This judgment is equally savage and unjust, for *Resignation* has many stanzas that exhibit all the vigour and originality of his earliest productions. But commendation and reproach were soon to be alike indifferent to him; for, as the dying bard reminds Voltaire, then an old man also,— Young.

> "One who writes *Finis* to our works
> Was knocking at the gate."

This dreadful summons Dr Young obeyed in April 1765, having reached the eighty-fourth year of his age. He was buried under the communion-table of the church at Welwyn.

It is unnecessary to consider Young in the character of a lyric poet, as, in his attempts to rise to the level of Pindar, he has sunk beneath his own. His fame as a tragedian rests on the *Revenge.* It is remarkable that Young's three tragedies all end with the obvious expedient of suicide. In the *Night Thoughts*, faults and beauties are scattered with almost equal prodigality. He is perhaps more deficient in judgment than any poet who has attained to the same degree of eminence. This deficiency appears in the *Night Thoughts*, by the perpetual blending of sublimity and epigrammatic point,—an error into which few poets are in danger of falling, but which we could wish that Young had avoided. There is also a palpable straining after effect in this poem; much labour without art, and much smoke without fire. But if he often offends us by turgid exaggeration and mean conceits, he as often makes us amends by passages of true beauty and grandeur. Next to the *Night Thoughts*, the *Universal Passion* is Young's greatest performance. But the effect of these satires is almost neutralized by the lavish applause bestowed upon those to whom they are dedicated. It must, however, be admitted, that if Young often praised the worthless, he never abused the virtuous, which is too often a kindred propensity. Though every line of the *Universal Passion* sparkles with wit or antithesis, the reader must regret with Swift that the poet was not either more angry or more merry. The greater part both of Young's rhyme and blank verse, for he is the most unequal of all poets, is of a structure more peculiar than pleasing to the ear.

YOUNG, THOMAS, one of the most distinguished men of the present century, was born at Milverton, in Somersetshire, on the 13th of June 1773. Both his parents were Quakers, and he was the youngest of ten children. His father bore the same name with himself; his mother was a niece of Dr Brockelsby, an eminent physician in London. His parents, we are informed, were among "the strictest of a sect, whose fundamental principle it is, that the perception of what is right or wrong, to its minutest ramifications, is to be looked for in the immediate influence of a Supreme Intelligence, and that therefore the individual is to act upon this, lead where it may, and compromise nothing. To the bent of these early impressions he was accustomed in after-life to attribute, in some degree, the power he so eminently possessed of an imperturbable resolution to effect any object on which he was engaged, which he brought to bear on everything he undertook, and by which he was enabled to work out his own education almost from infancy, with little comparative assistance or direction from others."

At a very early period he became an inmate in the family of his maternal grandfather, Robert Davis, of Minehead, who, although engaged in mercantile avocations, had cultivated a taste for classical literature, and, without being

Young. a very deep or accurate scholar himself, was anxious to inspire his grandson with the love of scholarship. Here he learned to read with fluency when he was only two years old. He was afterwards placed under the tuition of a village schoolmistress; and, during the intervals of his attendance, he was occupied with the task of committing to memory various English and even some Latin poems. It is stated that he easily retained the words, although unacquainted with their meaning; but this mode of exercising his memory can scarcely be regarded as very judicious. Before he had completed his sixth year, he attended the seminary of a dissenting minister. He was next sent to a school at Bristol, where he remained about a year and a half, and where, as his biographer remarks, "the deficiency of the instructor appears to have advanced the studies of the pupil, as he here first became his own teacher, and had by himself studied the last pages of the books used, before he had reached the middle under the eye of the master." During the holidays he appears to have derived no small advantage from his acquaintance with one of his father's neighbours, a land-surveyor and land-steward; in whose office he was indulged with the use of mathematical and philosophical instruments, and, what was then of more importance, with the perusal of three volumes of a Dictionary of Arts and Sciences. New sources of knowledge were thus opened to him, and the delight which they afforded seemed to be inexhaustible.

In the year 1782 he was sent to the school of a Mr Thompson, at Crompton, in Dorsetshire. Of this preceptor he was accustomed to speak with great respect, as a man of an enlarged and liberal mind; and under his tuition he proceeded through the ordinary course of Greek and Latin classics, together with the elementary parts of mathematics. The master possessed a miscellaneous library of moderate extent; and of this he encouraged his pupils to make a free use, allowing them a certain degree of discretion in the employment of their time. This method of proceeding was peculiarly adapted to the taste and exigencies of such a pupil as Thomas Young, whose prematurity of judgment, accompanied with an insatiable thirst for knowledge, qualified him to act as his own preceptor. He rose earlier and went to bed later than his companions, and was thus enabled to devote himself to a surprising variety of pursuits. By the aid of a schoolfellow who had some French and Italian books, he rendered himself tolerably familiar with those languages. "The next study he undertook was botany; and for the sake of examining the plants which he gathered, he attempted the construction of a microscope from the descriptions of Benjamin Martin. This led him to optics; but in order to make his microscope, he found it necessary to procure a lathe. Everything then gave way to a passion for turning, and science was forgotten for the acquirement of manual dexterity; until, falling upon a demonstration in Martin, which exhibited some fluxional symbols, he was never satisfied till he had read and mastered a short introduction to the doctrine of fluxions. Mr Thompson had left in his way a Hebrew Bible. He began by enabling himself to read a few chapters, and was soon absorbed in the study of the principal oriental languages. At the age of fourteen, when he quitted Mr Thompson's school, he was thus more or less versed in Greek, Latin, French, Italian, Hebrew, Persic, and Arabic; and in forming the characters of those languages, he had already acquired much of the beauty and accuracy of penmanship which was afterwards so remarkable in his copies of Greek compositions, as well as of those subjects connected with the literature of ancient Egypt." Such a statement as this might appear scarcely credible, if we were not possessed of the most unexceptionable evidence that, in every stage of his intellectual career, Young was a very remarkable person.

After he had completed the fourteenth year of his age, Young. he went to reside in the family of Mr David Barclay, of Youngsbury, in Hertfordshire. Through the intervention of Sir William Watson, it had been arranged that Young and a grandson of Mr Barclay should pursue their studies under a private tutor; but in the meantime the person who had been engaged found a situation which appeared more advantageous; and Young, who was only about a year and a half older than his companion, began to act as his preceptor. They were afterwards joined by another youth, named Hodgkin, who was of an age somewhat more advanced, and who in 1794 published a work entitled *Calligraphia Græca*. Young did not, however, relinquish his office of tutor, and he found himself capable of directing the studies of both his companions. About this early period of his life he exhibited symptoms of what was supposed to be incipient consumption; but under the care and skill of Dr Brockelsby and Baron Dimsdale he recovered his health without suffering any ultimate inconvenience. Nor did his studies experience any material interruption; for we are informed that he was enabled to pursue his labours through nearly the whole duration of his indisposition, and that he merely relieved his attention by what to him answered the purpose of repose, namely, a course of reading in such Greek authors as amused the weariness of his confinement. From 1787 to 1792 he resided during summer in Hertfordshire, and during winter in London. With only the occasional assistance of some masters in the metropolis, he rendered himself perfectly familiar with the great poets and philosophers of antiquity. Of his daily studies he preserved ample notes. "Of the various and conflicting opinions of the ancient philosophers," says Mr Gurney, "he had drawn up a most admirable analysis; and as his reading was not merely the gaining words and phrases, and the minuter distinctions of dialects, but was invariably also directed to what was the end and object of the works he laboured through, it is probable that the train of thought into which he was led in this analysis, was not without its effect in somewhat mitigating his attachment to the peculiar views of the sect amongst whom he had been born. He had acquired a great facility in writing Latin. He composed Greek verses which stood the test of the criticism of the first scholars of the day, and read a good deal of the higher mathematics. His amusements were the studies of botany and zoology, and to entomology in particular he at that time gave great attention. During the whole term of these five years, he never was seen by any one, on any occasion, to be ruffled in his temper. Whatever he determined on, he did. He had little faith in any peculiar aptitude being implanted by nature for any given pursuits. His favourite maxim was, that whatever one man had done, another might do; that the original difference between human intellects was much less than it was generally supposed to be; that strenuous and persevering attention would accomplish almost anything; and at this season, in the confidence of youth and consciousness of his own powers, he considered nothing which had been compassed by others beyond his reach to achieve, nor was there anything which he thought worthy to be attempted, which he was not resolved to master."

It was the wish of Dr Brockelsby that he should devote himself to the medical profession; and having prepared himself by previous reading, he attended Dr Higgins's lectures on chemistry during the winters of 1790 and 1791. He began to perform some simple experiments; but at no period of his life was he much disposed to spend his time, either in devising original experiments, or in repeating those of others. His first appearance as an author is supposed to have been in the *Monthly Review* for 1791, to which he communicated a short note on gum laudanum, with a verbal criticism on Longinus. The criticism, we

Young. are informed, was admitted by Dr Burney to be correct. The critic had only attained the age of eighteen. Towards the close of 1792, he took lodgings at Westminster, where he resided about two years, and pursued his medical studies. He attended the lectures of Baillie and Cruikshank in the Hunterian school of anatomy; and during that period was among the most diligent of the pupils who frequented St Bartholomew's Hospital. He likewise attended courses of lectures on the practice of physic by Dr Crichton and Dr Latham, on midwifery by Dr Clarke and Dr Osborn, and on botany by Sir James Edward Smith.

In 1793 he varied his pursuits by making a tour in the west of England, chiefly with the view of studying the mineralogy of Cornwall. About this period he had been introduced to the Duke of Richmond, to whom his uncle was well known; and the Duke, then Master-general of the Ordnance, offered to retain him as his private secretary. Such an appointment might have conducted a young man of his talents to much higher preferment, but he was reluctant to quit the onward path of science. Mr Burke and Mr Windham, to whom he had likewise been introduced by Dr Brockelsby, recommended the plan of entering himself at Cambridge, as a preparation for the study of the law. Burke, it has been stated, "was so greatly struck with the reach of his talents and the extent of his acquirements, more particularly by his great and accurate knowledge of the Greek language, that Dr Young may be considered as in no small degree indebted to the good offices of that eminent statesman for the extent of interest which his uncle took from this period in his future settlement in life." Adhering to his previous choice of the medical profession, he proceeded to Edinburgh in the autumn of 1794, and there attended the lectures of Black, Munro, and Gregory. He cultivated the acquaintance of the Greek professor, Mr Dalzel, to whom he communicated some notes, as well as a Greek epigram, which were inserted in the second volume of the *Collectanea Græca*. "He pursued every branch of study in that university with his accustomed intensity, but made the physical sciences more peculiarly the objects of his research. He now separated himself from the Society of Quakers; and amidst his medical, scientific, and classical labours, he determined on cultivating some of those arts in which he considered that his early education had left him deficient. But everything, be its nature what it might, was with him a science; whatever he followed, he followed scientifically. He was extremely fond of music, and of the science of music he rendered himself a master. He had at all times great personal activity, and in youth he delighted in its exercise. But perhaps it may provoke a smile, though too characteristic an anecdote to omit, that in instructing himself in the figure of a minuet, he made it the subject of a mathematical diagram."

Towards the close of the year 1795, he removed to the university of Göttingen. Here he attended lectures on civil and natural history, as well as on different branches of medical science. Of the very extensive and well arranged library belonging to that university, he did not fail to make an assiduous use. As he was entirely exempted from those dissipations into which so many young men fall, he had sufficient leisure for recreation as well as study; and at Göttingen, as well as at Edinburgh, he diversified his occupations by engaging in various bodily exercises. "He took lessons in horsemanship, in which he always had great pleasure, and practised under various masters all sorts of feats of personal agility, in which he excelled to an extraordinary degree." On the 10th of July 1796, he took the degree of M.D. His inaugural dissertation was printed under the title, *De Corporis Humani Viribus conservatricibus Dissertatio.* Götting. 1796, 8vo. He easily obtained Young. a dispensation from the oath which, in this and other German universities, is very absurdly tendered to candidates, that they will not take the same degree in any other university. Having visited Dresden and Berlin, he now directed his course to England. As he could not be admitted to immediate practice as a licentiate of the College of Physicians, he entered himself as a fellow-commoner of Emanuel College, Cambridge. Dr Farmer, the master, was his uncle's intimate friend. Here he resided three years, and afterwards kept his terms, so as in due time to take his degrees in physic. He did not attend any of the public lectures; nor is it to be supposed that a graduate who had studied at Edinburgh and Göttingen could derive much advantage from an elementary course at Cambridge.

Dr Brockelsby died in the month of December 1797, having bequeathed the larger part of his fortune to his nephew, Mr Beeby. The remainder, including his house, library, and pictures, fell to the share of his grand-nephew, Dr Young. At the age of twenty-four, he was thus placed in a state of comfortable independence; and after he had completed his necessary residence at college, he established himself in Welbeck Street, and commenced the practice of physic. In 1802 his reputation as a man of science procured him the appointment of professor of natural philosophy in the Royal Institution, where for two years he was associated with Davy. Of the Journals of the Royal Institution, the first volume and a part of the second were edited and chiefly written by Young. During this year he published *A Syllabus of a Course of Lectures on Natural and Experimental Philosophy*, containing mathematical demonstrations of the most important theorems in mechanics and optics. Here he announced his great discovery of the general law of the interference of light; that "wherever two portions of the same light arrive at the eye by different routes, either exactly or very nearly in the same direction, the light becomes most intense when the difference of the routes is any multiple of a certain length, and least intense in the intermediate state of the interfering portions; and this length is different for light of different colours."[1] His lectures were too scientific and too profound to be intelligible to any considerable proportion of his auditors; and the matter was so abundant, and the style so condensed, that students of a more academical training might frequently have found it extremely difficult to accompany him in his masterly discussions.

During the summer of 1802, he accompanied, in a medical capacity, the late Duke of Richmond and his brother Lord George Lennox, in an excursion to France. He attended some of the meetings of the National Institute, and formed an acquaintance with several members of that learned body. On his return to London, he was elected foreign secretary of the Royal Society, of which he had been admitted a fellow at the age of twenty-one. This office he retained during the remainder of his life, and was always one of the leading and most efficient members of the council. In the year 1804 he married Eliza, the daughter of James Primrose Maxwell, Esq., of Cavendish Square; and this union is said to have been attended with uninterrupted happiness. His wife, who survived him, had no children. Her scientific attainments have not been overlooked by Arago. After his marriage, he thought it expedient to resign his professorship, in order to present the appearance of a more entire devotion to the practice of physic; but it was impossible for such a man to withdraw himself from the pursuits of science and literature. He now occupied himself in preparing for the press a most elaborate and valuable work, *A Course of Lectures on Natural Philosophy and the Mechanical Arts*, Lond. 1807, 2 vols.

[1] See Dr Young's *Lectures on Natural Philosophy*, vol. i. p. 464, vol. ii. p. 633.

Young. 4to. This work was the result of assiduous and energetic labour for the space of five years; two of which were devoted to the preparation of the lectures as delivered, and three more to the examination and arrangement of the great body of references contained in the second volume, as well as to the improvement of the texture of the work, particularly where new materials, or new experiments, or repeated investigations, seemed to render it necessary. In a commercial point of view, the book was by no means successful. The booksellers became insolvent soon after its appearance, nor was the sale sufficient to defray the expense of the publication. Of the merits of a work so truly scientific, very few readers were competent to form an opinion; and, according to the author's own impression, his labours first began to be generally appreciated by the philosophers of the continent.

In 1808 Dr Young was admitted a fellow of the College of Physicians; and in 1810 he was elected physician to St George's Hospital. For fourteen successive years from the period of his marriage, he passed his winters in the metropolis and his summers at Worthing. We are informed that his practice, though respectable, was never very extensive, and that he was averse to some of the ordinary methods by which practice is acquired. "He was not," says Dr Pettigrew, "a popular physician. He wanted that confidence or assurance which is so necessary to the successful exercise of his profession. He was perhaps too deeply informed, and therefore too sensible of the difficulty of arriving at true knowledge in the profession of medicine, hastily to form a judgment; and his great love of and adherence to truth, made him often hesitate where others felt no difficulty whatever in the expression of their opinion. He is therefore not celebrated as a medical practitioner, nor did he ever enjoy an extensive practice; but in information upon the subjects of his profession, in depth of research into the history of diseases, and the opinions of all who have preceded him, it would be difficult to find his equal."[1] Dr Young was likewise connected with the Middlesex Hospital, where for two seasons he delivered a course of lectures, which, according to his own statement, "were little frequented, on account of the usual miscalculation of the lecturer, who gave his audience more information in a given time than it was in their power to follow." He printed *A Syllabus of a Course of Lectures on the Elements of the Medical Sciences*, Lond. 1809, 8vo. This was followed by a more elaborate publication, *An Introduction to Medical Literature, including a System of Practical Nosology*, Lond. 1813, 8vo. A second edition appeared in 1823. This volume is another monument of his indefatigable research, as well as of the sagacity and judgment which he exerted in all his investigations. After an interval of two years, he produced another professional work, which greatly extended his reputation, *A Practical and Historical Treatise on Consumptive Diseases*, Lond. 1815, 8vo.

His separate publications exhibit but a small portion of his literary labours. His contributions to periodical works, and to the transactions of various societies, were very numerous, and not a few of them were very elaborate. At the suggestion of his intimate friend George Ellis, he was induced to lend his powerful aid to the *Quarterly Review*. Young. His first undertaking was merely to furnish notices of medical publications; but he immediately began to include other branches of science, nor did he overlook some of his favourite branches of literature. His review of Adelung's *Mithridates*, inserted in the tenth volume, would alone have been sufficient, had he left no other monument of his ingenuity and learning, to procure him the character of an uncommon man: To the *Imperial Review*, which ran a shorter course, he likewise contributed a variety of articles. Dr Young was one of the many distinguished individuals who appeared as contributors to the Supplement to the sixth edition of the *Encyclopædia Britannica*. His articles, or portions of articles, sixty-three in number, related to subjects not a little dissimilar in their nature. Some of them are reprinted in the present work, and, unless where his name is expressly mentioned, they are generally distinguished by his initials. He supplied several biographical notices, not only of scientific men, but likewise of classical scholars, among whom are Bryant, Porson, and Wakefield. He had previously written several papers on the very difficult and obscure subject of hieroglyphics; and in the article EGYPT, of the seventh edition of the present work, he presented the result of his investigations. In this bewildering field of literature, the only ancient guide is Horapollo, whose work Dr Young describes as puerile, and "much more like a collection of conceits and enigmas than an explanation of a real system of serious literature."[2] The labours of many different scholars had left the subject of hieroglyphics almost as obscure as they found it, when Young and Champollion,[3] nearly at the same time, commenced their more fortunate inquiries. Dr Young afterwards published a separate work, under the title of *An Account of some recent Discoveries in Hieroglyphical Literature and Egyptian Antiquities; including the author's original Alphabet, as extended by Mr Champollion, with a Translation of five unpublished Greek and Egyptian Manuscripts.* Lond. 1823, 8vo. He was likewise the editor of *Hieroglyphics collected by the Egyptian Society*. Lond. 1823, fol. This is a collection of lithographic plates, executed at the expense of the society; but the subscriptions being insufficient to defray it, the work was transferred to the Royal Society of Literature, and he still continued his superintendence. His unrivalled merits in this difficult province have been so fully estimated in the article HIEROGLYPHICS, written for the supplement to the sixth edition of the present work, that it would here be superfluous to resume the subject.

Early in the year 1817, Dr Young had been called to Paris for the purpose of attending a patient; and he was much gratified by the reception which he there experienced from the most distinguished men of science. With Alexander von Humboldt, Cuvier, Arago, Biot, and Gay-Lussac, he had previously become acquainted in England. With such individuals as these it was a great pleasure to renew his personal intercourse; and in the summer of the same year he again visited Paris, and resided there for a few weeks.

---

[1] Pettigrew's *Medical Portrait Gallery*; Biographical memoirs of the most clebrated Physicians, Surgeons, &c. vol. iv. London, 1840, 4 vols. 8vo.

[2] Young's *Account of some recent Discoveries in Hieroglyphical Literature*, p. 3. See likewise Mr Salt's *Essay on Dr Young and M. Champollion's Phonetic System of Hieroglyphics*, p. 44. Lond. 1825, 8vo. Orus, Horus, Horus Apollo, or Horapollo, is said to have been an ancient Egyptian, and to have written in his native language. The treatise which bears his name is professedly a translation from the Egyptian into the Greek tongue by a certain Philippus, who is otherwise unknown. It was first printed by Aldus, in a volume containing several other reliques of Greek literature, Venet. 1505, fol. The subsequent impressions are not numerous. An elaborate edition has recently been published by Leemans, *Horapollinis Niloi Hieroglyphica*, Edidit, diversorum codicum recenter collatorum, priorumque editionum varias lectiones, et versionem Latinam subjunxit, adnotationem, item hieroglyphicorum imagines, et indices adjecit Conradus Leemans, Phil. Theor. Mag. Lit. Hum. Doct. Amst. 1835, 8vo. The Greek text, accompanied with an English version, has still more recently appeared, under the title of *The Hieroglyphics of Horapollo Nilous*, by Alexander Turner Cory, Fellow of Pembroke College, Cambridge. Lond. 1840, 8vo.

[3] See the work of Klaproth, *Examen critique des Travaux de feu M. Champollion sur les Hiéroglyphes.* Paris, 1832, 8vo.

Young. In 1818 he was appointed one of the commissioners for taking into consideration the state of the weights and measures employed in Great Britain. In this commission, issued under the privy seal, he was associated with Dr Wollaston, Captain Kater, Mr Davies Gilbert, Sir Joseph Banks, and Sir George Clerk. He acted as secretary to the board, of which he appears to have been the most efficient member; for to the three Reports presented to parliament, he furnished both the scientific calculations, and the account of the various weights and measures in common use. Before the close of this year, he was appointed secretary to the Board of Longitude, with the charge of the supervision of the *Nautical Almanac*. In the act of parliament under which this appointment took place, he was nominated one of the commissioners. "This appointment was to him a very desirable one, though the labour in which it involved him was great, as his anxiety to increase his medical practice henceforth ceased, and it made that the business of his life which had always been his inclination." After a period of ten years, the board was suppressed; but the Admiralty was permitted to retain the officer intrusted with the calculations of the almanac. The assistance of men of science was soon found to be necessary in other departments connected with the Admiralty; and a new council of three members, consisting of Dr Young, Captain Sabine, and Mr Faraday, was intrusted with those services which had previously been performed by the board.

After his appointment to the office of secretary, he discontinued his summer residence at Worthing. During the summer of 1819 he proceeded to Italy, where he spent about five months, and visited all the most remarkable cities. One object of peculiar interest was the examination of the Egyptian monuments preserved in that country. He returned homeward by Switzerland and the Rhine. He afterwards published a work entitled *Elementary Illustration of the Celestial Mechanics of La Place; with some additions relating to the Motion of Waves and of Sound, and to the Cohesion of Fluids*. Lond. 1821, 8vo. This volume, and the article TIDES reprinted in the present work, he was disposed to regard as containing the most fortunate of the results of his mathematical investigations. During the ensuing year he paid another visit to Paris; and in 1824 he made an excursion to Spa and to Holland. On his return he undertook the scientific direction of a company for life-insurance. The rage for joint-stock schemes had about this period attained its utmost height; but he declined all participation in the commercial part of the speculation, and restricted himself to his own mathematical department. He was thus induced to deviate into a new path of inquiry; and, in 1826, he contributed to the *Philosophical Transactions* a Formula for expressing the Decrement of Human Life; and to Brande's *Philosophical Journal*, a Practical Application of the Doctrine of Chances. He had the satisfaction of witnessing the prosperity of the company with which he had formed this connection.

In the course of the preceding year, he had removed from Welbeck Street to a house which he had built in Park Square; "where he continued to reside during the remainder of his life, and where, in a situation to which he was extremely attached, he led the life of a philosopher, surrounded by every domestic comfort, and enjoying the pleasures of an extensive and cultivated society, who knew how to appreciate him. He expressed himself as having now attained all the main objects which he had looked forward to in life as the subject either of his hopes or his wishes." In 1827 he was elected one of the eight foreign members of the Royal Institute of France. But the life which had thus been so prosperous and so honourable was not destined to be long. With the exception of the consumptive tendency which he had exhibited at an early period, his health had not been impaired by serious illness a single day. In the summer of 1828 he made an excursion to Geneva; and on his return, his friends began to perceive symptoms of decaying strength. The business intrusted to the Board of Longitude having about this time been transferred to the new council, he was subjected to the labour of drawing up various reports, when the state of his health rendered this an exertion to which he was no longer equal. From the month of February ensuing, he had repeated attacks of what he supposed to be asthma. In the beginning of April, he experienced great difficulty of breathing; and this symptom was accompanied with a habitual though not copious discharge of blood from the lungs. "Though thus under the pressure of severe illness," says Mr Gurney, "nothing could be more striking than the entire calmness and composure of his mind, or could surpass the kindness of his affections to all around him. He said that he had finished all the works on which he was engaged, with the exception of the rudiments of an *Egyptian Dictionary*, which he had brought near to its completion, and which he was extremely anxious to be able to finish. It was then in the hands of the lithographers, and he not only continued to give directions concerning it, but laboured at it with a pencil when, confined to his bed, he was unable to hold a pen. To a friend who expostulated with him on the danger of fatiguing himself, he replied it was no fatigue, but a great amusement to him; that it was a work which, if he should live, it would be a satisfaction to him to have finished, but that if it were otherwise, which seemed most probable, as he had never witnessed a complaint which appeared to make more rapid progress, it would still be a great satisfaction to him never to have spent an idle day in his life.... In the very last stage of his complaint, in the last lengthened interview with the writer of the present memoir, his perfect self-possession was displayed in the most remarkable manner. After some information concerning his affairs, and some instructions concerning the hieroglyphical papers in his hands, he said that, perfectly aware of his situation, he had taken the sacraments of the Church on the day preceding; that whether he should ever partially recover, or whether he were rapidly taken off, he could patiently and contentedly await the issue."[1] With some slight variations, his illness continued till the morning of the 10th of May 1829, when his strength having been gradually exhausted, he expired without a struggle, before he had completed the fifty-sixth year of his age. The fatal disease was ascertained to be an ossification of the aörta, exhibiting the appearance of having been in progress for many years. His intellectual labours had been so great and so incessant as to produce the indications of an age much more advanced. His mortal remains were deposited in a vault belonging to his wife's family, in the church of Farnborough in Kent.

The work which had engaged his attention during the last days of his life was published under the title of *Rudiments of an Egyptian Dictionary in the Ancient Enchorial Character; containing all the Words of which the sense has been ascertained. Intended as an Appendix to Mr Tattam's Coptic Grammar*. Lond. 1830, 8vo. It appears in the same volume with the work of Mr Tattam, *A compendious Grammar of the Egyptian Language, as contained in the Coptic and Sahidic Dialects*.

[1] Gurney's *Memoir of the Life of Thomas Young, M.D.*, &c., p. 41, Lond. 1831, 8vo. To this Memoir he has subjoined "A Catalogue of the Works and Essays of the late Dr Young," which had been prepared by himself in 1827. The *Life of Thomas Young, M.D.*, &c., has been written by George Peacock, Dean of Ely, in 1855; and the same author published, in the course of the year, the *Miscellaneous Works* and *Scientific Memoirs* of Dr Young.

Ypres. || Yriarte.

Among other advantages, Dr Young possessed that of a handsome person and prepossessing appearance. His manners were polished and even elegant, though perhaps exhibiting a very slight tendency to a scholar-like preciseness. By his friend and biographer he is described as "a man in all the relations of life, upright, kind-hearted, blameless. His domestic virtues were as exemplary as his talents were great. He was entirely free from either envy or jealousy; and the assistance which he gave to others engaged in the same lines of research with himself was constant and unbounded. His morality through life had been pure, though unostentatious. His religious sentiments were by himself stated to be liberal, though orthodox. He had extensively studied the Scriptures, of which the precepts were deeply impressed upon his mind from his earliest years; and he evidenced the faith which he professed in an unbending course of usefulness and rectitude." Of his merits as a man of science, it may here be sufficient to state that a very high estimate has been formed by Arago.[1] His literary attainments were equally solid and extensive; nor would it be easy to mention another individual of the present century worthy in all respects of being compared with Thomas Young. For further notice of Young, see Dean Peacock's *Life* of him, published in 1855, and the SIXTH PRELIMINARY DISSERTATION. (D. I.)

YPRES (Flemish, *Yperen*), a fortified town of Belgium, capital of an arrondissement of the same name, in the province of West Flanders, stands in a fertile plain on the Yperlee, 30 miles S.S.W. of Bruges, and 16 N.N.E. of Lille. The marshes in the vicinity having been mostly drained, the town has been rendered less unhealthy than formerly. At one time Ypres is said to have contained 200,000 inhabitants; and it was long famous for its woollen and linen manufactures, the fabric called *diaper* (a corruption of d'Yperen) having derived its name from this town, where it was first made. The chief manufactures are now linen thread and lace; but it has also manufactures of woollen and linen cloth; with dye and bleaching works, tanneries, &c. The town-house and cloth-hall occupy a vast Gothic building of the fourteenth century, surmounted by a fine tower in the centre. The cathedral of St Martin is a Gothic edifice of considerable size, but of no great beauty. Jansen, the founder of the Jansenists, was bishop of Ypres in the 17th century, and is buried in the cathedral. There are several other churches and chapels, four hospitals, an exchange, a royal college, academy of painting, and a public library.

YRIARTE, TOMAS DE, nephew of Don Juan de Yriarte, the learned keeper of the King's Library in Spain, was born in the island of Teneriffe in 1750. He early displayed a taste for dramatic writing, and for introducing French plays upon the Spanish stage; and at the age of twenty-one he gained considerable reputation by his Latin verses on the birth of Charles IV. Having gained the situation of archivist in the office of the principal secretary of state, much of his time was necessarily occupied with the duties of this office, and he had less leisure for the indulgence of his poetical taste than formerly. Much of his leisure time, besides, was occupied with petty squabbles with his contemporaries, Sedano, Melandez, and Fornor; and it is to be regretted that many of his writings likewise are filled with those personal controversies.

The poetry of Yriarte is marked by purity of style and elegance of expression, but it is wanting both in power and elevation. It is destitute of that richness and vigour which belongs to all poetry of a very high class. His didactic poem on *Music* (La Musica, 1780), consisting of five books, shows considerable skill in the management of the details. His book of *Fables* (Fabulas Literarias), consisting of some eighty original fictions, published in 1782, are so easy in their versification, and generally the moral aim of them is so well taken, that while they want the geniality of Æsop and La Fontaine, they nevertheless possess the abiding merit of sustaining unaided the reputation of their author down to the present day. The best of Tomas de Yriarte's miscellaneous poems are his eleven *Epistles*. He died in 1791. His whole Obras were published at Madrid in 8 vols. 1805.

Yrieix || Yvetot.

YRIEIX, ST, a town of France, capital of an arrondissement of the same name, in the department of Haute Vienne, on the left bank of the Loue, 27 miles S. of Limoges. It is an ill built place, but has a curious old Gothic collegiate church, four other parish churches, a college, hospital, and court of law. Here are ironworks and manufactures of porcelain, leather, woollen and linen cloth. Some trade is carried on in porcelain-clay, cattle, hides, and hemp. Pop. (1856) 7682.

YSSENGEAUX, or YSSINGEAUX, a town of France, capital of an arrondissement of the same name, in the department of Haute Loire, on a rocky eminence near an affluent of the Mignon, 13 miles N.E. of Le Puy. It is irregularly built, and has a dull and gloomy appearance, the only good building being the parish church. Here are a college and law-court. Silk, lace, and ribands are made here, and there is a considerable trade in corn, cattle, and timber. Pop. (1856) 7523.

YSTAD, a seaport town of Sweden, in the län and 34 miles E.S.E. of Malmo, on the Baltic, near the S. extremity of the kingdom. It is a well built town, with a good market-place, two churches, a town-hall, and barracks. Woollen and linen cloth, leather, soap, tobacco, and snuff, are made here, and an active trade is carried on. The harbour is good, and most of the steamers plying between Stockholm, Lübeck, Kalmar, Stettin, Stralsund, and Copenhagen, touch here. Pop. 5056.

YUCATAN. See MEXICO.

YUNNAN, a province of China, situated on its south-western frontier, bounded on the N. by Sechuen and Tibet, on the E. by Quang-See and Kw-choo, on the S. by Anam and Laos, and on the W. by Burmah and Tibet. It is about 540 miles in length by 330 in breadth, with an area of 107,969 square miles; and though mountainous, it is one of the most fertile and opulent in China, being well watered both by rivers and lakes. Its produce is gold, copper, and tin, amber, rubies, sapphires, agates, pearls, precious stones, marble, musk, silk, elephants, horses, gums, medicinal plants, and linen. It has a vast commerce, contains twenty-one cities of the first class, and fifty-five of the second and third. The population is estimated at five and a half millions.

YVERDUN, a town of Switzerland, canton of Vaud, at the S. extremity of Lake Neufchatel, 17 miles N. of Lausanne. Its principal edifice is an old castle, in which Pestalozzi established his celebrated educational institute in 1805. It has a church, town-hall, deaf-mute institution, and a considerable trade in French wines. Pop. 3619.

YVETOT, a town of France, capital of an arrondissement of the same name, in the department of Seine Inférieure, in a fertile plain, 20 miles N.W. of Rouen. It is an ancient town, and consists of one principal street more than two miles long, lined with old-fashioned timber-framed, and slate-roofed houses. Linen and cotton cloth, velvet, hosiery, and hats, are made here; and there is a considerable trade in corn, cattle, and sheep. Yvetot was formerly an important commercial town, and its lords were styled kings, even in legal documents,—a practice which has given rise to some antiquarian researches. Pop. (1856) 8234.

[1] "Eloge Historique du Docteur Thomas Young," par M. Arago, *Mémoires de l'Académie Royale des Sciences de l'Institut de France*, tome xiii. p. lvii.

Z.

Z ‖ Zaleucus.

Z, the last letter of the English alphabet, is merely a vocal sibilant; the sound of which is formed by a motion of the tongue from the palate downwards and upwards to it again, with a shutting and opening of the teeth at the same time. This letter has been reputed a double consonant, having the sound *ds*; and hence we often double it, as in *puzzle, muzzle*, &c. Among the ancients, Z was a numeral letter, signifying 2000; and with a dash over it thus, $\overline{Z}$, signified 2000 times 2000, or 4,000,000. (See ABBREVIATIONS.)

ZAANDAM (sometimes, but improperly, called *Saardam*), a town of Holland, province of North Holland, on the Y, at the mouth of the Zaan, which divides it into East and West Zaandam, 5 miles N.W. of Amsterdam. The town is particularly neat and clean, and the houses are mostly of wood, and painted white or green. It has an immense number of windmills, amounting, it is said, to about 700, including paper, corn, saw, coffee, snuff, oil, and other mills. Peter the Great of Russia wrought in the docks here as a ship-carpenter; and the hut in which he lived is still in good preservation and much visited. Ship-building is still carried on to some extent. Pop. about 12,000.

ZACATECAS. See MEXICO.

ZACH, BARON VON. See ASTRONOMY, Supplement to Part. I.

ZACHARIAE, KARL SALOMON, *Baron Von Lingethal*, an eminent German jurist and political writer, was born at Meissen on the 14th of September 1769. He was educated at Leipsic, and subsequently at Wittemberg, where he was in 1802 appointed ordinary professor of jurisprudence. He had previous to this time given great promise of future success as a political writer; and as an invitation from the university of Heidelberg in 1807 held out superior claims to a man of literary tastes to the position which he at that time occupied, he resolved to accept of it. Here he remained till his death in 1843. Zachariae is generally regarded as the ablest modern writer on law and politics which Germany has known. He was chosen a member of the first and second chambers of the Grand-Duchy of Baden, and was ennobled a short time before his death. The following are his chief works:—*Handbuch des Kursächsischen Lehnrechts*, 1796; *Die Einheit des Staats und der Kirche*, 1797; *Handbuch des Französischen, Civilrechts*, 4 vols. 1827; *Vierzig Bucher Vom Staate*, 5 vols. 1820–32; also a new and improved edition of this excellent work was published 1839–48; and *Lucius Cornelius Sulla*, an admirable work, was published in 1834.

ZALEUCUS, a famous legislator of the Locrians, and the disciple of Pythagoras, according to Diodorus. Bentley (*Dissert. Ep. Phal.*), however, has shown this to be a mistake. He flourished (Eusebius *Chron.*) 660 years B.C. Zaleucus made a law, by which he punished adulterers with the loss of both their eyes; and his son offending, was not absolved from this punishment; yet, to show the father as well as the just lawgiver, he put out his own right, and his son's left eye. This example of justice and severity made so strong an impression on the minds of his subjects, that no instance was found of the commission of that crime during the reign of the legislator. It is added, that Zaleucus forbade any wine being given to the sick, on pain of death, unless it was prescribed by the physicians; and that he was so jealous of his laws, that he ordered, that whoever was desirous of changing them, should be obliged, when he made the proposal, to have a cord about his neck, in order that he might be immediately strangled if those alterations were esteemed no better than the laws already established. The authenticity of these stories is in the highest degree suspicious. Yet it cannot be doubted that his laws were severe, and the high reputation of the Locrians for legal order, seems to testify that they must have worked well. It is reported of him, that he violated his own law during a time of public excitement, and on being reminded of it, he fell upon his own sword, declaring that the law should be vindicated.

Zambesi ‖ Zanesville.

ZAMBESI, one of the names given to a large river in South Africa, which has been recently explored by Dr Livingstone. It is the same river that is called Ambesi, Ojimbesi, Luambesi, and Leeambye, at different parts of its course; all the names signifying "the great river," or "*the* river," in the dialects of various tribes. It falls into the Indian Ocean by several mouths, about the middle of the coast of Mozambique; the head of the delta being in S. Lat. 18. 3., E. Long. 35. 57. Beyond a short distance above this point, the course of the Zambesi was entirely unknown till the discoveries of Livingstone. He reached it from the S. at Shesheke, S. Lat. 17. 31, E. Long. 25. 31., and found it there a river 500 yards broad, flowing from the W. Proceeding up the stream, he soon came to a point where it flowed from the N.; and traced its course through the Barotse country, a valley somewhat like that of Egypt, 100 miles long, and from 20 to 30 broad. He traced it as far as the point where the Leeba joins it from the N., S. Lat. 14. 10., E. Long. 23. 35.; the Zambesi itself here flowing from the E. At a later period he traced the whole lower course of the river from the point where he first reached it to the ocean. In this part of its course, the principal affluents of the Zambesi are the Chobe from the right, and the Kafue and Loangwa from the left. Near S. Lat. 17. 52., E. Long. 25. 41., are the remarkable falls to which Livingstone has given the name of Victoria Falls. The river, here 1000 yards broad, is precipitated into a vast chasm, 100 feet deep, and not more than 80 feet wide; and at the bottom is compressed into a channel only 15 or 20 yards broad, and forced abruptly to change its direction. The violent concussion of the water raises lofty columns of foam, and emits a loud noise. Some difference of opinion exists as to whether the Zambesi could be easily navigated, or made the channel of any extensive commerce; but these questions will probably be decided by the result of the present expedition of Dr Livingstone.

ZANESVILLE, a town in the State of Ohio, United States of North America, on the left bank of the Muskingum, 80 miles from its mouth, and 52 miles E. of Columbus. The town is regularly laid out with wide and straight streets, and contains many superior buildings. The county buildings are very handsome, besides which there are fourteen churches, two banks, numerous schools and academies, among which is a free school, founded by John M'Intire, one of the first settlers in the place, and an athenæum, with a reading-room and library of 10,000 volumes. There is here abundance of water-power, and bituminous coal is found in abundance in the adjacent hills. In 1850 there were 1 cotton factory, 2 woollen factories, 1 nail factory, 2 glass-works, 5 ironfoundries, 1 paper-mill, 5 flour-mills, 2 oil-mills, and 5 newspaper offices. The town is connected by bridges with the three suburbs of Putnam, South Zanesville and West Zanesville, on the opposite bank of the river, over which the Central Ohio Railway Company have also erected an iron bridge 538 feet long. This line connects it with Columbus on the one side and Wheeling on the other, while another, the Zanesville,

Wilmington, and Cincinnati line, is in course of construction. It has also, by means of the river, regular steam-communication with Cincinnati and other places. Pop. (1850) 7929, with suburbs 10,355.

ZANTE. See IONIAN ISLANDS.

ZANZIBAR. See AFRICA.

ZARA (the ancient ZADERA), a city of the Austrian empire, capital of Dalmatia, stands on the shore of the Adriatic, opposite the island of Ugliano, 150 miles S.E. of Venice. It occupies a long narrow tongue of land, surrounded on three sides by the sea, and separated on the E. from the mainland by a deep moat, which is crossed by a drawbridge. It has an elongated oval form, is about two miles in circuit, and is surrounded by walls, and otherwise strongly fortified. A main street extends the whole length of the town, dividing it into two portions, each of which is again divided by a cross street, thus forming the city into four quarters. The principal streets are wide and regular, but the others are mostly narrow, unpaved, and dirty. The town is very badly supplied with water. It is the seat of an archbishop and of several provincial courts, has a handsome cathedral, in the Byzantine style, erected in the thirteenth century, five other churches, lyceum, gymnasium, archiepiscopal seminary, midwifery school, lying-in and foundling hospital, arsenal, theatre, &c. There are several rosaglio distilleries, producing the famous maraschino. It carries on an active fishery, and some trade. The harbour on the N.E. of the town is about half-a-mile in length, by from 220 to 250 yards in width, but is rather shallow, so that vessels of 300 tons have to lie in the open sound. Pop. about 8000.

ZARSKOE-SELO, or TSARSKOE-SELO, *i.e.*, Emperor's Village, a town of Russia, government of St Petersburg, and 16 miles S. of that city, with which it is connected by railway. It is chiefly noted for a summer residence of the emperor, a magnificent building, richly fitted up, and surrounded by a beautiful park. The church of St Sophia here is a miniature copy of the mosque of St Sophia at Constantinople. There are also a college, military school, and some manufactures of linen, carpets, &c. Pop. (1856) 10,833.

ZEA. See CEOS.

ZEALAND. See DENMARK.

ZEALAND, a province of Holland, which, besides the islands of Walcheren, N. and S. Beveland, Wolfersdyk, Schouwen, Duiveland, and Tholen, formed in the river Scheldt, includes a section of the continental dominions. It lies between N. Lat. 51. 14. and 51. 45., and E. Long. 3. 8. and 4. 2.; and is bounded on the N. by the province of Holland, E. by that of N. Brabant, S. by Belgium, and W. by the German Ocean. Its length and breadth are each about 35 miles, and its area 667 square miles. The surface is flat and low, being but a few feet higher than the water at half-flood tide. As the shore in this province is not, as in some others, protected against the sea by sand-hills or downs, it has been found necessary to defend it by artificial dykes, which are from 14 to 16 feet in height, with a gentle declivity towards the sea, and nearly perpendicular on the land-side. In front they have placed stakes, which, by dividing the waves, in some measure break their force. The soil of the island is uniformly rich, being clayey, with a fruitful loam, which requires but little manure, and scarcely ever disappoints the hopes of the husbandman. All kinds of corn and green crops come to perfection in these soils. As agriculture is thus productive, there is every year a surplus of food. The wheat, especially in Schouwen, is considered the best in the kingdom; besides which, much rye is cultivated, and likewise barley, which is of peculiar excellence for malting. Beans and pease are raised in great quantities, chiefly for export; and flax is raised to a great extent both for home use and for foreign trade. Madder is a valuable article of cultivation, and that of the island Schouwen is in the highest estimation. The annual export of this dye amounts to more than 20,000 cwt. The dairies yield large portions of good cheese and butter, and great numbers of swine are fattened. The sheep are small, and their wool indifferently fine. The horses are a heavy breed, but strong and tolerably hardy. The climate is moist, and variable, and for strangers very unhealthy, but not so much so for the natives. It snows and freezes much less on the islands than on the mainland. The people adhere to their ancient customs, manners, and dress, and speak a peculiar dialect of Dutch, nearly approaching to that of the Flemings. Many of them are engaged in fishing and other marine pursuits. Their manufacturing industry is chiefly applied to spinning fine linen yarn; and there are many distilleries, breweries, oil-mills, limekilns, salt-refineries, and establishments for shipbuilding. The capital is the city of Middelburg, in the island of Walcheren, and the population of the province in 1859 was 166,483.

ZEALAND, NEW. See NEW ZEALAND.

ZEBID, a city of Arabia, once the capital of Yemen; but its port having fallen into a state of decay, the principal city of the province is now Mocha. It stands on a river of the same name 15 miles from the Red Sea, and 52 miles N. of Mocha. The old mosques and minarets give to the place a magnificent appearance from a distance, and it is still distinguished by an academy, much resorted to by the youth of Yemen. But the town is gradually falling into ruins, and even the stones of the houses are being carried off and sold, to be elsewhere applied to the purposes of building. Pop. 7000.

ZECHARIAH, the eleventh in order of the minor prophets, was "the son of Berechiah, the son of Iddo, the prophet." He seems to have entered upon his office in early youth (Zech. ii. 4). The period of his introduction to it is specified as the eighth month of the second year of Darius, a very short time later than the prophet Haggai. The mission of Zechariah had especial reference to the affairs of the nation that had been restored to its territory.

The Book of Zechariah consists of four general divisions. 1. The introduction or inaugural discourse (ch. i. 1–16). 2. A series of nine visions, extending onwards to ch. vii., communicated to the prophet in the third month after his installation. 3. A collection of four oracles delivered at various times in the fourth year of Darius, and partly occasioned by a request of the nation to be divinely informed, whether, now on their happy return to their fatherland, the month of Jerusalem's overthrow should be registered in their sacred calendar as a season of fasting and humiliation. The prophet declares that these times should in future ages be observed as festive solemnities. 4. The 8th, 9th, 10th, and 11th chapters contain a variety of prophecies unfolding the fortunes of the people, their safety in the midst of Alexander's expedition, and their victories under the Maccabæan chieftains, including the fate of many of the surrounding nations, Hadrach (Persia), Damascus, Tyre, and Philistia. The remaining three chapters portray the future condition of the people, especially in Messianic times.

The genuineness of the latter portion of Zechariah, from ch. ix. to xiv., has been disputed. Among the first to suggest doubt on this subject was Joseph Mede, who referred chaps. ix. x. and xi. to an earlier date, and ascribed them to Jeremiah. His opinion was adopted in England by Hammond, Kidder, Newcome, Whiston, Secker, Pye Smith, and Davidson, and has been followed, with variations, on the continent by Flügge, Bertholdt, Rosenmüller, Eichhorn, Corrodi, Hitzig, Credner, Knobel, and Forberg. On the other hand, the integrity of this portion of Zechariah has been defended by Jahn, Carpzov, Beckhaus, Koester. Hengstenberg, and Blayney.

Zeitz ‖ Zeno.

Many of the arguments against the genuineness of this latter portion of Zechariah rest on peculiar interpretations of his language, making it refer to events that happened prior to the time when the prophet flourished. But this exegesis is not in all points correct.

The language of Zechariah has not the purity and freshness of a former age. Some of its solecisms are noticed by De Wette (*Einleit*, § 249). A slight tinge of Chaldaism pervades the composition. The symbols with which he abounds are obscure, and their prosaic structure is diffuse and unvaried. The rhythm of his poetry is unequal, and its parallelisms are inharmonious and disjointed. His language has in many phrases a close alliance with that of the other prophets, and occasional imitations of them, especially of Ezekiel, characterize his oracles. He is also peculiar in his introduction of spiritual beings into his prophetic scenes.

ZEITZ, a town of Prussian Saxony, capital of a circle of the same name in the government of Merseburg, on the right bank of the White Elster, here crossed by a stone bridge, 22 miles S.W. of Leipzig. It is surrounded by walls entered by six gates, and has a fine old castle called Moritzburg, now used as an hospital and house of correction. It has a cathedral and several other churches, a Calvinistic collegiate institution, gymnasium, a public library, and manufactures of woollen and cotton goods, leather, beer, spirits, and earthenware. It is the seat of various courts for the circle, and has medicinal springs and fine walks in the vicinity. Pop. 12,346.

ZELLE, or CELLE, a town of Hanover, in the province of Lüneburg, on the left bank of the Aller, which here receives the Fuse, and becomes navigable 23 miles N.E. of Hanover. It has an ancient castle, surrounded by a wall and moat, the residence of the dukes of Lüneburg, and for three years of Matilda of Denmark, the sister of George III.; the city church, containing the ducal vault; five other churches; a county hall; a new county hall, completed in 1842; a gymnasium; a lying-in hospital; a large prison; and an excellent national stud, containing many horses of good breed. Wax-bleaching and the making of linen, hosiery, tobacco, and soap are carried on here; and there is a considerable transit-trade, and much navigation on the river. Zelle is the seat of several courts of law, public offices, and an agricultural society. The population of the town proper in 1852 was only 5201; but there are three large suburbs, which raise the total population to 13,152.

ZEMBLA, NOVA. See NOVA ZEMBLA.

ZENO (*Ζήνων*) of Elea, founder of the Eleatic school of speculative philosophy, and inventor, according to Aristotle (Diog. Laërt. and Sextus Emp., *Adv. Math.*) of the system of Dialectic, was the son of Teleutagoras, and was born at Elea (called also Velia, or Hyele), probably about 495 B.C. He was the pupil and the adopted son of Parmenides, with whom he visited Athens, probably about 454 B.C., if we may trust the *Parmenides* of Plato, where he is said to have read one of his great works in the hearing of Socrates, then a youth. According to Strabo, Zeno, as well as his master, was engaged in legislating for Elea. He probably lived till somewhere about 435 B.C. The circumstances of his death are variously reported by different writers. They all agree in this, that he conspired against a tyrant of Elea, who put him to death with great torture. Zeno, we are told, was a wise, modest, truthful man. He preferred the society of his quiet little village of Elea to the grandeur and wealth of the city of Athens. Zeno is described by Plato as a tall and handsome man. Plutarch says he was the tutor of Pericles.

The following are the leading doctrines of Zeno, so far as they can be gathered up from the stray fragments of him which now remain, or from the reports of those ancient writers who profess to have studied him. The prose work (*συγγραμματι* is Plato's word in the *Parmenides*) which Zeno read at Athens, was written in defence of the doctrines of his master Parmenides, who continued and developed the system of Xenophanes. According to Parmenides, all is one, and unity is the sole existence. If all is one, said the empirical Ionians, then there can be no difference among objects. The like is merely the unlike, the unlike is just the like: the great is the small, and the small is the great; motion is rest, and rest is motion. The Ionians, unfortunately, trusted merely to their *senses*, which could only give them plurality. They could find no basis for what Xenophanes, Parmenides, and the rest of the absolutists called unity, within the compass of their philosophy. Hence these materialists denied altogether that such an object had any existence, save in the crazed brains of its advocates. Now, how did Zeno reply to such objections? In place of defending his master directly, he attacked his adversaries by turning on them their own arguments, and by ridiculing the sorry figure which they presented, when stripped of what they most valued. He engaged to demonstrate that all the difficulties raised by the partisans of plurality, against the doctrine of unity, not only were quite pointless, but fell directly upon the system which they were meant to defend. From the empirical hypothesis of the Ionians he was prepared to show, that the unlike could be cogently proved to be the like, and the like the unlike,—doctrines which these philosophers thought they could demonstrate from the premises of the Eleatics. That this is the correct view to take of Zeno's polemic is sufficiently established by Plato (*Parmenides*, Bek., p. 7), and by Simplicius in his commentary on that philosopher. The Ionians could hardly have fared worse at the hands of any of the Grecian sages than they did at the hands of Zeno. He brought a most powerful mind to his task, and, curious to say, subsequent thinkers have very generally agreed in misunderstanding both his reasoning and his method, and it is only of late years that Kant, in his *Antinomies of the Pure Reason* (see *Kritik der Reinen Vernunft*) seized upon the much maligned doctrines of the Eleatic, and held them up to the admiration of all true thinkers as rare examples of acute and just thought. Bayle, in a clever paper on Zeno, in his *Dictionnaire*, makes him, according to custom, a sceptic. Brucker finds that Zeno surpasses his intelligence, and he is content to make him a pantheist. Others, again, have charged him with nihilism. Zeno, fortunately, can afford to sit quite easy to all those affronts offered to his reason. If any objection can be taken to his polemic, it is that he perhaps carries his arguments too far against the existence of empirical sensationalism, which not unlikely raised the idea of his confirmed nihilism in some men's minds.

Zeno.

Here are Zeno's doctrines in brief. He proved irrefragably that unity (or God) is eternal, that it is one, that it is round, that it is neither finite nor infinite, and that it is neither quiescent nor moveable. His celebrated arguments against the possibility of motion, afford a very favourable specimen of his reasoning. There are four of them, and they all take their rise, as Kant and Hamilton (*Lectures on Metaphysics*) have shown, from the inability of the mind to conceive either the ultimate indivisibility, or the endless divisibility, of space and time, as extensive and as protensive quantities. The possibility of motion, however certain as an observed fact, is thus shown to be inconceivable. To have discovered this peculiarity of our mental constitution, and to have stated it with eminent clearness, belongs to Zeno the Eleatic, and to him alone. His four arguments against motion are, in substance, as follows (see Aristotle, *Phys.* vi. 9):—

1. Motion is impossible, for whatever is moved must traverse the intervening space, between where the motion begins and where it ends. Now, as this space merely consists of a series of points, in

Zeno.

each of which the body must successively remain, of course motion is impossible.

2. This argument is that which is known as the celebrated problem of Achilles and the tortoise. It shows that a slow thing can never be overtaken by a swift; that Achilles, starting at any assigned time after a tortoise, cannot by any possibility overtake it, for as the tortoise, by hypothesis, is constantly in motion, and as the space over which it travels is infinitely divisible, Achilles can never overtake the tortoise.

3. That an arrow flying is immoveable; in other words, that motion and rest are identical. For that which occupies a certain space for a certain time is at rest; now the moving arrow does so, hence it is at rest.

4. Motion leads to absurdity. For suppose two bodies, equal in every respect, moved in a given space, and in an opposite direction, with the same force applied to both, and suppose the starting point of the one body to be one extremity of the space, and the starting place of the other body to be the centre of such space, both bodies will reach their destination at the same time; that is, the whole of the time occupied by the body that traversed the whole space was just equal to its half, or to the time taken by the body that merely traversed its half. Hence the whole time is equal to its half, which is absurd.

ZENO (Ζήνων), the founder of the sect of the Stoics, was born about 350 B.C., at Citium, in the island of Cyprus. Clinton assigns his birth to between 357 B.C. and 352 B.C., and his death to between 263 B.C. and 259 B.C., the year given to it by Diogenes Laërtius. This place having been originally peopled by a colony of Phœnicians, Zeno is sometimes called a Phœnician. His father was by profession a merchant, but discovering in the youth a strong propensity towards learning, he early devoted him to philosophy. In his mercantile capacity he had frequent occasion to visit Athens, where he purchased for his son several of the writings of the most eminent Socratic philosophers. These he read with great avidity; and when he was about thirty years of age, or twenty-two according to his disciple Persaeus, he determined to take a voyage to a city which was so celebrated both as a mart of trade and of science. Upon his first arrival in Athens, going accidentally into the shop of a bookseller, he took up a volume of the commentaries of Xenophon, and after reading a few passages, was so much delighted with the work, and formed so high an idea of the author, that he asked the bookseller where he might meet with such men. Crates, the Cynic philosopher, happening at that instant to be passing, the bookseller pointed to him and said, "Follow that man." Zeno attended upon the instructions of Crates, and was so well pleased with his doctrine, that he became one of his disciples. But though he admired the general principles of the Cynic school, he could not easily reconcile himself to their peculiar manners. Besides, his inquisitive turn of mind would not allow him to adopt that indifference to every scientific inquiry which was one of the characteristic distinctions of the sect. He therefore attended upon other masters, who professed to instruct their disciples in the nature and causes of things. When Crates, displeased at his following other philosophers, attempted to drag him by force out of the school of Stilpo, Zeno said to him, "You may seize my body, but Stilpo has laid hold of my mind." After continuing to attend upon the lectures of Stilpo several years, he resorted to other schools, particularly to those of Xenocrates and Diodorus Cronus. By the latter he was instructed in dialectics. He was so much delighted with this branch of study, that he presented to his master a large pecuniary gratuity, in return for the free communication of some of his ingenious subtilties. At last, after attending almost every other master, he offered himself as a disciple of Polemo. This philosopher appears to have been aware that Zeno's intention, in thus removing from one school to another, was to collect materials from various quarters for a new system of his own; for, when he came into Polemo's school, he said to him, "I am no stranger, Zeno, to your Phœnician arts; I perceive that your design is to creep slyly into my garden and steal away my fruit." Polemo was not mistaken in his opinion. Having made himself master of the tenets of others, Zeno determined to become the founder of a new sect. The place which he made choice of for his school was a public portico, adorned with the pictures of Polygnotus and other eminent painters. It was the most famous portico in Athens, and called, by way of eminence, Στοὰ, "the Porch." It was from this circumstance that the followers of Zeno were called *Stoics*.

Zenobia ‖ Zephaniah.

In his person Zeno was tall and slender; his aspect was severe, and his brow contracted. He had not a very original mind, and he was even more eclectic in his philosophy than critical. His constitution was feeble, but he preserved his health by great abstemiousness. The supplies of his table consisted of figs, bread, and honey; notwithstanding which he was frequently honoured with the company of great men. In public company, to avoid every appearance of an assuming temper, he commonly took the lowest place. Indeed, so great was his modesty, that he seldom chose to mingle with a crowd, or wished for the company of more than two or three friends at once. He paid more attention to neatness and decorum in external appearance than the Cynic philosophers. In his dress, indeed, he was plain, and in all his expenses frugal; but this is not to be imputed to avarice, but a contempt of external magnificence. Zeno lived to the extreme age of ninety-eight; and at last, in consequence of an accident, voluntarily put an end to his life. As he was walking out of his school he fell down, and in the fall broke one of his fingers; upon which he was so affected with a consciousness of infirmity, that, striking the earth, he said, "Why am I thus importuned? I obey thy summons;" and immediately went home and strangled himself. The Athenians, at the request of Antigonus, erected a monument to his memory in the Ceramicum. For a full view of the Stoical system of which Zeno was the founder, see the SECOND PRELIMINARY DISSERTATION prefixed to the present work.

ZENOBIA. See PALMYRA.

ZEPHANIAH, the ninth in order of the minor prophets, both in the Hebrew and Greek copies of the Scriptures. The name seems to have been a common one among the Jews. Contrary to usual custom, the pedigree of the prophet is traced back for four generations—"the son of Cushi, the son of Gedaliah, the son of Amariah, the son of Hizkiah." We have reason for supposing that he flourished during the earlier portion of Josiah's reign. At all events, he flourished between the years 642 B.C. and 611 B.C.; and the portion of his prophecy which refers to the destruction of the Assyrian empire must have been delivered prior to the year 625 B.C., the year in which Nineveh fell.

The Book of Zephaniah consists of only three chapters. In the first the sins of the nation are severely reprimanded, and a day of fearful retribution is menaced. The circuit of reference is wider in the second chapter, and the ungodly and persecuting states in the neighbourhood of Judæa are also doomed; but in the third section, while the prophet inveighs bitterly against Jerusalem and her magnates, he concludes with the cheering prospect of her ultimate settlement and blissful theocratic enjoyment. It has been disputed what the enemies are with whose desolating inroads he threatens Judah. The ordinary and most probable opinion however is, that the foes whose period of invasion was "a day of the trumpet and alarm against the fenced cities and against the high towers" (ch. i. 16), were the Chaldæans.

The language of Zephaniah is pure: it has not the classic ease and elegance of the earlier compositions, but it wants the degenerate feebleness and Aramaic corruption of the succeeding era. His style has not the sustained majesty of

Zephyrus || Zhukovsky.

Isaiah, or the sublime and original energy of Joel: it has no prominent feature of distinction; yet its delineations are graphic, and many of its touches are bold and striking.

ZEPHYRUS, the personification of the west wind, was represented as the son of Aurora, and the lover of the nymph Chloris according to the Greeks, or of Flora according to the Romans; and as presiding over the growth of fruits and flowers. He is described as giving a refreshing coolness to the air by his soft and agreeable breath, and as moderating the heat of summer by fanning the air with his silken wings. He is depicted under the form of a youth, with a very tender air, with wings resembling those of the butterfly, and with his head crowned with a variety of flowers.

ZERBST, a town of North Germany, capital formerly of the duchy of Anhalt-Zerbst, now of a circle of its own name, in the united duchy of Anhalt-Dessau-Coethen, stands on the river Nuthe, an affluent of the Elbe, 11 miles N.W. of Dessau. It is a well built town, containing many public buildings, and the fortifications, which formerly surrounded it, have been converted into pleasant promenades. It was formerly the seat of an upper appeal court for the principalities of Anhalt and Schwartzburg, abolished in 1850. Among its public buildings are the old ducal castle, the town-hall, three churches, one of which, St Nicholas, recently restored, is one of the finest Gothic churches in North Germany; an excellent organ, a Roman Catholic chapel, and a Jewish synagogue. It has also a high school for boys and an upper school for girls, an orphan asylum, hospitals, and house of correction. The chief manufactures are gold and silver articles, earthenware, and tobacco. Important horse and cattle markets are also held here. A saline mineral spring was recently discovered here, and handsome baths have been erected. The Empress Catherine II. of Russia was a princess of Zerbst, but was not born here, as is frequently stated, but at Stettin, of which place her father was governor. Pop. (1855) including the populous suburb of Ankuhm, 9979.

ZETLAND. See SHETLAND.

ZEUXIS, one of the most famous painters of antiquity, flourished about 420 years B.C. He was born at Heracleia, though at which of the towns of that name, has been much disputed. He was in Athens shortly after the commencement of the Peloponnesian war; but he found his most munificent patron in Archelaüs, king of Macedonia, who employed him to decorate with paintings his royal palace at Pella. The most famous of his productions are, his "Helen," painted for the temple of Juno, in Croton; "Marsyus Bound," the "Female Hippocentaur," the "Infant Hercules strangling the Serpent," and "Jupiter enthroned, with the Gods standing by." The story of his contest with Parrhasius, in which he produced a bunch of grapes so true to nature that the birds pecked them, is familiar to all. According to the usual account, Zeuxis died from excessive laughter at the picture of an old woman which he had painted; but modern critics are sceptical on the subject. He is considered one of the greatest ornaments of the Ionian school of art, a school which excelled in the imitation of nature, but appealed to the sensual taste rather than to the higher artistic faculty.

ZHUKOVSKY, VASILY ANDREEVICH, an eminent Russian poet, was born near Bielev, on the 29th of January 1783. He gave early indications of very superior talent, and added, at an unripe age, an excellent version of Gray's *Elegy* to the hundred and fifty already in existence in the Russian language. It was as lieutenant of the Moscow volunteers that he wrote his *Minstrel in the Russian Camp*, which was sung with the greatest enthusiasm by the whole of the Russian soldiers. Obliged to quit the army in 1813 by ill health, he retired to the capital, where he received a pension, and where his most popular poems and ballads were written. Among these are his *Svietland*, which is considered on all hands as his masterpiece, and his *Ziudmilla*, an imitation of Bürger's *Lenora*. While there can be no doubt as to the beauty and elegance of the poems of Zhukovsky, one had better not inquire too narrowly into their origin. Southey and Scott, and a good few English poets would have little difficulty in claiming their own at the hands of this polite Russian. But this is a pretty common fault with more Russian poets than Zhukovsky. Buoyed up by real merit, and by a more than ordinary share of court patronage, Zhukovsky might have lived to enjoy an honourable old age. He proceeded to Baden for the benefit of the waters, but he died on the 12th of April 1852. An edition of the works of Zhukovsky appeared in 8 vols. in 1835-37, which was augmented to 11 vols. in 1849, nine-tenths of which are either original poems or poetical translations. An English translation of his *Svietland* has been published by Sir John Bowring.

Zimmermann || Zinzendorf.

ZIMMERMANN, JOHANN GEORG, one of the few Continental writers of the last century whose names are familiar to English ears, was by birth a Swiss, having been born in the canton of Berne in 1728. His father, who was a senator of the canton, brought him up for the medical profession, and sent him to study at the University of Göttingen, which, owing to the talents of the famous Swiss physician, Haller, was then one of the most famous medical schools in Europe. On completing his studies, Zimmermann married a relative of Haller's, and retired to his native town, in which he had been appointed public physician. His duties however were, he found, insufficient to occupy his time, and he wisely devoted his leisure to the cultivation of literature, and published a collection of short pieces in prose and verse, one of which is the first sketch of his famous *Essay on Solitude*. To this succeeded an *Essay on National Pride*, which was highly popular, and was translated into several languages, including the English. A work on medicine, which he published in 1763, was so highly admired, that he was offered the post of physician to the King of England in Hanover; and he accordingly left Switzerland and removed to Hanover. Here he published his *Essay on Solitude*, in its complete form; and it was at once received with every mark of general favour. It was translated into most of the continental languages; and in an English version it acquired, in this country, a popularity which few translations enjoy, but which has somewhat decayed. Zimmermann attended Frederick the Great on his deathbed, and very unnecessarily, if not improperly, published an account of his conversation with him shortly before his death. The breaking out of the French Revolution affected him with a sort of frenzy. He opposed, in the most violent way, the republican principles which were everywhere promulgated on the continent, and lived in constant dread of suffering every outrage which his diseased imagination represented as the inevitable result of democratic rule. When the French invaded Hanover in 1794, his worst fears seemed likely to be realized, and, overwhelmed with consternation and dismay, and wasted to a skeleton with anxiety, Zimmerman died in 1795.

ZINC. See CHEMISTRY.

ZINZENDORF, NICHOLAS LOUIS, COUNT OF, the founder of the *Herrnhuters*, was born at Dresden, in 1700. His father, who had been one of the Elector's councillors, died early, and his education was superintended by his grandmother, a lady of great piety, very largely tinctured, however, with enthusiasm. From her the young Zinzendorf imbibed the opinions of the pietists, then widely prevalent in Germany, and which seem to have taken a strong hold of his mind, even in his earliest years; for it is said that, when a child, he wrote letters to the Saviour, and threw them out of the window, in the expectation that they would thus reach their destination. At the age of ten he was

Ziska. sent to Halle, and from thence he was removed to Wittenberg, by the orders of his uncle, who wished him to be prepared for the active duties of life, and who believed that his pietism might be exorcised by the teaching of the Wittenberg divines, the great opponents of the pietists. Zinzendorf's opinions, however, remained unaltered, and he devoted his time mainly to theological studies. On leaving the university, he travelled in Holland and France, and then returned to Dresden, where he received a post in the government, which he relinquished in a few years from utter disinclination. In 1722 he married, and gave a settlement on his estates to some Moravian brethren. This settlement, on which the name of "Herrnhut" (God's protection) was conferred, gradually increased in numbers, and the count determined to devote himself to their religious instruction. To qualify himself for his work, he underwent an examination in theology, and was regularly ordained. Many obstacles occurred that would have damped the courage of any other; but he persevered. In 1736 he was banished from his native land, the government looking with a jealous eye on his innovations; but this sentence was repealed in 1747. In the meantime, he had been consecrated bishop of the Moravian Church in Berlin, and had set out on his missionary travels. During the course of his journeyings, he visited the West Indies and North America, directing much of his care to the instruction of the native Indians. On his return to Europe, he busied himself in visiting and inspecting the various societies of United Brethren which had been established in different countries, in obtaining for them legal recognition, and in organizing their missions and the administration of their affairs. He also published many works for the edification of his followers, which exhibit a strange mixture of sincere piety and extravagant mysticism, verging at times upon blasphemy. He died at Herrnhut in 1760.

ZISKA, JOHN, of Trocznow, a famous general of the forces of the Hussites, was born in Bohemia about the year 1380. He entered very young into the army, and after distinguishing himself on several occasions, lost an eye in a battle, whence some have supposed he was called *Ziska*, or *One-eyed*. But this is a fiction, as Ziska, or more properly Zizka, was his family name. At length the reformation, begun by John Huss, spreading throughout almost all Bohemia, Ziska placed himself at the head of the Hussites, and had soon under his command a body of 40,000 men. With this army he gained several victories over those of the Romish religion, who carried on a kind of crusade against them; and he built a town in an advantageous situation, to which he gave the name of *Tabor*, whence the Hussites were afterwards called *Taborites*. Ziska lost his other eye by an arrow at the siege of the city of Raby; but this did not prevent his continuing the war, his fighting battles, and gaining several great victories, among which was that of Ausig on the Elbe, in which 9000 of the enemy were left dead on the field. The Emperor Sigismund, alarmed at his progress, caused very advantageous proposals to be made to him, which he readily accepted, and set out to meet Sigismund, but died on the road, on the 11th of October 1424..

Ziska, it is said, ordered that his body should be left a prey to the birds and wild beasts, and that a drum should be made of his skin, being persuaded that the enemy would flee as soon as they heard the sound. It is added that the Hussites executed his will; and that the news of this order made such an impression on the disturbed imaginations of the German papists, that in many battles they actually fled at the beat of the drum with the utmost precipitation, leaving their baggage and artillery behind them. This, we fear, is mere fable. The cruelty of Ziska forms the principal stain on his character. He believed, after the manner of the Hebrews of old, that he was the instrument of Divine vengeance, sent into the world to scourge men for their transgressions. Zittau || Zoology.

ZITTAU, a town of the kingdom of Saxony, circle of Bautzen, on the left bank of the Mandau, not far from its junction with the Neisse, 26 miles S.E. of Bautzen. The town is large and well built, and contains a number of fine public buildings, among which are the town-hall, an elegant building in the Byzantine style, recently erected, the church of St John, and several others. This is the great seat of the Saxon linen trade, which employs many hands in the town and populous vicinity. Woollen and cotton manufactures, bleaching, dyeing, and paper-making are also carried on. It has a gymnasium, a training school for teachers, a trades school, theatre, public library, and a number of charitable institutions. It is connected with Löbau, &c. by railway. Pop. (1855) 11,237.

ZNAIM, a town of the Austrian empire, capital of a circle of the same name in Moravia, on the Thaya, 36 miles S.S.W. of Brünn. It has an old castle, formerly the residence of the margraves of Moravia; several churches, among which is a curious old circular building; a gymnasium; courts of law; manufactories of cloth; and some trade in wine and mustard. Pop. about 5000.

ZODIAC. See ASTRONOMY.

ZOLLVEREIN. See GERMANY and EUROPE.

ZOMBOR, an imperial free town of South Hungary, formerly capital of the county of Bacs, now of a circle of its own name, is situated on the Bacser, or Francis Canal, 8 miles from its mouth on the Danube, and 120 miles S. of Pesth. It has several fine buildings, including a county-hall, town-house, several churches, barracks, and government-offices. It is also the seat of several district courts, and has a Roman Catholic high-school, a Greek ecclesiastical seminary, a sugar-factory, some silk manufactures, and a considerable trade in corn, wine, and cattle. Pop. (1854) 21,601.

ZONARAS, JOANNES, a miscellaneous Greek writer of considerable note, flourished at Constantinople about the beginning of the twelfth century. Under the Emperor Alexius Comnenus, who died in 1118, he rose to the distinction of being nominated great *drungarius*,[1] and chief secretary; but after the death of his wife, he retired to a monastery, and there closed his earthly career. His principal work is his Χρονικὸν, or Annals, deduced from the creation of the world to the death of his imperial patron. The earlier portion of it we cannot easily suppose to be very important; but that which relates to the history of the Greek empire is not without a considerable share of historical value. The *editio princeps* was published by Wolfius, Basil, 1557, 3 tom. fol. This was succeeded by the valuable edition of Du Cange, Paris, 1686, 2 tom. fol.; which was reprinted in the Venice edition of the Byzantine historians. Zonaras is well known to canonists by his work, *In Canones S. S. Apostolorum et Sacrorum Conciliorum Commentarii*, Lut. Paris, 1618, fol. These commentaries are inserted in Bishop Beveridge's *Pandectæ*. Some of his works, one in verse, may be found in other collections. See particularly Cotelerii *Ecclesiæ Græcæ Monumenta*, tom. ii. p. 483, tom. iii. p. 465. A publication more interesting to philologers remains to be specified, *Jo. Zonaræ et Photii Lexica, ex Codicibus Manuscriptis nunc primum edita, Observationibus Illustrata, et Indicibus Instructa*, Lipsiæ, 1808, 3 tom. 4to. The first two volumes contain the Lexicon of Zonaras, edited by Tittmann; the third volume contains that of Photius, edited by Hermann.

ZOOLOGY. See ANIMAL KINGDOM.

[1] See Du Cange, *Glossarium ad Scriptores Mediæ ad Infimæ Græcitatis*, tom. i. col. 334, voc. Δρουγγάριος.

ZOOPHYTES.

Zoophytes. WHEN the word *Zoophyte* began to be used by naturalists, it designated a miscellaneous class of beings, which were believed to occupy the space between the animal and vegetable kingdoms, and in which the characteristics of the subjects of each met and were intermingled. They were of a "middle nature," not because of their outward resemblance to plants, but because they were deficient in the more obvious qualities of animals, and were apparently more influenced by exterior forces than by any volitions springing up within. Almost insensible and immotive, their weak and obscure life was merely regarded as one of vegetation, engendered in them by putrefaction or fermentation, and unsusceptible of the volitions and passions which move and agitate higher entities. Thus the term indicated a mingled life or constitution, and had no reference to figure; but some time after it had been allowed on all hands that the productions in question were "better than mere vegetives," another class of objects, hitherto supposed to be altogether vegetable, was ascertained to be of animal origin; and as their similitude to mosses and lichens, to seaweeds and mushrooms, was undeniable, and indeed so remarkable as to have long veiled their nature from us, so the term zoophyte was transferred to this newly discovered order, and has since been applied by the majority of English authors to it alone. With continental naturalists, however, the word has still its widest application, embracing, in their nomenclature, not merely those polypiferous beings which cover the bottom of the ocean with a singularly exact mimicry of vegetation, but also the star-fishes and sea-urchins, the sea-figs, and sea-nettles or jelly-fish, and even the intestinal worms. It is in this wide acceptation that the word is employed by Cuvier and Blainville; and we use it here with the same latitude, agreeably to the plan indicated in our article ANIMAL KINGDOM.

The zoophytes, then, as defined by Cuvier, form a sub-kingdom co-equal with the two divisions in the animal kingdom named *Radiata* and *Acrita* by Macleay. The classes included in it have less of a common resemblance than the classes of any other sub-kingdom, so that in the great variety of structures which they present to our study, we seek in vain for any one character that shall connect them together. The most general character is that which has conferred upon them the synonyme of "Radiated Animals," given because the organs of locomotion, and even the internal viscera, are arranged very often in a circular disposition round a centre, so as to give a sort of radiant appearance to the whole body, or to some part of it. The nervous system is at the best only rudimentary, and is demonstrable only in a few genera of three of the classes. Thus its existence has been shown in several species of intestinal worms, where it consists of one or two ganglions placed near the mouth, and from which diverge a few filaments, and one or two longer chords that follow down the length of the body. In the more normal zoophytes, the nervous system forms a circle round the oral aperture, whence slender filaments radiate towards the circumference, rarely dividing into a few branchlets, and losing themselves in the parenchyma long before they reach the periphery. But in the larger number of this sub-kingdom no trace of such a system is discoverable, unless, with Macleay, we find it in the "minute granulations" which bespeck their homogeneous, mobile, and irritable pulp, and "which may be considered as the nervous molecules dispersed over, or, as it were, confounded with, the substance of these animals, so as to impregnate the whole with sensibility." This property of animal life they accordingly enjoy in a high degree of development, while their instincts are reduced almost to a nullity; and, in regard to the external senses, it may with truth be said of most of them, that they are "sans teeth, sans eyes, sans taste, sans everything."[1] They are, almost without exception, indolent and slow of movement, some advancing by the writhings and contractions of a soft body; some by the play of invisible cilia, which garnish, in set rows, their appendages; and others by the aid of hollow extensible tentacular suckers; while many among them are rooted, and as fixed as the plants whose graceful forms they seem to envy and strive to emulate. Zoophytes.

There is, according to Cuvier, no true system of a circulation in any zoophyte; but Nordmann has delineated a very beautiful system of vessels, apparently sanguiferous, in some intestinal worms; and a similar one has been shown to exist in the Planariæ, and in some external parasites, as in the genus Phylline. Among the more regular zoophytes, we find very generally a system of aqueducts, which permeate and ramify through the body, but which are distinguished from any circulatory vessels by having a direct communication with the water in which the animal floats. This system is mainly subservient to locomotion; but to a certain extent it must supply the purposes of a circulation in higher organisms, for the fresh currents of water which it leads within the body will oxygenate and render fit for assimilation the nutritive materials that come within their reach and influence. The Holothuriæ afford a good illustration of this double function, for they have two aquiferous systems—one connected with the intestines, and in correspondency with the organs of respiration; the other subservient only to the turgescency and relaxation of the organs that perform the offices of feet. This latter system only, it is said, can be discovered in the star-fishes and sea-urchins; while the vascular canals that ramify like veins through the clear gelatinous bodies of the sea-jellies, originating in the alimentary cavities, and running in divergent lines to the circumference, seem to constitute a system accessory principally to respiration and nutrition. In many fixed polypiferous zoophytes, there are also found ducts for introducing water within the body; and in others, where these aquiferous ducts have no existence, the surface or appendages of the little creature are clothed with minute vibratile cilia, that constitute a real breathing apparatus.

Some families, such as the holothuriæ, the sea-urchins, and several intestinal worms, as well as some polypiferous zoophytes, have a mouth, an alimentary canal, and an excrementitious or anal orifice; others have a kind of stomach with only one orifice, which is by turns a mouth and a vent; in a great number there is merely a digestive cavity, excavated in the substance of the body for the reception of the food, which enters sometimes by one and sometimes by several orifices; and in other zoophytes of abnormal character there is no mouth, and we suppose that these must imbibe their nutritive matter by pores on the general surface.

The individuals of some species of intestinal worms are male and female, but in general the zoophytes are hermaphroditical and oviparous. Some are propagated by a sort of gemmation, or by self-division. Many of them are compound animals—a kind of monster, in which often hundreds of individuals consociate, and are organically connected together, so as to make one living mass or commonwealth,

[1] "Imperfecta veteribus, nec inepte, dicta animantia, destituuntur capite, auribus, naso, oculis, pleraque pedibus; ab insectis itaque diversissima, a quibus dudum removi naturæ cryptogama." (Linnæi *Systema Naturæ*, 1069.)

Intestinal Worms.

that possesses all things in common, and usually shoots up in an arborescent form.

Having premised these few remarks, we proceed to treat of this sub-kingdom under the following divisions or classes:—I. INTESTINAL WORMS; II. ECHINODERMATA or SEA-STARS; III. ACALEPHÆ or SEA-JELLIES; IV. POLYPES, or ZOOPHYTES properly so called; V. RHIZOPODS; VI. SPONGES; and VII. LITHOPHYTES.

[In addition to the true ZOOPHYTES and the remaining classes of the sub-kingdom RADIATA, some members of the sub-kingdom ARTICULATA have been treated of in this article, which was written for the seventh edition of the *Encyclopædia Britannica* by that able naturalist the late Dr George Johnston, whose useful labours amongst the lower orders of animals are well known to the scientific world. The ENTOZOA or intestinal worms are now considered a class of the ARTICULATA, whilst the EPIZOA are looked upon as members of the class CRUSTACEA. Higher in the scale than all the rest are the POLYZOA, which are now placed near tunicated animals in the sub-kingdom MOLLUSCA. The additions made in this reprint of the original article are indicated by being placed between brackets. The INFUSORIA have been treated of under that title. LITHOPHYTES belong to the vegetable kingdom.]

I.—INTESTINAL WORMS.[1]

(*Entozoa; Entelmintha.*)

It affords a striking illustration of the wide diffusion of animal life to have ascertained the fact, that almost every species of the vertebrated orders, and very many of the inferior classes, afford, either within or on the surface of the body, a place of nativity and domicile to one or more living creatures, framed with especial adaptation to the circumstances of their destined abodes. They do not, however, infest every animal indiscriminately; for, on the contrary, the parasites of almost every species are peculiar to itself, or they are confined to a few of analogous habits and structure. There are some partial exceptions. Thus, the fluke (*Distoma hepaticum*), so common in the liver and gall-ducts of sheep and other domestic cattle, is found occasionally in the liver of man, but comparatively so small as to have been sometimes looked upon as a distinct species. The *Ascaris lumbricoides* of man is identical with that found in the horse, the ox, and the sow; his *Trichocephalus* occurs in the ape; the *Cysticercus* of the cellular tissue is common to him and the ape and pig; and the *Strongylus giganteus* has a wide range, not fearing man, and rioting in the kidney of many of the inferior animals. Frœlich took from a tropical parrot an *Ascaris*, which was apparently identical with a worm that Rudolphi found in our domestic pigeon; and similar examples, more especially from among the parasites of fishes, might be instanced.[2] But there is no example of a worm being common to a warm and a cold blooded animal; nor does the same worm ever occur in the mammalia and in birds, nor in amphibia and in fishes; nor, indeed, in the species of any two well-distinguished classes; and so also it is ascertained that the parasites of the carnivorous animals (with the sole exception of the renal parasites) are in every instance different in kind from those of the vegetable feeders.

It must not, however, be concluded, that of the animals liable to the attacks of intestinal worms, every individual is vermigerous. On the contrary, the Entozoa in general are comparatively of rare occurrence, and many are so rare that few helminthologists, of however wide research, have ever met with them. Mr Lawrence has seen a female, who from time to time has voided many hundreds of small worms (*Spiroptera hominis*) from the urinary bladder;[3] but, so far as is known, no other human being was ever so afflicted. Goeze found in the boar a *Trichocephalus*, which Rudolphi has sought for in vain both in wild and domestic swine; and he tells us he had dissected innumerable mice in a fruitless search after their *Trichocephalus*, described also by the first-named naturalist.[4] These are undoubtedly extreme cases, but they place in a strong light the partial and accidental diffusion of these creatures. What circumstances determine them to select one individual in preference to another are unknown, though reasons enough have been stated, of all which it may be safely said that the facts adverse to their admission are almost as many as those in their favour. There is no denying that worms in general often infest the delicate and sickly; that youth is favourable to the evolution of some, and maturity to that of others; and females may be more verminous than males; but the contraries are numerous, and the lovers of statistics have not yet balanced the proportions. A crude farinaceous diet has been much blamed, and we should suppose justly; yet the poor of Scotland, who subsist much on such a diet, are not more wormy than the better fed poor of England. Rich moist pastures are said to be favourable to the generation of the fluke in our sheep and cattle; but this is only the case with some pastures, which, in every district, have acquired this bad pre-eminence, and on which certainly our herds cannot be fed many days without the certainty of being tainted. Salt pastures are, on the contrary, unfavourable or destructive to the fluke and worms in general; nor in man does any cause apparently more certainly predispose the body to their visitation than an unsalted innutritive diet. "Salt," says Dr Paris, "when taken in moderate quantities, promotes, while in excessive ones it prevents, digestion: it is therefore tonic and anthelmintic, correcting that disordered state of the bowels which favours the propagation of worms." And as an instance of the results of its want, Lord Somerville adduces a punishment which formerly existed in Holland. "The ancient laws of that country ordained men to be kept on bread alone, *unmixed with salt*, as the severest punishment that could be inflicted upon them in their moist climate; the effect was horrible: these wretched criminals are said to have been *devoured by worms* engendered in their own stomachs."[5]

The extrinsic causes which give a predisposition to worms are as little known as those which act immediately on the body. Very few avertebrated animals are vermiparous, while there is probably no species of vertebrate that is exempted from parasites. Of the latter class, such species as have been reduced to domesticity, or are retained captive, are more subject to worms than the wild and untamed; and fishes appear to be pre-eminently infested with them. It is not yet determined that the same parasites infest the same animals in different and remote countries, although this is probably the case; but a few facts, relating principally to the human species, seem to prove that climate has a certain influence over their generation. The *Filaria medinensis*, or Guinea-worm, is only found under the torrid zone, in Asia and Africa; and the *Furia infernalis* is peculiar to Lapland.[6] *Ascarides* prevail to such an extent in Abyssinia, as to regulate in some degree the movements

Intestinal Worms.

---

[1] [On the subject of the Entozoa the reader may consult the following works in addition to those hereafter cited:—"Goodsir on the development, structure, and economy of the Acephalo cysts," *Trans. Roy. Soc.*, Edinb. 1844; Dujardin's *Histoire Naturelle des Helminthes*, 1845; Prof. Owen's *Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals*, 1855; Dr P. J. van Beneden's *Mémoire sur les Vers Intestinaux*, 28 plates, Paris, 1858].

[2] Of upwards of 200 species examined by Dr Bellingham, several occurred in six, others in ten, and one in fifteen different animals.

[3] *Medico-Chirurg. Trans.*, ii. p. 382; *Cyclop. of Anat. and Physiology*, ii. p. 124.

[4] *Ent. Hist. Nat.*, ii. part ii. pp. 96, 97.

[5] Paris's *Pharmacologia*, p. 517, Lond. 1820, 8vo.

[6] Rudolphi considers the Furia an apocryphal animal, but in favour of its existence we have to add to the testimony of Linnæus and Solander that of Dr E. D. Clarke (*Travels in Scandinavia*, part i. p. 208).

Intestinal Worms.

of the inhabitants; and in the West India Islands, intestinal worms in general are much more common than they are in Europe. We know, on the evidence of Vallisnerius, that *Ascarides* are very frequent in the calves of Italy; while those born from the cows of Germany, says Rudolphi, are rarely infested with them. Hasselquist tells us that when in Cairo he was told that three-fourths of the inhabitants were diseased with *Tænia solium;* and "I have been informed by my friend Dr Knox," says Dr Hodgkin, "that our troops which were stationed in and near the Cape were generally infested by these animals."[1] Egypt and Africa may then perhaps be considered as the lands of choice of this Tænia, which, however, has spread, though in smaller numbers, over Germany, Holland, England, and France. In the latter country it occurs, but not simultaneously in the same individual, with the *Tænia lata*, Linn.—a species of extreme rarity in the English, Dutch, and Germans, but very common in the natives of Switzerland and Russia.[2] If any evidence can be drawn from the silence of Otho Fabricius, it would seem that the Greenlanders are not subjected to the tape-worm, but they breed the Ascarides abundantly.

Intestinal worms, as their name implies, are found principally in the alimentary canal, and the viscera subservient to its functions. There are species, however, which have their appropriated seats in the cellular and adipose and serous tissues, and in the parenchyma of the most secret organs. One species peoples in myriads the voluntary muscles, and more than one has penetrated the heart; several develop themselves in the lungs and air-passages, in the liver, the kidneys, and the brain; one or more have entered the blood-vessels or aneurismal tumors connected with them;[3] some float in the humours of the eye; and more than one loathly worm bathes unharmed in the acrid excretion of the urinary organs. If indeed we except the bones, the cartilages, and ligaments, no organ seems exempted from the occasional attacks of worms, unless it be the spleen, in which, according to Rudolphi, no worm has yet been discovered ever to take up its abode. These parasites may in one sense be considered as accidental, since they are found in certain individuals only of the species they infest; and there can be no doubt, although their evil deeds have been frequently much exaggerated, that they become not seldom the cause of serious or fatal disease. And here we may cursorily notice an opinion which has found its advocates in every period of the history of medicine, that most contagious diseases, fevers, and plagues, originate from animalcules introduced into the body, and are propagated by their communication to other bodies through the medium of the atmosphere. Linnæus was a believer in this hypothesis, which has recently been supported, with much ingenuity, by Dr Holland, who, however, properly remarks, that "though the course of discovery has recently been approaching, in some points, nearer to the hypothesis in question, it still furnishes nothing beyond stronger presumptions and more numerous analogies" in its favour.

If animalcules can be so pernicious—and we admit that no more probable cause of many pestilences, and especially of cholera, has been assigned—their influence is, according to physiologists, more than counterpoised by the share which another class of them has in the continuance and propagation of the species. This class is by naturalists named the *Spermatozoa*, of constant and invariable presence in the seminal fluid of every animal capable of propagating its kind; but they are absent in that of the mule, and of other animals which may be sterile from age or the season of the year. Like the accidental Entozoa, the Spermatozoa of every animal has its peculiar characteristics, but the differences between them are comparatively slight. "They all agree in having slightly oblong and flattened heads, with lengthened tails, tapering so as to become nearly or quite invisible with the best glasses; they possess active powers of motion, and are evidently endowed with sensation. No trace of organization has yet been discovered in them, probably on account of their extreme minuteness. Whether essential to generation or not, they may be regarded as the parasites of the tubuli semeniferi."[4]

Intestinal Worms.

The origin of the Entozoa within animal bodies, and their viscera, has for long been the subject of much debate and curious speculation. It was a hasty disposal of the question to say that they were no other than the worms of stagnant waters, of marshes, and of vegetable roots, introduced within the body, either in their perfect or egg state, but altered in their appearance and character by the genial heat and other novel circumstances by which they were now surrounded. Though this explanation had the support of Linnæus, and has lately found a strenuous advocate in one of the most learned men that ever graced the medical profession, it has been long known to be quite untenable; for no fact is better ascertained than that intestinal worms are found solely in animal bodies, where only they can live and propagate. The instances to the contrary which have been alleged, of tape-worms and flukes living in marshes, and of earth-worms in our bowels, are known to rest on fiction or incorrect observation; so that, in the discussion of the question, it must be assumed as a fact, that the worms are born in, and peculiar to, the places where we find them. This assumption presented no difficulty to the earlier naturalists, who were unanimous in the belief that all worms were the results of a putrefactive process;

> putrefaction into life ferments,
> And breathes destructive myriads;

or of spontaneous generation; the spawn of a superabundant phlegm, vivified by the heat and fermentation of the belly. But to this ancient doctrine the experiments of Redi on the generation of insects gave the death-blow.[5]

To explain the beginning of these worms within the body on the common doctrine that all created beings proceed from their likes, or a primordial egg, is indeed so difficult, that the moderns have been driven to speculate, as our fathers did, on their spontaneous birth; but they have revived the hypothesis with some modification. Thus, it is not from putrefaction or fermentation that the Entozoa are born, for both of these processes are rather fatal to their existence, but from the aggregation and fit apposition of matter which is already organised, or has been thrown from organised surfaces. Thus Buffon applied his doctrine concerning organic molecules to account for their genesis. Milk, he tells us, "consists entirely of organic and prolific matter, which, when not properly digested by the stomach, and applied to the nourishment and growth of the body, assumes, by its natural activity, other forms, and produces animated beings or worms:" hence their commonness in the bowels of children; and their origin in the most hidden organs has the same source, for the "living organic particles" may, from various causes, be forced too abundantly to any part of the frame, and living creatures in that part are the result of their union. Rudolphi has adopted an opinion

[1] *Lectures on Morbid Anatomy*, vol. i. p. 200.

[2] Rudolphi, *Entoz. Hist.*, ii. part ii. p. 72, comp. p. 162.

[3] "On Animals in the Blood," see the *Lancet* for August 1840, p. 778.

[4] Hodgkin's *Lectures*, vol. i. p. 213. On these animated bodies the reader will find ample information in Blainville's *Manuel d'Actinologie*, 573, &c.

[5] Of various hypotheses of the earlier writers Le Clerc has given an excellent account in his chapter xiv., "On the Origin of Worms in Animal Bodies." (*History of Worms*, trans. p. 329, &c.)

Intestinal Worms.

very similar to that of Buffon; for it appears to him that the objections which their history furnishes to a belief in their sexual propagation are insurmountable, and that we must of necessity believe in their spontaneous appearance, or rather in their production from the fit apposition of organic particles that have not been assimilated with the parent body, or from the separation from it of organized particles, which, retaining their proper life, become the germs of an entozoan in situations and under circumstances favourable for their development and metamorphosis. Their origin in this manner is not more wonderful, or more inexplicable, than that of many of the inferior animals from sections of themselves. The Nais, the Planaria, and the Hydra, furnish examples of animals of as perfect organization as worms being thus propagated; for if a small portion is cut away from any species of these genera, and placed in a suitable position, it will continue to live and grow, and develop new organs, until it has acquired in every respect the form and structure and habits of the animal from whence it was separated. Now particles of matter fitted by digestion, and their transmission through a living body, for immediate assimilation with it, or flakes of lymph detached from surfaces already organised, seem neither to exceed nor fall below that simplicity of structure which favours this wonderful development; and the supposition that, like the morsels of a Planaria, they may also, when retained in contact with living parts, and in other favourable circumstances, continue to live and be gradually changed into creatures of analogous conformation, is surely not so absurd as to be brought into comparison with the metamorphoses of Ovid. It is a speculation fairly open to inquiry; and indeed one main argument in favour of the spontaneous generation of Entozoa, is the admitted inadequacy of all other hypotheses to explain the facts. Is it possible to believe of a worm which has been found, during the nineteen centuries of the world's age, in one or a few individuals only, that its eggs can have been transmitted from generation to generation, and be thus so very rare in its perfect state? But we have one proof at least that a change of condition in an animal is capable of generating a worm, for a good authority assures us that a parasite found in the flesh of the domestic swine is not to be found in the wild race;[1] and Dr Jenner ascertained that he could produce hydatids and fluke-worms at will in rabbits, by feeding them *solely* on green succulent food.[2] How but from innate workings are we to explain the first origin of worms that have neither sensual organs nor ova, but, like the hydatid, increase from buds that pullulate from the inner surface of the vesicle that contains them? And Rudolphi has even seen what he believed to be young nascent Tæniæ germinating from the villous surface of the bowels. We think the hypothesis is supported also in some degree by the fact, that the origin of Entozoa in general is favoured by all causes which tend to disturb the equality between the secerning and absorbent systems. Thus there is great reason to believe that some inflammatory action of the liver, of the eye, and of other wormed viscus, precedes the evolution of parasites in them; and it is well known that a morbid state of the alimentary canal, especially an abundant secretion of unhealthy mucus, is connected with the production and increase of all intestinal worms, so much so that Broussais believes an inflammatory state of the mucous membrane to be even an essential condition to their existence. It is obviously necessary to suppose that there are unknown conditions or laws regulating this the spontaneous growth of worms within us, so that a certain uniformity in the products is the result; but it seems not more difficult to admit the existence of such laws, overruling the destiny of unappropriated organic matter, than their existence and rule over the shred of a Planaria severed from another's body. That there are such laws of regulation, we infer from the fact that the detached portions of a Planaria, a Hydra, or a Nais, invariably evolve into their respective species; and from the analogous fact that the worms of the different cavities and textures are usually dissimilar, as might have been expected from the dissimilarity in the structures from which their unformed and unseminated embryos are separated.[3]

Intestinal Worms.

The variety in the exterior forms of intestinal worms is sufficiently great to form the basis of their classification into subordinate divisions. Thus we have the round or cylindrical worms (*Nematoidea*); the sacciform, with prickly proboscides (*Acanthocephala*); the flat or fluke-worms (*Trematoda*); the tape-worms (*Cestoidea*); and the cystic or hydatids (*Cystica*). In very few of them are there any external appendages, either to diffuse or heighten their sensibilities and perceptions, or to assist in locomotion;[4] but we can distinguish in all of them a head, a body, and an anal extremity; in some there is a neck; in the Trematodes, one or two ventral suckers; and in some the organs of generation are protruded. The skin is commonly white, smooth, thin, and moist, but coriaceous in many of the Acanthocephala, and sometimes roughened with reverted prickles. Minute black points, suspected to be visual organs, bespeckle the anterior extremity of some non-parasitical genera (*Planariæ*), often classified with the flukes; and similar specks have been discovered on a few true Entozoa at certain stages of their development. Thus they are of a brilliant lustre in the *Phanoglene* and *Enchelidium;* and traces of them are visible in the *Gyrodactylus auriculatus*, in several *Cercariæ*, in the *Polystoma integerrimum*, in the young of many *Distomæ*, *Monostomæ*, and *Amphistomæ*, and in the *Scolex polymorphus*.[5]

The internal structure of the Entozoa is as various as their outward form, and in some degree of harmony with it, as will be proved when we come to explain the characters of their classification. It ranges from a homogeneous structureless tissue, such as composes the whole of a zoosperm, to that of an animal with organs of defined limits and function, such as we find them in a nematoid-worm, where there are distinct muscles, a perfected apparatus of digestion, and a system of generation on male and female individuals. In a very few intestinal worms, anatomists have recently demonstrated the existence of a slightly developed nervous system. In others, there exists a system of vessels, in which an obscure circulation of a colourless fluid has been seen; but in none of the class is there any trace of a distinct respiratory organ,[6] the functions of which are performed by the skin or surface. The genera whose habitat is the alimentary canal, may have a slightly oxy-

---

[1] *Cysticercus cellulosæ:* "The fact of its being found in the swine which man has domesticated, and not in the wild race, appears to furnish an instance of organised bodies which have been formed long after the general creation." (Blumenbach's *Elem. of Nat. History*, trans., p. 243.) The fact has been contradicted, but the history of insects and infusory animalcules furnishes us with many similar, so that the argument is not invalidated.

[2] *Cyclop. of Pract. Medicine*, vol. ii. p. 438.

[3] The reader will find the subject discussed at great length by Rudolphi in cap. xviii. of his *Historia Nat. Entozoorum*, vol. i. pp. 370–416.

[4] The *Phanoglene*, which lives in the larvæ of some neuropterous insects, has some prolongations like antennæ; and Diesing has described some genera (*Ancyracanthus, Heterochoilus*) with heads furnished with filaments of various forms.

[5] Lamarck's *Anim. sans Vert.*, iii. p. 546, note 1, 2d edit.

[6] Respiratory tracheæ, similar to those of insects, have been ascribed to some of the nematoid worms, but erroneously. See Rudolphi, *Entoz. Synopsis*, p. 579, &c.

Intestinal Worms.

genated atmosphere to breathe;[1] but such as live in the muscles, in the humours of the eye, or in the brain, no uncombined air can reach; and we are forced to conclude that all the oxygen they require for existence is communicated to them through the fluids they feed on, or from the blood as it circulates over the surfaces with which they are contiguous, or from the medium in which they float. They doubtless require but a small supply, for the heat that is involved by respiration in other animals is here furnished by the warm abodes they live in; and their food, consisting of chyle, lymph, and excretions in a recent state, is already half prepared for assimilation. We know that their food must be of this soft and liquid nature; for many worms, having no oral aperture, seem to imbibe all their nutriment through minute pores in the skin, or by the process of endosmose; and the whole of what they imbibe is probably assimilated. Even in such worms as have a mouth, this is never armed with cutting or triturating instruments, but constitutes a simple pore for the entrance of a soft material upon which suction can operate. As in the nematoid worms there is both a mouth and an anus, we may conclude, that of their food some part is feculent and excrementitious; and the same inference may be made from every species of similar structure. The Trematoda or flukes have no anus, and their mouth is certainly ill defined, but they have an alimentary canal, ramified in a dendritic fashion; and Rudolphi believes it to be proved, by the colour of the matter in these vessels, that their food is also partly excrementitial, for the worm, naturally colourless, is often dusky, or variously tinctured by the nature of its food.[2] It is singular that this order appears to receive no part of its nourishment from cutaneous absorption, a mode of supply very general in the class, and especially remarkable in the order Acanthocephala. When a specimen of an Echinorhynchus is taken fresh from the bowels, it is small, flattish, and flaccid; but shortly after being immersed in a glass of water, it has become larger, swollen, and distended like a sac; and the most conclusive experiments have proved that the water of distention could only have passed inwards through the skin, the structure of which is peculiarly adapted to the office. If any part of the skin of the *Echinorhynchus gigas* is held up opposite to the light, and examined from the internal side with a common lens, we perceive a remarkably elegant net-work of vessels, sprinkled over with minute pearl-like vesicles, which are, as it were, the centres of the anastomosing branchlets, or perhaps merely dilatations of the vessels at their points of coalescence and union.[3]

The nematoid and acanthocephalous worms have distinct sexes; but the Trematoda and many Cestoidea are androgynous, that is, each individual of the species possesses the organs peculiar to both sexes, and may of itself fecundate its ova, although, with regard to some of them, it has been supposed that the union of two individuals is necessary, as is the case with the slug and snail. In other worms, the female or reproductive organs exist alone; and in the cystic Entozoa no generative apparatus has been provided. "They would seem to be gemmiparous, and to have the reproductive power diffused over the whole cyst, at least in the Acephalocysts, in which the young are not developed from any special organ, or limited to any particular part of the cyst."

Intestinal Worms.

The great majority of the higher Entozoa are oviparous; but we have several exceptions among the Nematoids, and one at least among the fluke-worms, which are viviparous. The distinction is however immaterial, for in both kinds the ovaries possess a similar structure, and the eggs accumulate in them in the same fashion. In the oviducts of the viviparous Cucullani, as of the oviparous Echinorhynchi, there are found the same bodies which Rudolphi conjectures to be cotyledons, or little placentæ, into which the ovules are fixed, so that even in this respect no difference exists. The ovules of the oviparous species are of two kinds, containing either an unformed and inconspicuous embryo, or one that is fully formed, but motionless. The ovules of the viviparous species, on the other hand, contain a moveable embryo.

The number of ova produced by a single worm is sometimes prodigious, and almost incredible. *Ascaris lumbricoides* contains, when pregnant, many thousands; *Ascaris nigrovenosa*, according to Goeze, may have 700 living young at a birth; and the *Cucullanus* as many. But what are these to the calculations of Dujardin,[4] who supposes that one *Tænia serrata*, with its 200 articulations, may contain in the united chain not less than twenty-five millions of ova! And it is in fact not uncommon to find eight or ten of these productive monsters in one poor dog. From this fertility we might conclude the numbers within the body of those animals which they infested would be fearfully great; but this is seldom the case, and least of all with those very species that we have instanced as so marvellous in their productive powers. The Tænia or tape-worm is often solitary, and rarely numerous in any individual. It is not difficult to reconcile this apparent contradiction of means and end, when we call to recollection the numerous accidents to which both worms and eggs are exposed, from the nature of their sites; how many undeveloped ova, how many young, how many adults, must daily pass away.

We have already slightly indicated the diseases that may arise from their presence and multiplicity, an injury that some physico-theologists would fain persuade us is countervailed by a series of benefits that animals derive from their parasites. One gravely tells us, that by their motions they cause a gentle irritation in aid of the intestinal functions, which, moreover, may stimulate the other viscera to the discharge of their duties, and prevent their falling into a state of inaction favourable to the commencement and increase of organic diseases. Another insists that the Entozoa drink up the superabundant chyme, chyle, or mucus, in the bowels. Another believes that they were created as a wholesome check on the pride and vanity of man, as trials of his patience and other virtues, and "finally to secure to him an entrance into an immutable and eternal state of felicity when that of probation is at an end, so that the gates of death may be to him the gates of peace and rest!"[5] Now it may be commendable to look for good in everything; but this, we think, is looking rather too far, looking also into a sort of kaleidoscope, in which we see all beautiful though unstable pictures patterned out of worthless things.

---

[1] M. Chevreul, however, found no oxygen in the gas of either the small or great intestines of three different subjects. See Bostock's *Physiology*, vol. ii. p. 490

[2] Dr Drummond doubts whether the colour is dependent on the contents of the intestine. "It is certain that in a mass of individuals (of Echinorhynchus acus) found in the same portion of intestine, considerable diversity of colour prevails; and where there has been only a transparent mucus present, I have found specimens of a pure white, and others of a bright orange." *Mag. of Nat. Hist.*, n. s., ii. p. 519.

[3] Rudolphi, *Entoz. Synop.*, p. 582. See also Owen in *Cyclop. of Anat. and Phys.*, ii. p. 126, and Drummond in Charlesworth's *Mag. of Nat. Hist.*, ii. p. 517, 518.

[4] *Ann. des Sciences Nat.*, n. s., vol. x. p. 34. And so of *Filaria medinensis* Rudolphi writes: "Filariæ nostræ prole quasi farctæ sunt; quod si harum longitudinem illius vero minutiem spectas, fœtuum multa millium millia singulis tribues."

[5] Kirby's *Bridgewater Treatise*, vol. i. p. 331.

Intestinal Worms.

The relationship of the Entozoa with other animals is involved in much obscurity, but we cannot therefore concur with Bäer in his proposal to exclude them from a natural classification of the animal kingdom; nor do we exactly understand Rudolphi's notion when he says they constitute a peculiar fauna, rather than any order or class parallel with the ordinary divisions of systematists. If the zoosperms are to be reckoned distinct beings, they must probably go to throng the chaos of infusory animalcules; and Dujardin has discovered in the earth-worm and in the slugs a parasite (*Albertia*) that combines with the structure and habits of an entozoon many of the peculiarities of the rotatory animalcules. The hydatids may represent the hydraform polypes; the tape-worm the *Cestum veneris* of the gelatinous medusæ; the Acanthocephala have some exterior resemblance to the sipunculidous genera of the radiated animals; the Nematoids, a nearer one to the Annelides; and the Trematoda have, with a very general yet erroneous assent, been made members of a family that embraces the Planariæ—leech-like natives of fresh and salt waters—which Mr Swainson errs no less in arranging with the mollusca. Their affinities being thus so remote and uncertain, we are not surprised to find the classification of the intestina unsettled; but from among the many that have been proposed, we only select two for exposition here; that, namely, of Rudolphi, which has been most generally approved; and that of Cuvier, for this, from its wider scope, will afford us an opportunity of noticing some tribes, remotely perhaps allied to the true worms, but which only now come within the plan originally laid down for our guidance.

Rudolphi confines himself to the proper parasites of animal bodies (*Entozoa*), which, following Zecler and Goeze, he divides into five orders:[1] 1. *Nematoidea;* 2. *Acanthocephala;* 3. *Trematoda;* 4. *Cestoidea*; and, 5. *Cystica.* In our exposition of their characters and genera, we shall reverse Rudolphi's plan, and begin with those of simplest organization.

Order 1.—CYSTICA.

Character.—Body flattened or roundish, continued posteriorly into a vesicle peculiar to one or common to several individuals. Head furnished with two or four bothria,[2] or with four suckers, and a circle of hooked prickles, or with four prickly proboscides.[3]

Genus ECHINOCOCCUS.—An external simple or double vesicle, to the inner surface of which many entozoa adhere, like grains of sand. Of these the body is obovate, and the head armed with a circle of hooked prickles and suckers. The species infest the viscera of man, of apes, and of domestic cattle.

Genus CÆNURUS.—Vesicle simple, containing many adherent entozoa. Of these the body is elongate and flattish, rugose; the head armed with a prickly beak and with four suckers. The only known species (*C. cerebralis*, Plate VI. fig. 8) is found in the brain of domestic animals, especially of sheep, and it is the cause of a disease in them known by the name of the *sturdy*. It is curable by the judicious use of the trephine.

Genus CYSTICERCUS.—Plate VI. fig. 7.—External vesicle simple, containing a solitary entozoon, whose roundish or depressed body passes insensibly into a caudal vesicle. Head furnished with four suckers and a prickly beak. The species are found in quadrupeds, principally in their abdominal viscera. One occasionally makes good its habitat in the cellular substance between the muscles, and even in the eye and brain of man; and the same is very common in the muscles of swine, whose flesh is then said to be *measled*. Blumenbach, as we have before mentioned, asserts that the wild swine are not subject to this disease; but the assertion seems unfounded. "In suis domestici cerebro et omnibus partibus musculosis vulgatissimus occurrit, neque *fero* deest." Rud. *Ent. Syn.*, p. 180, c. p. 547.

Genus ANTHOCEPHALUS.—External vesicle hard and elastic, containing a more delicate one, within which there is a solitary entozoon. Body elongate, depressed, passing into a large caudal vesicle. Head armed with two or four bothria and four prickled rostella. This genus was previously named *Floriceps* by Cuvier, and naturalists in general have preferred that designation. The species seem to be almost peculiar to the fishes of southern climates, nestling in the abdominal membranes and viscera.[4]

Intestinal Worms.

The Cystica are all gemmiparous. In the *Cœnurus*, the gemmæ pullulate from every part of the inner surface of the vesicle, where heads and their necks have been found at different stages of development, and always united together in groups. They appear at first like minute tubercles, having the limpidness of glass, and gradually evolve from this formless condition into their perfect state. Siebold has also traced the evolution of the young in the *Echinococcus*. The primary or maternal vesicle is lined with an extremely delicate epithelium, to which there adhere some limpid, mostly oblong, corpuscles, analogous to those primary buds met with in the neck of the Cænuri. The liquid of the vesicle contains some free Echinococci, within whose bodies, when their coronet of hooks and suckers is everted, nothing more is to be distinguished than some scattered limpid corpuscules. These Echinococci evidently derive their origin from the primary vesicle. On examining the inner surface of it, we notice here and there some minute vesicles, enclosing a mass of delicate granulations, whence the heads of the Echinococci pullulate, either solitary or in groups of from two to seven or more. In fact one portion of the granulous mass forms a small roundish body, which is manifestly continuous with the rest of the mass by one of its extremities. This rounded mass soon acquires insensibly a pear-shape, whence it passes to an oval, while at the same time its attachment to the mass whence it issued becomes more slender and frail. We now begin to discern, in the interior of this body, the circlet of hooked prickles and the limpid corpuscles; and now also the heads of the Echinococci commence to protrude and retract these parts, in doing which the entire body is alternately elongated and shortened. Arrived at this stage of development, the thin envelope that enclosed them is torn, but the young Echinococci do not immediately escape, for they are held to its inner surface by a slender cord proceeding from the envelope, and penetrating within their own bodies at a dimple indented in the posterior extremity. This dimple has nearly the appearance of a sphincter muscle grasping this cord of the envelope. After a short period the cords and the Echinococci separate. On being torn up, the envelope of the young Echinococci shrivels upon itself, the Echinococci are ejected, and in this manner they form a rounded mass, in the centre of which the shrivelled envelope is hidden, and upon which the worms repose, as the polypes do upon their stem. These masses sometimes remain for a space hanging from the inner surface of the maternal vesicle, and sometimes they are detached even before the Echinococci have themselves separated. The granulous mass contained in the vesicle is of the nature of a yolk, whence the heads derive the nourishment necessary for their development by means of the slender cords already mentioned. Siebold thinks it doubtful whether all the vesicles, large and small, that contain heads of Echinococci, and which float at freedom in the maternal vesicle among the freed heads, are detached from the inner surface of the vesicle, or whether some of them do not come direct from the freed heads, these having produced germs of Echinococci in their interior, and become distended by them into vesicles. Hanging from the free vesicles containing heads of Echinococci, he has often seen hooked spinules, which were perhaps the remains of a

[1] *Entozoorum Synopsis*, &c, Berolini, 1819, 8vo.

[2] Bothria are small pits or excavations, with a thickened rim, placed round or near the mouth.

[3] On this order the reader will consult with advantage Dr Hodgkin's *Lectures on Morbid Anatomy*, vol. i. pp. 184–197.

[4] On this genus see some interesting observations by Dr Drummond in the *Magazine of Natural History*, n. s., vol. ii. p. 655, &c., and vol. iii. p. 227.

Intestinal Worms.

former circle of them; nay, he believes that he has even seen the remains of suckers in these vesicles. Still, however, there remains much obscurity on this strange transmutation; and even a greater darkness covers the origin and the propagation of the maternal vesicle. Since the *Echinococcus hominis* frequently presents us with small hydatids enclosed within each other after the manner of a nest of pill-boxes, we are forced to believe that the exterior hydatid is the primordial vesicle, within which the others have been successively evolved; but how? "I can no more answer this question," says Siebold, "than I can account for the existence of the primordial vesicle itself."[1]

Order 2.—CESTOIDEA.

Character.—Body elongate, flattened, soft, continuous, or jointed. Head very rarely simply lipped, usually furnished with two or four bothria or suckers. Androgynous.

Genus TÆNIA.—Body elongate, flattened, jointed. Head with four suckers. The Tæniæ inhabit the alimentary canal, and principally the small intestines, but they have been found very rarely in the liver and gall-bladder. They occur only in vertebrated animals, some of them nourishing two or three species. Of those species which Rudolphi has described without a mark of doubt as to their reality, we find that one infests man, thirty-two the mammalia, sixty-five the birds, six the fishes, and two the reptiles. These numerous species he divides into two sections: first, those with an unarmed, and, secondly, those with a prickled head; but Mehlis has recently shown that many species which are furnished with hooked prickles when young, lose them when they arrive at maturity.

Genus BOTHRIOCEPHALUS.—Body elongate, flattened, jointed. Head subtetragonal, with two or four opposed bothria. Nearly allied to Tænia. Of twenty-four species described by Rudolphi, one is peculiar to man, three to aquatic birds, and twenty to fishes. The genus has been subdivided into several others by De Blainville. The individuals of one of these subgenera, *Dibothriorhynchus*, were affixed by the prickles of their probosces to masses of Ascarides, which again were the parasites of a butterfly.

Genus TRIÆNOPHORUS.—Body elongate, flattened, subarticulated. Mouth two-lipped, armed on each side with two tricuspidate spines. There is but one species, a native both of fresh and salt water fishes.

Genus LIGULA.—In its state before evolution the body is flattened, continuous, very long, grooved down the middle with a furrow; and neither head nor genital organs are visible. In its developed state the body is also flattened, unjointed, and very long; the head armed on each side with a very simple bothrium; and ovaries are seen on the medial line in a single or double series, with threadlike filaments (*lemnisci*). The species are principally the intestinal parasites of birds; two or three kinds are found in fish; and one has occurred in the common seal.

Genus TETRARHYNCHUS.—Plate VI., fig. 6.—Body flattened, unjointed. Head furnished with two bipartite bothria, and protruding four retractile prickly proboscides. The species are all piscivorous, although one has been also found in the stomach of a tortoise, and another in some cuttle-fish. They adhere to the abdominal viscera, to the gills and fins, and even infest the muscles. Bremser is of opinion that the species are Bothriocephali in an imperfect stage of development; and Nordmann believes this opinion to be correct, at least in regard to certain species. On the genus see Drummond in *Mag. Nat. Hist.*, n. s., vol. ii. p. 571, &c.; and Leblond in *Ann. des Sc. Nat.*, n. s., tome vi. p. 293. The latter took a species from the interior of a fluke-worm or Distoma, a true entozoon, the parasite of another of not superior organization, and scarcely of greater bulk. Helminthology is indeed full of miracles. *Lib. cit.*, n. s., tome vii. p. 249–253.

Genus GYMNORHYNCHUS.—Body flattened, unjointed, very long, with a subglobular receptacle for the neck. Head furnished with two bipartite bothria, and emitting four naked retractile proboscides. Found immersed in the flesh of some giltheads (*Bramæ*), and rays or skates (*Raiæ*).

Genus SCOLEX.—Body flattened, unjointed. Head furnished with four bothria. The only species described (*S. polymorphus*) is common in the intestines of many fish and of the Cephalopods. There exists a suspicion that other Scoleces may be metamorphosed into Bothriocephali.

Genus CARYOPHYLLÆUS.—Body flattened, unjointed. Head enlarged, scalloped, two-lipped, the lips superior and inferior. The species is common in the intestines of the carps (*Cyprinorum*).

In the preceding order there were no appropriated organs of digestion, which begin now to be developed. In the majority of the Tæniæ there are two or four canals which run through all the articulations of the long tape-like body, and which, underneath the cephalic knob, are connected together by numerous anastomoses, forming there a sort of network. It is remarkable that no one yet has succeeded in proving any direct communication to exist between these canals and the proboscis. In all the Tæniæ, the Bothriocephali, the Schistocephalus, and in the Triænophorus, the generative apparatus, both fecundating and reproductive, is multiplicate, while it is simple in Caryophyllæus. The orifices of both apparatus are, it seems, always separate. In *Tetrarhynchus epistocotyle*, Nordmann did not find any sexual organs; and the four retractile spinigerous proboscides led by four canals to as many oblong, transparent, muscular reservoirs, which, he conjectures, ought consequently to be considered stomachs. In the posterior part of the body of these animals, the same distinguished naturalist discovered a vascular system composed of several longitudinal canals, and ramified by anastomoses; but no movement of any liquid could be perceived in it. On the posterior margin of the body there is a thick fringe of cilia, which is easily detached.

Intestinal Worms.

The eggs of the Cestoidea are multiform, and vary remarkably in size. According to Siebold, some have a single envelope, and others not fewer than three. The eggs of *Tænia stylosa*, when found in the intestines of *Corvus glandarius*, are quite peculiar in their structure; for they have four envelopes, of which the two external ones are round, the inner one oval, and that which lies between the second and the fourth is very narrow and drawn crosswise, having at the same time two very long twisted diverticula. The eggs of *Tænia cucumerina* deserve also to be particularised, from ten to twenty of them being always placed in a common envelope. The vesicle of Purkinje appears to be wanting in the eggs of the Cestoidea.

The embryo, while yet in the egg, is endowed with certain motions; and Dujardin discovered that the Tæniæ have then six hooked spinules, or horny falciform teeth, disposed symmetrically in pairs. These spinules have no relation, as one is at first disposed to conclude, with the spinules that arm the interior of the extrusile proboscis, or the circumference of the oval aperture, for they exist in the embryos of unarmed Tæniæ, as well as in those which are so provided; nor are the shape and disposition of the two kinds at all analogous.

The articulations of the body are not formed until some time after the embryo has quitted the envelope of the egg, but the first traces of the suckers surrounding the beak are sooner recognisable. It is probable that the little worm from the tench, described under the name of *Gryporhynchus pusillus* by Nordmann, is only the young of one of the Cestoidea, perhaps of a Tænia.

Order 3.—TREMATODA.

Character.—Body flattened or roundish, soft, furnished with suctorial pores. Androgynous.

Genus MONOSTOMA.—Body soft, roundish, or flattened. The sucker anterior and solitary. The Monostomæ live in the abdomen and intestines, and have been found in the muscles, of vertebrated animals. Of the species described in Rudolphi's *Synopsis*, one is from a mammal, nine from birds, ten from fishes, and three from reptiles.

Genus AMPHISTOMA.—Body soft, roundish; an anterior and posterior pore or sucker. Of eighteen species, twelve belong to birds, three to the mammalia, and three to reptiles. The genus has been recently subdivided, or its definition will at least embrace the *Holostomum* of Nitzsch, the *Amphistoma* and *Diplodiscus* of Diesing; and the beautiful *Diplostomum* of Nordmann, found in the eyes of fishes, is nearly related.

[1] See Burdach's *Traité de Physiologie*, vol. iii. pp. 32–34, Paris, 1838.

Intestinal Worms.

Genus DISTOMA.—Body soft, flattened, or roundish. Suckers solitary, one anterior, the other ventral. A genus better known by the name of *Fasciola*. The species are the parasites of every order of vertebrated animals, and are exceedingly numerous, nearly 200 having been described. Of these, the most notorious is the *Fluke* (Plate VI., fig. 9), generally believed to be the cause of the *rot* in sheep, by which disease numerous flocks are annually destroyed. Another species (*Fasciola trachea*, Montagu in *Wern. Mem.*, i. p. 197, pl. 7, fig. 4) breeds in the windpipe of poultry, and produces the fatal distemper usually termed the *gapes*.

The three preceding genera are the heads of a large family, extremely variable in the degree of organisation, but, amid this diversity, always marked by having from *one* to *three* suckers of more or less perfect formation. It is from the number, the form, and the position of these organs that attempts have anew been made to subdivide the family into groups and genera; for many new and extraordinary forms have been discovered since the publication of Rudolphi's work. Our space forbids us to characterise these novelties, but we may mention the *Gregarina* of Dufour, living in groups in the alimentary canal of tardigrade insects; the *Diplostomum*, which peoples the humours of the eyes of fish; the *Cercaria* of fluviatile mollusca, so remarkable for its anomalous mode of propagation; and the *Diplozoon*, the only animal known which is truly double, having two heads and two bodies united at their middle, and in organic connection, and, unlike the Siamese twin, no monstrous production, but a normal species after its kind.[1]

Some of the species in the family are without sex, and seem to be composed of granules lying in a fluid gelatinous matrix, held together by a thin skin, which gives the animal form and consistency. On the contrary, in the greater number of the species there is a digestive apparatus, consisting of a mouth, an œsophagus or pharynx, and an intestine forked or sometimes ramified; but there is no anus, for the ascription of this name to the posterior sucker is founded in error. In several genera we find subservient to the digestive organs a double system of vessels, one closed, the other (furnished with a reservoir, named by some helminthologists the *cisterna chyli*) has a communication with the exterior by means of a caudal aperture, the vent of some secretion. These more complex species are all hermaphrodites, some fecundating themselves, while others copulate after the fashion of the snail. The sexual organs are often very complicated and much interwoven, but they have distinct orifices. The eggs are diversiform, and usually laid anterior to the formation of the embryo. There are some exceptions, however, and at least one species of Monostoma is viviparous. When the embryo is matured, the upper part of the shell of the egg bursts and opens like an operculum, allowing the embryo to pass out; and then it swims about vivaciously in the circumfluent medium by means of cilia that cover the body. We know not what may be the number and the nature of the metamorphoses through which the young passes before assuming the shape of the parent. The young of the *Monostoma mutabile*, observed by Siebold, contained all of them a worm of a peculiar figure, having no correspondency with the figure of the mother, but resembling the cyst of some Cercariæ. Analogy induces Nordmann to believe that this worm within the young is in fact changed into a cyst, from which, under favouring circumstances, the Monostoma is ultimately developed.[2]

Genus TRISTOMA.—*Capsala* of *Bosc.*—Body flattened; two simple suckers in front and a radiated one behind; the mouth emitting a proboscis? between the former. The species infests the gills of various fish. It is occasionally found at freedom in the sea, and has occurred on the British coast.

Genus PENTASTOMA.—Body roundish or flattened; mouth protruding a little hook, placed between the anterior suckers, of which there are two on each side, arranged in a lunated manner. Parasites of the viscera of the quadrupeds. The best known species is found in the frontal sinus of the dog and of the horse, growing to the length of six inches. The sexes are distinct. The name *Linguatula* has been preferred for the genus, of which Diesing has published a monograph, with descriptions of eleven species. Because the sexes are separate, Cuvier gives it a place among the Nematoidea, while Diesing thinks its peculiar structure entitles it to be reckoned the type of a separate order, which he names *Acanthotheca*; and Miram expresses an opinion the same as Diesing's. *Recherches sur l'Anatome du Pentastoma Tœniodes*, in *Ann. des Sc. Nat.*, n. s., tome vi. p. 135. (Plate VI. fig. 5.)

Intestinal Worms.

Genus POLYSTOMA.—Plate VI. fig. 10, 11.—Body roundish or flattened; six suckers in front, a ventral and posterior one solitary. This genus is the type of a family named *Polycotyla* by Blainville. It contains many genera, and among them the Tristoma, and others which have often been classified with the Leeches. The bulk of the species prefer the exterior of animals, especially the gills of fish, to which they adhere by means of the prehensile organs or suckers on the hinder part of the body. All of them are hermaphrodites. The orifices of the genital organs are in front, not far from the mouth. On each side of this there is an oblong or round sucker; in the œsophagus a body resembling a tongue has been distinguished; the alimentary canal is dendritic, without an anus, and all the body is permeated with a double vascular thread, in which there is obviously a circulation of blood, attended with a vibratile motion. Some species are furnished with eyes, or eye-like specks; and the surface of the body is variegated with spots, or tinctured of a deep colour.

Order 4.—ACANTHOCEPHALA.

Character.—Body roundish, utricular, elastic; proboscis retractile, armed with spinules arranged in rows; sexes separate.

Genus ECHINORHYNCHUS.—The only genus of its order, but a very numerous one, for not less than 100 species have been discriminated. They are found in the intestines and other viscera of vertebrated animals, retaining themselves in their position by means of the prickly proboscis,[3] which is not the organ for taking their food, for its extremity is not perforated. The sexual organs are very complex. The ovaries are not attached, but float free in the cavity of the sac-like body. The ova resemble spicula, and appear to be discharged posteriorly through a minute pore.[4] It seems that the species undergo a considerable change in figure in their progress from the embryo to the adult state; and some lose the prickles of their proboscis.

Order 5.—NEMATOIDEA.

Character.—Body cylindrical, elastic, the intestinal tube terminated at one end by the mouth, at the other by an anus; sexes separate.

Genus LIORHYNCHUS.—Body elastic, round; head evalvular; mouth with a smooth protrusile tube. Of the three species mentioned in Rudolphi, one infests the badger, one the seal, and one the conger eel. Diesing has lately characterised several allied genera.

Genus OPHIOSTOMA.—Body round, elastic, attenuated towards each extremity; head with an inferior and superior lip. The *Fissula* of Lamarck. The species are intestinal, and occur in quadrupeds and fishes occupying the swimming-bladder of the latter.

It is probably in the neighbourhood of Ophiostoma that we should place the genus TETRASTOMA of E. Forbes, a strange parasite, "fixing itself by means of four suckers or mouths to the walls of the stomach, and of the vessels of the Cydippe, after interrupting the circulation of the fluids." Mr Forbes first described it as a tongue-shaped organ existing in the stomach of the crystalline medusans, but its parasitical nature was discovered by Major Playfair of St Andrews. See *Athenæum*, Sept. 26, 1840, p. 746.

Genus ASCARIS.—Body round, elastic, attenuated at both extremities; head trivalvulur: spiculum of the male double. The species are numerous, and difficult of discrimination. The most common example of the genus is *A. lumbricoides*, found in the small intestines of man, of the swine, of the ox, horse, and ass. See Plate VI. fig. 3.

Genus STRONGYLUS.—Body round, elastic, attenuated at both

[1] The *Syngamus trachealis* has been adduced as another example in which the male is organically blended by its caudal extremity with the female; but Siebold afterwards discovered that he had been deceived in this description. Lam. *Anim. sans Vert.*, 2de edit., iii. p. 652.

[2] Lamarck, *Anim. sans Vert.*, vol. iii. p. 617, 2de edit.

[3] Of this organ Dr Drummond has given a good description in *Mag. Nat. Hist.*, n. s., ii. p. 520; and some most interesting observations on their economy in vol. iii. pp. 63–71.

[4] See Drummond in *loc. cit.*, p. 523.

Intestinal Worms.

ends; mouth circular or angulated; apex of the tail in the male terminated with a purse-like sheath, whence the penis is protruded.

The *S. gigas* (Plate VI. fig. 4) may be considered the type of the genus. It attains the length sometimes of 2 or 3 feet, and is as thick then as a man's little finger: and it makes one shudder to think that this monstrous worm is occasionally the cankerous inhabitant of the kidneys of man, where it lies rolled up, battening on their flesh, and producing unspeakable torture. It afflicts other animals, as the dog and wolf, and is not confined to the kidneys. It is often found of a deep red colour, dependent undoubtedly on the blood it has sucked from its victims. Of worms excreted with the urine, see cases very interesting to the "greedy hunters after monsters," in Le Clerc's *History*, p. 264, et seq. Also the *Cyclopædia of Practical Medicine*, vol. iv. p. 516.

Genus PHYSALOPTERA.—Body round, elastic, attenuated at both extremities; mouth circular; tail of the male deflexed, winged on each side, ending in an inferior vesicle: penis protruded from a tubercle. The species are few and intestinal.

Genus SPIROPTERA.—Body round, elastic, attenuated at both extremities; mouth circular; penis emerging from between the wings of the spirally involute tail. The species are numerous. One has been said to occur in the urinary bladder of man.

Genus CUCULLANUS.—Body round, elastic, attenuated behind; mouth circular, placed under a striated hood; the male organ a double spiculum. The species infests the stomach and intestines of various fish.

Genus OXYURIS.—Body round, elastic, the posterior part of the female subulate; mouth circular; penis sheathed. The species are few, and confined to quadrupeds. One is very troublesome to the horse; and the worm which perhaps annoys man more than any other (*Ascaris vermicularis*) has lately been removed to this genus.

Genus TRICOCEPHALUS.—Body round, elastic, the anterior capillary extremity suddenly succeeded by a thicker portion; mouth circular; male organ simple and sheathed. "The species inhabit the large intestines, particularly the cœcum of the mammalia; they do not occur in either birds or fish."—Bellingham. The *T. dispar* (Plate VI. fig. 2) is said by Rudolphi to be very common in the large intestines of man. "It is about two inches in length, only one third of which is taken up by the thick part of the animal. This portion has a spiral form in the male, which is furnished with a small penis, protruding from near the tail. In the female, which is oviparous, the thick portion is straighter, and is simply pierced at the extremity. On the continent it would seem that this is the worm which is met with the most frequently in the human intestines. Indeed some of the most distinguished helminthologists state, that they scarcely ever fail to find them. The large intestines are their principal seat, but more especially the appendix vermiformis of the cœcum. Though I have frequently and carefully sought for this worm, I have only once been able to find it. In this instance it was lodged in the mucus filling the appendix of an emaciated and cachetic girl, who had been much exposed to want and hardship." (Dr Hodgkin's *Lectures*, &c., vol. i. p. 207.) Dr Bellingham's experience is very different; he finds it very commonly in the Irish. See his Catalogue of the Entozoa indigenous to Ireland, in the *Mag. of Nat. Hist.* n. s. vol. iv. p. 343, &c.

Genus TRICHOSOMA.—Body round, elastic, very slender, growing insensibly larger to the posterior extremity; mouth a mere point; male organ a simple sheathed thread. Named *Capillaria* by Zeder. The species are found principally in birds, next in the mammalia, and very rarely in reptiles and fish.

Genus FILARIA.—Body round, elastic, linear, elongate; mouth circular; male organ a simple spiculum. The species are numerous, and infest many avertebrated[1] as well as vertebrated animals. They are principally intestinal, but a species has been found in the eye of the horse, another in the eye of man, and another in the bronchial glands. The most celebrated species (*F. medinensis*, or *Guinea-worm*, Plate VI. fig. 1) burrows in the cellular tissue under the skin. It was well known to the ancients; and a portion of the history of it given by Paulus Ægineta may be quoted: "In India and the countries above Egypt, there are bred little dragons, animals like worms, in the muscular parts, as the arms, thighs, and legs, and in children they are in the sides, and plainly move under the skin. But after some time a place nigh the end of the worm suppurates, the skin breaks, and the head of the little dragon comes out. While it is drawn out it causes pains, and especially when it is broke. Wherefore some say that a leaden weight should be hung to the dragon, that the falling out should not be in heaps, but in pieces. Others condemning these, because by the weight of the lead the worm is broken, and causes cruel pains, order the part to be put in warm water, by the fomentation of which the worm comes out, and is drawn out piecemeal by the fingers." Le Clerc's *Hist. of Worms*, p. 242. Freind's *Hist. of Physick*, vol. i. p. 49, &c. Mr Hutcheson gives an account of his having extracted one that measured 3½ yards in length. Good's *Study of Medicine*, vol. vi. p. 653.[2]

Intestinal Worms.

The eggs of the Nematoidea, with a very few exceptions, are of an oval shape when mature. The changes which they undergo in the process of hatching have been minutely described by Siebold, but we can only mention one or two particulars. The covering or shell is colourless and single, but frequently double. The vitelline mass is whitish, and contains, in unripened eggs, a well-marked proligerous vesicle with a proligerous spot. When these immature eggs have passed into the uterus, remarkable changes begin in the yolk, which at this period is a mass of delicate granulations, set in a uniform manner, and completely filling the envelope of the egg. The proligerous vesicle, deeply hidden in the vitelline mass, is obscurely seen, and soon afterwards disappears. On its disappearance, the physiologist is surprised to observe on the vitelline mass those remarkable grooves, the existence of which he had never suspected in any invertebrated animal, and least of all in the Entozoa, and which had been seen only in the eggs of the Frogs (*Batrachians*) by Prevost and Dumas, and some other observers.[3]

The *Intestinaux* constitute the second class of zoophytes in Cuvier's arrangement.[4] He divides them into two orders, so different in their organization that they seem rather to deserve the rank of classes. The first order, the *Intestinaux cavitaires*, have an alimentary canal floating in a distinct abdominal cavity, with a mouth and an anus; but the body of the constituents of the second order, the *Int. parenchymateux*, contains within its parenchyma only ill-defined viscera, having the resemblance mostly of vascular ramifications; and sometimes even these traces of organism are imperceptible. We shall here present a brief sketch of Baron Cuvier's system.

Order 1.—THE CAVITAIRES, *Cuv.*

Epizoa. Owen.

This nearly corresponds with the order Nematoidea of Rudolphi, embracing also the genus Linguatula or Pentastoma, and the Prionoderma, which Rudolphi has placed among his fictitious or obscure species. Cuvier believes that at the end of this order we ought to classify, as a distinct family, the LERNÆÆ of Linnæus, or EPIZOAIRES of Lamarck; but it is now proved that these are really crustaceans, which, in their infancy, do not differ from the new-born Cyclopes, and are equally capable of swimming about; but assuming the character of adhesive parasites, they suffer a deformity that increases with their growth, and conceals their nobler alliances,[5] for they never acquire all the members with which the more normal crustaceans are provided. Of all the paradoxical creatures which the naturalist meets with in his researches, there is none that surpasses or equals these in eccentricity, none more at variance with our notions of animal conformation, and exhibiting less of that decent proportion between a body and its members which constitutes what we choose to call symmetry or beauty. Of these monsters we shall attempt no description; but the figures of a few of them, given in Plate VI. figs. 13–17, will convey some idea of their shapes and variety. They are all external parasites, living on the skin and on the gills of fish, to which they adhere by hooked grasps or claws; and it is presumed that they injure the fish by sucking out their blood. Burmeister, who places them

[1] On the Entozoa of insects consult Léon Dufour, in *Ann. des Sc. Nat.* n. s. tome vii. p. 5.

[2] Its exterior figure might induce us to place after Filaria the genus TRICHINA of Owen, found in myriads in the voluntary muscles of man, but its simplicity of structure scarcely raises it from among the Infusoria, more especially from above the eels of vinegar and paste. On this interesting worm see the elaborate essay of Owen in *Trans. of the Zoological Society*, vol. i. p. 315; and in *Cyclop. of Anat. and Physiology*, ii. p. 114; Hodgkin's *Lectures*, vol. i. p. 211; and several essays in recent volumes of the *Lancet* and *Medical Gazette*.

[3] See Burdach's *Traité de Physiologie*, vol. iii. pp. 59–64.

[4] *Règne Animal*, iii. pp. 245–274.

[5] The males however retain their freedom and powers of locomotion at all ages. See Cuvier, *Règ. Anim.*, iii. p. 255, note 2; and Burdach's *Traité de Physiologie*, tome iii. p. 130.

Intestinal Worms.

among the Siphonostomous Crustacea of Latreille, gives the following synopsis of their genera:—

I. Family Penellina.

Body without Tentacula or Articulated Members.

* Body more or less twisted in an angular manner, unequally thick, and furnished anteriorly with bifurcated arms.
  † Three long corneous arms placed around the mouth: the two anterior, or all the three, forked: the oviferous sac resembling a spirally twisted cord. Lernæa, *Oken.*
  †† Four soft and fleshy appendages placed around the mouth; the anterior forked; oviferous sac cylindrical. Lerneocera, *Blainv.*

** Body straight and of equal thickness; four pairs of cutaneous prominences toward the anterior part, which is prolonged into the form of a neck.
  † Without arms; nor is the tail penniform. Pennicula, *Nordm.*
  †† With arms, and a penniform tail. Penella, *Oken.*

II. Family Lernæoda.

Body with two pincers or prehensile appendages, situated behind the proboscis, and without swimming feet, which are sometimes represented by simple cutaneous prolongations.

* Prehensile apparatus simple, situated at the point of union between the trunk and the neck. Anchorella, *Nordm.*

** Prehensile apparatus elongated, composed of appendages which have the shape of arms, and which are united together near their extremity.
  † Cephalothorax prolonged into a neck.
    § Pincers with hooklets placed on the lower part of the neck, between the arms. Tracheliaste, *Nordm.* Lernantoma, *Blainv.*
    §§ Pincers with hooklets placed at the upper part of the neck, almost behind the head. Branchiella, *Nordm.*
  †† Cephalothorax short, rounded or heart-shaped; pincers, with hooklets, placed immediately in front of the arms.
    § Arms very long and thin: the abdomen elongated, and not jointed. Lerneopoda, *Blainv.*
    §§ Arms very long and thin: the abdomen circular and jointed. Achthere, *Nordm.*
    §§§ Arms short and thick: abdomen not jointed, and verrucose. Basaniste, *Nordm.*

*** No prehensile organs in the shape of arms.
  † Tentacula of two or three joints not formed of articulated feet, armed with hooklets; a pair of jaws and two palpi. Chondracanthus, *Cuv.*
  †† Tentacula with six joints; an eye on the top of the head; three pairs of jointed pincers behind the mouth, which is conical. Lernanthrope, *Blainv.*

After this family there follow, in the system of Cuvier, some genera of marine worms, which are not parasitical, and are undoubtedly members of the family Planariæ. The Nemertes had been previously characterised by Sowerby, and by him named Lineus. It is remarkable for the extraordinary length to which it grows. We have been informed that specimens of thirty feet long have been seen, and have had some in our possession which, when extended, could not be less than fifteen or twenty. It is to be found under stones, coiled up in an intricate mass of a purplish-brown or claret colour, smooth and glossy, of nearly uniform calibre throughout, and free of wrinkles or joints. The head is distinct enough; and underneath it there is a long slit, which is the mouth. The intestine runs the entire length of the body; and, what is very curious, we have a specimen which has swallowed a periwinkle, the shell forming a knob near the middle of the body, reminding us of the appearance of a gorged snake. After the Nemertes, says Cuvier, we ought probably to place the Tubulariæ of Renieri, which are equally large and very much elongated, but which have a small mouth pierced under the anterior extremity; and the Ophiocephales of Quoy and Gaimard, distinguished by having the apex of the snout cleft: and the Cerebratules of Renieri, which differ from these merely in the comparative shortness of the body.

Order II.—The Parenchymateux,—*Cuv.*

Intestinal Worms.

This order is divided into four families. The first is co-equal with the *Acanthocephala* of Rudolphi; the second embraces the *Trematoda* of the same author, with some additions. One of the most extraordinary is the Hectocotyles of Cuvier, a long worm, compressed and enlarged at the anterior extremity, upon which is the mouth, whose inferior surface is garnished with numerous suckers, arranged in pairs; and at the posterior extremity there is a sac, filled with folds of the oviduct. One species, which hides itself in the flesh of the sea-polypus (*Octopus*) is four or five inches long, and has 104 suckers; another of smaller size, and with seventy suckers, is the parasite of the *Argonauta*. The Aspidogaster of Baer is a minute parasite of the mussel, distinguished by having under the belly a lamina, hollowed with four rows of little pits. In this family also Cuvier arranged a multitude of animals which were formerly comprised in the genus Planaria of Müller. They are little worm or leech-like animals, with a soft, compressed, or foliaceous body, found both in the sea and in fresh waters. There is no abdominal cavity. The mouth, placed in the belly near its middle, is furnished, in many, with a protrusile proboscis, which leads into an intestine of a dendritic character, and whose ramifications permeate the whole body. A vascular network occupies the sides; and there is, posterior to the oral aperture, a double system of generative organs. The species are androgynous like the snails, and oviparous. The head is ornamented in most with black specks, which are probably eyes. They are voracious creatures, feeding on animal matter; but, above all, they are remarkable for the facility with which they reproduce any part of the body that may have been lost by accident, or cut away by the curious experimenter. In this wonderful power they equal the Hydra. The species and races are extremely numerous, and admit of much complicated classification.[1] Dugés distinguishes them into the typical *Planariæ*, with a ventral aperture; the *Prostomæ*, which have one orifice at the interior, and another at the posterior extremity; and the *Derostomes*, in which the oral aperture is beneath, but placed considerably forwards.[2]

The third family of the intestinal Parenchymateux is named the Tænioides. It conjoins the orders Cestoidea and Cystica of Rudolphi. The fourth family is the Cestoides, and embraces only the genus *Ligula* of Bloch, parasitical worms found in the intestines of some birds, and of various fresh-water fish. They appear the simplest of all the Entozoa. The body is like a long ribbon, obtuse in front, marked with a longitudinal stria, and finely scored crosswise. There is apparently no external organ; and in the interior we see nothing but the ova scattered in the parenchyma. The species which infests the bream grows to five feet in length; and Cuvier says that the worms are considered in some parts of Italy an agreeable food.

In the bowels of some seals, and birds which live upon fish, there are found certain worms very like the Ligulæ, but in which genital organs have been developed, and even a head similar to that of the Bothryocephalus or tape-worm. Rudolphi hazards the conjecture that these worms of birds are identical with the Ligulæ of the fish, which have acquired their fuller organization by passing from the intestines of the cold-blooded animal into those of a warm-blooded one. There are some facts in the history of other tape-worms which give a colour to this conjecture: and we may just call attention to its bearing upon the question of their equivocal generation.[3]

[Professor Owen's summary of the characters of the class *Epizoa*, and its three orders, is this:—

Body chitinous, vermiform, subarticulated, not always symmetrical; with antennæ and articulated limbs, terminated either by suckers, hooks, or bristles. Vascular system diffused; white blood. No respiratory organs. Dicœcious. Males small or rudimentary; females with external pendent ovisacs. Metagenesis resulting in a usually permanent parasitic attachment on the bodies of fishes.

Order I. Cephaluna. Attachment by cephalic processes, sometimes numerous and complex. *Gen.* Peniculus, Lernæa, Chondracanthus, Lernæocera, Penella.

II. Brachiuna. Attachment by a suctonal disk at the confluent extremities of the last pair of thoracic limbs. *Gen.* Actheres, Tracheliastes, Brachiella, Lernæopoda, Anchorella.

III. Onchuna. Attachment by hooks at the free extremities of the first pair of thoracic limbs. *Gen.* Dichelestium, Lamproglena, Ergasilus, Nicothœ.]

[1] They constitute the class Turbellaria of Ehrenberg, and a synopsis of his arrangement is given in Lam. *Anim. sans Vert.*, 2de ed. vol. iii. p. 609. [As to this class the reader may consult Oersted's *Plattwurmer*, 1844; Memoirs by Quatrefages in the *Ann. des Sciences Naturelles*; and Schmarda's *Neue Wirbellose Thiere*, vol. i. 1859.]

[2] See a description of some British species by Dr Johnston in the *Magazine of Zoology and Botany*, vol. i. p. 529.

[3] *Entoz. Syn.* p. 596.

Echinoder-mata.

II.—ECHINODERMATA.[1]

The Echinodermata have been defined to be radiated animals, with a coriaceous or crustaceous skin, commonly tuberculated, or even spiny, and perforated with holes arranged in regular series, whence issue contractile tentacular suckers. The mouth is either inferior or lateral, and mostly armed with certain osseous pieces that form a circle of teeth within the lip; the stomach is a loose bag, with distinct parietes, and with an intestine or cœcal appendages.; the respiratory apparatus is vascular; and the species are oviparous. This definition, however, must not be too nicely examined, otherwise several animals, which offer but a feeble and partial adumbration of its characters, might be excluded from a class to which they properly belong. The stellated disposition of the organs is generally so remarkble, that fancy will dream the Echinodermata to be the children of night, which have drawn their figures from the stars that presided over their birth; but there are among them some vermiform families which have resisted the planetary influence, excepting only in certain parts around the mouth. Their next most general character is derived from the tentacular tubes which the animals push out from pores drilled in rows between the vertical segments of the thick integument of the body, and withdraw again in part at pleasure: but the character becomes abnormal in some Holothuridæ, which have these suckers pullulating irregularly from the surface; and it fails us altogether in Sipunculus and its allies. The organs in question much resemble the tentacula of the snail, but they are really very dissimilar both in the use and mechanism of their movements: they may be compared to the glass of a thermometer, for they are closed tubes, with a vesicular bulb placed within the body, and they are protruded by forcing the fluid, with which the bulb is filled, up the cylindrical portion. It is not through them, as Lamarck imagined, that the circumfluent water gains access within the body, although it is very true that almost all the Echinodermata contain a large but variable quantity of it, partly flowing through a special apparatus, and partly effused, if we may so speak, into the visceral cavity, bathing the surface of every viscus which may be said to float in it; and since the quantity of this water can be increased or lessened at pleasure, so we find that the contour of all the flexible species is liable to alteration of figure, according to circumstances. When

> "Batt'ning in ease, and slumb'ring life away,"

the skin is rotund and swollen, and the organs are distended and displayed; but if alarmed or removed from their sites, the fluid escapes from them, and collapsion and retraction follows. Other purposes which this water must serve, are its aid in rendering the crude nutritive fluids of digestion fit for assimilation, and its purifying influence over the blood; for we learn from Delle Chiaje, that in all the Echinodermata there is a blood of a yellowish or orange colour, composed of a large proportion of lymph, and a certain number of globules endowed with a self-rotatory motion.[2] In what course this blood circulates has not been determined. Tiedemann, who may be regarded as our best authority on such a point, says that it "moves in a circle, but which is confined to the alimentary sac and ovaria alone. In the Asterias, numerous thin-coated veins, coming from the stomach, the cœcal appendages, and ovaries, unite into a single trunk. This produces a dilatation analogous to a heart, and then ramifies like an artery. In sea-hedgehogs are found, on both sides of the circumvolutions of the intestinal canal, two vascular trunks, the external of which seems to be a vein, and the internal an artery. These two trunks communicate by a dilatation similar to a heart, or by their minutest ramifications. The intestinal canal of Holothuria likewise exhibits an arterial and venous trunk, connected with each other by their smallest ramifications, as well as by a large vascular net-work spread over one branch of the respiratory organ." Delle Chiaje's description of the same system differs considerably; and it is difficult to define the limits between it and the system of vessels for conveying currents of water through the body. Blainville, of distinguished excellence as a comparative anatomist, felt this difficulty. He has concluded that there is no real circulation, and that the sanguineous system of the Asterias, and perhaps even of the Echinida, is nothing else than a system of ramose aqueducts, like the tracheæ of insects; and indeed it appears certain that these vessels communicate with the exterior by orifices more or less conspicuous. But, he adds, it is difficult to say as much of the vessels which we find in the Holothuridæ, for no anatomist has suspected their direct communication either with the arbuscular tentacula, or with the real aquiferous vessels, or with the desidroidal branchiæ; so that in these animals there may be an oscillatory movement of the blood in its special system, but certainly no circulation of it, returning and going to and from a font of pulsion.[3]

Echinoder-mata.

The aquiferous system alluded to must not be confounded with the aquiferous cutaneous tubes that jut out from between the tubercles on the dorsal surface of the star-fishes, but is an internal ramose set of vessels for leading water from the general cavity of the viscera, more especially into the locomotive organs of the animal, and its buccal tentacula. "It is composed of vessels," says Tiedemann, "which commence from a canal placed around the mouth, and spread in rays over the internal surface of the skin, as in Holothuria, or proceed to the chalky covering, as in sea-hedgehogs and asterias. These vessels open in the hollow tentacula,[4] and their vesicular dilatations. They contain a limpid fluid, which is shed over the tentacula during the animal's motions, and causes their increase or shrinking. When the animal draws in his tentacula, the contraction of their muscular coats forces the liquid again into the vessels. The fluid contained in this vascular system is not therefore agitated by a circular movement, but only flows outwards from within, and *vice versa*. This liquid, which is probably derived from the blood, seems at the same time to serve for the nutrition of the skin, of the chalky covering, and the locomotive organs."

With this system, that of respiration is most intimately associated; nor indeed are there any separated branchiæ, either in the star-fish or sea-eggs, whose fluids are aërated by a flow of pure water over their surfaces, and around and within their viscera, driven over them in currents determined by the regulated action of vibratile cilia, which clothe them almost everywhere, as the researches of Dr Sharpey have more especially proved.[5] In the Holothuridæ, anatomists have generally considered as pulmonic certain organs which lie between the long curves of the intestine, and closely connected with it. They are very much branched in a dendroidal fashion in some species, their branches reuniting successively backwards, until they form at last two trunks, or one only, that opens with the intestine into the cloacum; but it seems to show how readily their presumed function can be transferred to the general cavities when we find other species of the family in which these organs are slightly sketched, and some in which their existence is not to be demonstrated.

Lamarck divided this class into three sections or orders:—

I. FISTULIDA. Body elongate, cylindraceous; the skin leathery, soft, and irritable; intestine with an oral and anal orifice, the former encircled with retractile tentacula.

---

[1] From ἐχῖνος, *a hedgehog*, and δέρμα, *the skin*.

[2] Blainville's *Man. d'Actinologie*, p. 65.

[3] Ibid. p. 86.

[4] The feet or suckers are here meant.

[5] *Cyclop. of Anat. and Phys.*, art. "Cilia," i. p. 615.

Echinodermata.

II. ECHINIDA. Body more or less rotund or angular, covered with a shell of immoveable testaceous pieces without projecting arms; anus distinct from the mouth.

III. STELLERIDA. Body depressed, circular or angulated, and divided into arms or rays; the skin creto-coriaceous, tubercular; intestine in some families only, with an orifice distinct from the mouth.

[Professor E. Forbes proposed this arrangement of the Echinodermata in his *History of British Star-Fishes* (1841):—

ORDER I. PINNIGRADA. CRINOIDEÆ. First appearance of cirrhi springing from brachial membranes, which with the true arms form the organs of motion.

II. SPINIGRADA. OPHIURIDÆ. Disappearance of brachial membranes; cirrhi as before; true arms clothed with spines for motion.

III. CIRRHIGRADA. ASTERIADÆ. Arms disappear; body more or less lobed, and lobes channelled beneath for cirrhi, which act as suckers, and are the organs of motion.

IV. CIRRHI-SPINIGRADA. ECHINIDÆ. Gradual disappearance of lobes; cirrhiferous canals appearing as avenues where cirrhi act, as in Order III.; but are assisted by mobile spines clothing the integument.

V. CIRRHI-VERMIGRADA. HOLOTHURIADÆ. Lobes disappear; motion effected by avenues of cirrhi, assisted by contraction and extension of the soft body.

VI. VERMIGRADA. SIPUNCULIDÆ. Cirrhi become obsolete and disappear; motion effected by the contraction and extension of the animal's body.]

Order I.—FISTULIDA, LAMARCK.

(*Holothuridea—Holothuracea.*)

The radiant character of the class is faintly impressed upon this family, being marked with decision only in those parts which encircle the mouth. The form of the body is in general that of an elongated cylinder or pentagon, rather unseemly, and invested with a thick coriaceous tunic, which is sometimes scaly, like the skin of a fish, more frequently of a uniform earthy colour, or white painted with bright red or orange spots. If placed in a vessel of sea-water, we soon observe, issuing from perforations in the skin, a number of papillary tubes, which the animal has the power of extending at will. These are scattered over the body, or more usually arranged in rows, limited sometimes in extent, at other times running uninterruptedly from one extremity to the other. The creature gives perhaps little other evidence of life than what we infer from the protrusion of these organs, and from continual changes in the figure of its body. A species of Holothuria, which we watched for some time, was as changeable in this particular as its native ocean. From a long vermiform cylinder, it would become gradually shortened, and swollen in the centre; then it would relax itself, and again become cylindrical; next one part would be blown out, and another drawn in, with a deep stricture, as if a thread had been tied round; or the contraction would begin near the head, which is then made very narrow, and would spread backwards, the anterior portion recovering its original diameter as the wave of constriction passed away; and sometimes the contraction will spread in the opposite direction. This mutability in form is dependent on the action of the muscles which enter into the composition of the skin, and which are of two kinds: one set forms a series of transverse parallel fibres, lining its inner surface completely with an even muscular coat, while the other set is collected into five or ten strong cord-like tendinous bands, which stretch from the oral to the anal aperture, usually in pairs, but where five only, they are at equal distances.

In this state, it is not always easy to say which is the anterior and which the posterior extremity, for the tentacula and foreskin containing the oral apparatus are retractile, and then wholly concealed. When displayed, the tentacula form a circle, in which all the beauty of the creature centres. They are all alike in some species; in others, two of them are smaller and less divided than the rest, which for the most part are sufficiently branched to be called plumose or arborescent. Whether their functions are the same, has not been questioned; but we may observe, that the less are often alternately pushed out and in when the larger are kept steadily extended. They fringe, and are the continuation of a ligamentous neck; and in their middle we find the mouth, a round aperture, often limited by an interior ring of bony pieces, bound together by a strong muscular ligament, and giving insertion to one half of the longitudinal muscles. The pieces of the ring are ten in number, a large one placed in regular alternation with a smaller, all of them of a fibro-cretaceous consistence, so that, acted upon by the muscles attached to them, they must prove bruising instruments of considerable power.[1] Exterior to and between them, there is a circle of five or more vesicular glands of a linear oblong shape and fleshy nature, the use of which is undetermined; for while Bohadsch and Cuvier regard them in the light of salivary glands, Blainville is tempted to refer them rather to the aquiferous system. The intestine is very long. The superior portion, or that immediately under the osseous ring, from being thicker in texture and a little wider, may be considered the proper stomach, for the remainder is of a cylindrical form and nearly equal calibre throughout. It is tied to the side by a vascular mesentery; and after making a large bend upon itself within the belly, terminates in a cloacum or passage common to it and the respiratory apparatus, and which leads outwards by an aperture opposite the mouth. The only chylopoetic organ attached to the intestine, the salivary glands excepted, is what is presumed to be a liver, under the guise of some penicillate structures, which occupy the space formed by the sinuous bend just mentioned. From this structure, and from the great length of the alimentary canal, we may infer with probability that the food of the Fistulida is of sparingly nutritious quality, while their organization otherwise fits them to be little better than the recipients of that chance fare which currents or accident may bring almost within contact. Bohadsch found the intestine of a large Holothuria, of which he has written an excellent description, filled with sea-sand and the fragments of corallines and fuci;[2] and from matter like this, and the water gulped with it, the necessary nourishment is extracted during its long and lingering course.

The ovaries consist of a bundle of filaments attached to a determinate spot on the side near the middle of the visceral cavity; and notwithstanding their numbers, they have only a single exterior orifice placed in the median line near the head, which it is often difficult to discover from its minuteness. Each ovary contains many ova, of a roundish figure, and apparently immotive, being unclothed with the cilia which move about the eggs of polypes. At the period of their maturation there occurs a simultaneous development of certain very extensible filaments, which originate from near the anus, and are supposed by some anatomists to be the male organs. How and under what form the ova escape is not known. They are occasionally retained in the abdomen and developed there, which has give rise to a belief in their viviparous generation. Thus Bosc affirms, on the evidence of personal observation, that the common species of Holothuria are viviparous; and the same assertion had been made long before by Otho Fabricius in regard to his *H. pentactes*. But the most singular notion has been broached, that these animals do, at their full time, evacuate the entire mass of pregnant ovaries, with

Echinodermata.

[1] "Quæque *lanternæ* in Echinis quasi analoga est, nisi quod amplior sit, et *dentes deficiant*, quibus ea in Echinis armata reperitur." Pallas, *Misc. Zool.* p. 156.

[2] *De Anim. Marin.* p. 86.

Echinodermata.

the other viscera, through the mouth or anus; do, in fact, voluntarily, and from a law of their nature, eviscerate themselves.[1] The fact on which this seemingly absurd conjecture is based is most singular, perhaps unexampled in any other animals. When a Holothuria is placed in a basin of sea-water, it has been seen to emit jets of water from the posterior aperture at regular intervals, the jets succeeding each other at not more than about a minute's interval. This water is undoubtedly what has been rendered injurious by its stay and use in respiration, mixed probably with a considerable proportion from the intestine. But when the water in the basin has become impure, these jets become also less regular; and after evidence of uneasiness, and some unusual motions, the worm will at length vomit up its tentacula, its oral apparatus, its intestine entire and with its appendages, and a large cluster, if not the whole, of the ovaries. And after this complete embowelling, the animal lives for at least six or seven hours; for the empty skin shows, by its motions, that nearly all its irritability remains, and even its power of locomotion is not lost. "Denique, quod magis mirum est, omnia *Hydræ* individua, postquam intestina sua dejecere, septem et ultra horas supervivunt, motu non duntaxat elastico, sed progressivo gaudentia."[2] Sir John G. Dalyell has even proved, by actual experiment, that if this poor embowelled worm is supplied with fresh sea-water at proper intervals it will live to replace all its viscera with new growths, reproduce new tentacula, new teeth, a new stomach and intestine, and all its complicated aquiferous system, so as to be in every respect as it was previous to its wonderful evomition. It is by such miracles that we are brought to exclaim with Pliny, "mihi contuenti sese persuasit rerum natura, nihil incredibile existimare de ea."

The Fistulida are natives of every sea. Blainville believes them to be more numerous on the coasts of cold or temperate countries than under or within the tropics: but the data for such an opinion are unsatisfactory.[3] They abound in the Mediterranean, and are scattered over the German Ocean. The more remarkable species live at considerable depths, and come rarely under the notice of the zoologists; but some are littoral, lurking among sea-weed and in the crevices of rocks, while others burrow in the sand. They appear to be gregarious, and are evidently by their organisation very limited in their powers of locomotion. When they reluctantly remove from their sites, it is by the aid of their tentacular suckers; thrusting these forward to the utmost, they fix them to the ground, and drag the body on at a pace slower than the shadow on the dial. By the same organs they retain themselves in their natural positions, and effect a safe anchorage when the sea is agitated to the bottom. Otho Fabricius says of Holothuria pentactes, that it can swim,[4] a sort of exercise which the structure of the creature would not lead us to predicate; but the fact appears to be confirmed by Bosc, who tells us that the Holothuriæ swim slowly, as much by a kind of vermicular motion as by that of their tentacula, and the faculty which they possess of inflating the body at will.[5]

We learn from Delle Chiaje, that some of the Holothuriæ are eaten by the poor inhabitants of the rich shores of Naples; and the Sipunculus edulis (Lumbricus edulis, *Pallas*) serves as food for the Chinese who inhabit Java, and who search for it in the sand, with little bamboo sticks prepared for the purpose.[6] Their appearance is to us loathly, and they breathe no Sabæan odour; yet the celebrity of the *Trepang*, a species of Holothuria, must rescue the family from contempt in the eye of every liberal epicure, who, rising above national prejudices, allows his Chinese brothers to extol unchecked their treasures of the stormy seas. "This animal," says Professor Jameson, "is used very extensively by the Chinese for culinary purposes. They make of it a very rich and palatable soup, and dress it in different kinds of stews. There are various modes of curing it. It is first gutted and the water pressed out of it, and then laid in dry lime, called by the natives *chunam*; afterwards, according to the circumstances of the fishing station, dried in the sun, or on stages by means of fires of wood under them. It is a most important article of commerce, and is the most considerable article of the exports of the Indian islands to China, unless, perhaps, pepper. There are fisheries, as they are called, of trepang, in every country of the Indian Archipelago, from Sumatra to New Guinea. It has also within these last few years been discovered abundantly on the coasts of Ceylon and the Isle of France, and is no doubt general throughout those seas. It has, as we are informed, already been sent from thence to China, where it finds a ready market, although, from its being unskilfully prepared, it is classed with the lowest qualities of the Archipelago. When the Chinese can be employed in fishing and preparing it, there is little doubt that it will form an important article in the commerce of those countries with China, as it can be got in any quantities." After some farther details relative to the mode of fishing and curing it, the professor adds, "the whole quantity sent to China from Macassar, and other parts of India, may be estimated at 14,000 peculs. Taking this quantity at the low average of forty dollars a pecul, and valuing the dollar at 4s. 3d., its entire value, in a commercial view, is L.119,000. Notwithstanding this enormous export to China, we do not understand that its value in the market has ever been materially affected by the quantity imported; an evident proof that the demand of the market still exceeds the supply. When we reflect that the opium, pepper, birds' nests, sharks' fins, trepang, and various other articles, the products of the countries under our control, are fully as indispensable to the Chinese as the teas of China are to Europe, the fear so much entertained of the Chinese interdicting our trade with that empire is quite preposterous. In short, these few articles of luxury give us the command of the Chinese tea market. The celestial empire cannot exist without its trepang and birds' nests."

The systematic arrangement of the order has kept increasing in complexity with the discovery of new species, and their minuter examination. Linnæus found two genera sufficient in his time, viz., "SIPUNCULUS—corpus teres, rostro cylindrico angustato;" and "HOLOTHURIA—corpus ore antico, tentaculis carnosis antice cinctum."[7] Pallas referred the latter to Actinia, of which they formed a section, distinguished by having two apertures to the alimentary canal; for it was the opinion of this great naturalist that differences of structure, which, in higher grades of animals were justly reckoned to be of generic value, were in worms to be deemed not more than specific.[8] The family, nearly as we view it, was first defined by Lamarck, who made it embrace five genera, that stood in three separate sections thus:—

*1. Actinia:
** 2. Holothuria; 3. Fistularia;
*** 4. Priapulus; 5. Sipunculus.[9]

In the *Règne Animal*, the Echinodermata form two orders, the pedaneous and the apodous. The Holothuries are one of the families of the first, while the species which Lamarck would have referred to his third section constitute the entire second order. Cuvier throws the Holothuries into unnamed groups, from peculiarities in the distribution of the tentacular suckers; and his apodous genera

[1] Bohadsch, *de Anim. Mar.* p. 88.
[2] Ibid. p. 86; also *Edin. New Phil. Jour.* viii. p. 47.
[3] *Man. d'Actinologie*, p. 189.
[4] "Alius etiam in libero mari trans littora natare conspicitur, tentacula sua extendendo et complectendo." *Faun Groenl.* p. 353.
[5] *Hist. Nat. des Vers*, ii. p. 148.
[6] Griffith's Cuvier, *Moll. and Rad.* p. 455, pl. 12, fig. 3.
[7] *Syst. Nat.* edit. 12, p. 1072.
[8] *Miscell. Zoolog.* p. 72.
[9] *Anim. sans Vertèbres*, ii. p. 528.

Echinodermata. are Molpadia, Minyas, Priapulus, Lithodermes, Siponculus, Bonelia, and Thalassema.[1] The latter is now generally allowed to belong of right to the class Vermes.

Latreille's arrangement is little other than the reduction of Cuvier's to named divisions, as will appear from the following outline of it.

CLASS—HOLOTHURIDA.

Order I.—APODA.

Fam. 1. *Lombriciformia.* Mouth unarmed. Genera — Bonellia, Siponculus, Miniada.
2. *Veretriformia.* Mouth armed with osseous pieces—Priapulus, Molpadia.

Order 2.—POLYPODA.

Fam. 1. *Vagipedes.* Feet scattered over the whole body. Genera —Holothuria, Actinopoda, Fistularia.
2. *Inferipedes.* Feet ventral only.—Phantapus, Phalloide.[2]

Blainville's method of classifying the proper or pedaneous Holothuridæ is exhibited in this neat synoptical table:

Body { flattened, with suckers underneath.....*Cuvieria.*
subprismatic, with inferior suckers.....*Holothuria.*
fusiform, with scattered suckers.....*Thyone.*
vermiform, with pinnate tentacula.....*Fistularia.*
subpentagonal, with suckers in ambulacra.....*Cucumaria.*[3]

But the host of species discovered within these few years, during the voyages undertaken for the promotion of the natural sciences, has proved the inadequacy of these systems; and although the researches of Jæger and Brandt, with ample materials at their disposal, have brought into operation characters of a higher value on which to found a better arrangement, that good work has not yet been satisfactorily accomplished. The characters on which the naturalists mentioned have proposed to proceed, are derived from the absence or presence of the tentacular suckers, their homologous structure or dissimilarity, the existence or not of the aquiferous branchial apparatus, the pattern after which the suckers are disposed, the floating character or adhesion of the respiratory organ, and lastly, the variations in the tentacula which guard the mouth. Guided by these characters, whose importance is in the order stated, Brandt has worked out a genealogy of the family, perplexing from its numerous subdivisions; but it is confessedly the basis of that lately offered to us by Blainville, and which we now analyse; for, however dry and barren such tables may seem to be, it is really from their careful study that the student obtains his clearest view of the forms and general structure of the species. "The use of synoptical tables in every branch of science," says Mr Duncan, "is obvious. They afford great aid to memory; but also, on frequent review, they suggest continually to the inquiring mind new traces of undiscovered relations."[4] Blainville's new method of distributing the species, then, is as follows:[5]—

A. H: VERMIFORMES.

Body elongate, soft, vermiform; the *feet* small or none.

No suckers; tentacula pinnate.....1. SYNAPTA, *Eschscholtz.*
No suckers; tentacula pinnatifid.....2. CHIRODOTA, *Eschscholtz.*
Suckers small, in five bands.....3. ONCINOLABES, *Brandt.*

These species are closely connected with the apodous Entomozoa by the Siponculus, the Priapulus, and perhaps even the Molpadia. Their tentacula are continually in motion, moving towards the mouth. There is no cloacum, the anus being strictly terminal; and there is no aquiferous respiratory dendroidal apparatus.

B. H: ASCIDIFORMES.

Body short, coriaceous, convex above, flattened below, with the *orifices* superior rather than terminal.

The skin scaly.....4. CUVIERIA, *Peron.*
The skin rugose but soft.....5. PSOLUS, *Oken.*

C. H: VERETILLIFORMES.

Body considerably elongated, softish, subcylindrical, covered throughout with *tentacular suckers*, of which the inferior are the longest. Echinodermata.

The anus widely patulous.....6. HOLOTHURIA.
The anus plaited.....7. BOHADSCHIA, *Jæger.*
The anus closed, with five teeth or scales...8. MULLERIA, *Jæger.*

D. H:

Body more or less elongated; the inferior *suctorial feet* longer than the superior, and disposed in a determinate number of longitudinal rows.

The suckers in three rows.....9. STICHOPUS, *Brandt.*
The suckers in five rows.....10. DIPLOPERIDERIS, *Brandt.*

E. H: CUCUMIFORMES.

Body but little elongated, more or less fusiform, pentagonal, with the *tentacular feet* forming five ambulacra, one along each angle.

The feet small or obsolete.....11. LIOSOMA, *Brandt.*
The feet very obvious,
and tentacula pinnate.....12. CLADODACTYLUS, *Brandt.*
and tentacula pinnatifid.....13. DACTYLOTA, *Brandt.*

The species in this section connect the family with the Echinida.

F. H: SIPONCULIFORMES.

Body more or less suddenly narrowed behind, the pentagonal figure indistinct, without *ambulacra*, and perhaps without *tentacular feet*: tentacula simple, short, and cylindrical, as in Actinia.

Embraces only the genus.....14. MOLPADIA, *Cuvier.*

[Professor E. Forbes, in the work already cited, thus arranges the British genera of Holothuriadæ:—

FAM. 1.—PENTACTADÆ.

Suckers in five regular rows; body angular. *Cucumaria,* Bl. (Pentacta, *Ag.*) Suckers alternate in each row, closely set; tentacles 10; dental apparatus composed of nearly square plates. No gizzard.

Ocnus, Forbes. Distant suckers on the angles; tentacles 10; dental apparatus very short; a gizzard.

Psolinus, Forbes. Distant suckers, those below always bent; tentacles 10; dental apparatus short, truncate; no gizzard.

FAM. 2.—THYONIDÆ.

Suckers scattered over the whole body, which is cylindrical.

Thyone, Oken. Tentacles 10; dental apparatus with 10 appendages directed downwards; genital tubes simple.

Thyonidium, Duben and Koren. (Cucumaria communis, Forbes.) Suckers with a tendency to form 5 rows; tentacles 10, in pairs; dental apparatus with 10 appendages, directed upwards; genital tubes divided.

Holothuria, L. Suckers few above and in the form of conica papillæ; very numerous below, and extending on a sort of disk from one extremity of the body to the other; tentacles 20; the apices peltato-ramose; genital tubes branched.

FAM. 3.—PSOLIDÆ.

Suckers in 3 rows on an oblong disk, occupying a part of the under side of the body; 2 additional rudimentary rows of suckers.

Psolus, Oken. Body irregular; tentacles 10.

FAM. 4.—SYNAPTIDÆ.

Suckers absent.

Synapta, Auct.—(*Chirodota,* Forbes[6]). Skin furnished with oval perforated calcareous plates and anchor-like bodies of microscopic size.

The same author arranges the British Sipunculidæ thus:—

§ Proboscis with a circle of tentacles at the extremity, and the vent at the base.

---

[1] *Règne Anim.* iii. pp. 238 and 241.
[2] *Fam. Nat. du Règne Anim.* p. 529, Paris, 1825.
[3] *Mem. d'Actinologie,* p. 191.
[4] *Anal. of Organized Beings,* p. 19.
[5] *Mem. d'Actinol.* Supp. p. 650.
[6] [The species described by Forbes proves to be a Synapta, not Chirodota. See Woodward and Barrett's paper "On the genus Synapta" in *Proc. Zool. Soc.* 1858. Chirodota is distinguished by having wheel-like plates in the skin, without anchors. In Steenstrup's genus *Myriotrochus,* the wheels are larger and scattered over the skin, each having its own stalk. The calcareous bodies found in the skin of the Synaptidæ are very interesting objects for the microscope.]

Echinodermata.

Syrinx, Bohadsch. Proboscis shorter than body; tentacles digitate.

Sipunculus, L. Prob. as long as body; tentacles simple.

§§ Proboscis without tentacles; the vent at the end of a filiform tail.

Priapulus, Lamk. Posterior extremity of body truncate; caudal appendage much branched.

§§§ Proboscis without tentacles, but furnished with a long fleshy non-retractile appendage; vent at posterior extremity.

Thalassema, Cuv. Body smooth behind.

Echiurus, Cuv. Body with circles of horny points behind.

Note. A species of *Phascolosoma*, Leuck., has lately been found on the shores of Britain. This genus has no tentacles; the proboscis is set with rings of reverted spinulæ.]

Order 2.—Echinida.

The Echinida are popularly known by the name of sea-urchins or sea-hedgehogs, given to them from their shells being covered with moveable prickles like the skin of those quadrupeds; "Horret capillis ut marinus asperis Echinus;" but when the prickles have fallen off, the shells are more commonly called sea-eggs, partly from a conformity in the figure between the objects compared, and more so from a similarity in their calcareous composition and texture. From their forms, certain genera have been also called turbans, diadems, mermaids' skulls or hearts, or fairy-stones; a nomenclature more pleasing to us than the Greek compounds of science, and not more poetical than useful, since it aptly conveys a portraiture of those varieties in which Nature has, with her usual sportiveness, moulded these productions. It is from this variety that a general description of the shell becomes impossible; and to form a correct idea of its beautiful and complicated mechanism, it is necessary to select one as a type or standard for comparison and further description. For this purpose we shall take the shell of the common Echinus (*E. esculentus*).

The shell is of a globular figure, with a flattened base, formed of ten conformable plates, alternately broad and narrow, and ten annectant ones dissimilar in character. All of them proceed from the rim of the oral aperture in the base, and rise upwards, bellying in the middle, whence they again converge, and are united in a circle opposite the mouth by a series of small pieces to be afterwards described. The first series of plates is called *areæ* by Linnæus; and those by which they are joined together, and which are all narrow and of the same size, he named the *ambulacra*, from a resemblance his rich fancy traced in them to the walks between the parterres of a garden laid out after the olden fashion. The *area* are thickly studded with tubercles of different sizes; and when more narrowly examined, it will be seen that each *areæ* is divided down the middle, by a zigzag line, into two equal halves, composed of numerous small pentagons set in cross rows, and dove-tailed into each other with the most perfect adaptation, the projecting angle of one series being fitted into the concave angles of the other. Their tubercles support the spines, which move on a pearly globular pivot that sinks into a corresponding cup in the base of the spine, and where they are retained by the soft epidermis or skin that covers the entire shell in its fresh condition. The spines are calcareous, columnar, very often large in proportion to the shell; but with these primary spines smaller ones of three kinds are numerously intermixed, viz. one of the same form, differing only in size; another slender as a hair, but dilated into a club at each end; and another on a flexible stalk supporting three moveable prongs placed in a triangle, not very unlike the trident of Neptune. These Müller mistook for parasitical polypes; and we still find them in many systems forming the genus *Pedicellaria* among these animals. Their function is unknown; for Monro's conjecture that they supply the place of the organs of the senses in the more perfect animals is a very loose one, and improbable.[1] The *ambulacra* are joined to the *areæ* by a plain or even suture, and instead of being tubercled, they are perforated from top to bottom with holes, always disposed after a regular pattern, which probably varies in every species. These holes give exit to numerous fleshy tubular pedicles, whose apex forms a circular testaceous shield, serrulated round the rim, concave and perforated in the centre, and formed of six distinct pieces, united by a plain elevated suture. If we now examine the top of the shell, we find it occupied by a small circular tuberculated plate, with a hole in its centre (the *vent*), and the plate surrounded by five triangular scales, and five less ones of a lunate figure placed exterior to and between them. The triangular scales, called the *ovarial*, by Mr Gray, are each of them perforated with a hole leading to the ovaries, and they stand opposite the large *areæ*, into an emargination of which the point of the triangle dips; while the lunate scales, the *interovarial pieces* of Mr Gray, embrace the points of the small *areæ*, and the *ambulacra*, and are likewise perforated with a hole scarcely visible to the unaided eye, and the use of which is quite unknown. "One of the *ovarial* plates is considerably larger than the rest, convex externally, and perforated like a sieve with numerous minute foramina, and internally thick and rugose. This plate is somewhat similar, both in form and perhaps in use, to the orbicular spot on the back of the Stellerida, called *corpus spongiosum* by Spix."[2]

This description of the crust or shell of the Echinides, it will be remembered, is in a great degree specifical, and will not apply universally even to the globose species, from which it is especially drawn; and it must less accurately apply to those which are greatly depressed, or oval, or heart-shaped, or cranial, or which rise up in the form of a conical pentagon. In all these the *ambulacra* are often only half of the typical number, and often only partial in their extent; while the *areæ* become coalescent, amalgamating more or less completely, with a consequent loss in the distinctness of their radiation. In many of these, also, the oral aperture loses its central position, and gradually, through a succession of genera, approaches the margin, which in some it occupies; the vent being subjected in its position to the like variations, and drawing with these, alterations of equal extent in the other exterior apertures. Nor in shape and armature does the mouth vary less. It is circular in the true Echinus, and armed within with a most complex apparatus of calcareous jaws, arches, and teeth, consisting of twenty-five separate pieces; while other genera, nearly allied, present the strange contrast of having no trace of these parts, being wholly toothless, with the outer aperture transformed into a narrow transverse labiated slit. To fill up the interval between these extremes, there are genera which have an oral apparatus less complicated than that of the Echinus; for in natural orders of families there are no abrupt transitions in structural organization. Amid all their varieties there reigns an evident connection and harmony, indicating a design or plan after which they have been called into existence; and in contemplating that unity of purpose, and the beauty and intricacy of the workmanship bestowed on the individuals created to fulfil that purpose, we endow them with our superior intelligence, and give

[1] It has been recently stated that the animal uses them as grapnels to attach itself to sea-weeds. Our native species covers itself, when residing between tide-marks, with fragments of sea-weeds, evidently as a means of concealment; and we believe they are held on the shell by means of these organs, which are a sort of self-acting forceps.

[2] Gray in *Annals of Philosophy*, n. s. vol. x. p. 425. On the structure of the shell see also Grant's *Outlines of Comparative Anatomy*, pp. 18–21.

Echinodermata.

utterance to their evidence of the existence and attributes of the Deity.

From the differences just indicated in the structure of the mouth, we naturally and correctly infer that there will be a corresponding diversity of the food on which the Echinida subsist. The jawless Spatangi burrow in the sand, and, swallowing the earth around them, extract a hard nutriment from the decayed animal and vegetable matter intermixed; but the Echini live amid rocks near low water, trace their crevices, and there seek the small crustaceous and testaceous Mollusca, whose shells they are enabled to break by the power and hardness of their teeth. Cavolini indeed asserts that the Echini live upon sea-weed; but the testimony of Dr Monro to the contrary is equally positive, and more consistent with the anatomical structure. That great anatomist tells us that they prey upon living Buccina, "as I had found particles of shells in their alimentary canal;" and they seize and secure their prey by means of the suctorial tubes which garnish the ambulacra. "I therefore directed the fishermen to bring me, along with the Echini, some living Buccina; to which, as I had supposed they would do, they attached themselves so effectually, that when I lifted the Echinus out of the water, I found it could support with ease a Buccinum which weighed nearly a quarter of a pound."[1] "The Echinidans," says Mr Kirby, "whose station appears to be often near the shore, upon submerged ledges of rocks, feed upon whatever animal they can seize. We have seen that they sometimes turn upon their back and sides, as well as move horizontally. This enables them more readily to secure their food, with the aid of the numerous suckers in the vicinity of their mouth, which, when once they are fixed, never let go their hold till the animal is brought within the action of their powerful jaws. Lamarck thinks they do not masticate, but only lacerate their food; but as two faces of each of their pyramidal organs answer those of the two adjoining ones, and these faces are finely and transversely furrowed, this looks like masticating surfaces. Bosc, who appears to have seen them take their food, says it consists principally of young shell-fish and small crustaceous animals. As the latter are very alert in their motions, it is difficult for the sea-urchins to lay hold of them; but when once one of these animals suffers itself to be touched by one or two of the tentacles of its enemy, it is soon seized by a great number of others, and immediately carried towards the mouth, the apparatus of which developing itself, soon reduces it to a pulp."[2]

The intestinal canal which this food has to traverse is, like that of the Fistulida, long, cylindrical, and tortuous, with a vent separate from the mouth. There is no chylopoetic viscus; but Blainville deems to be hepatic some glandular spots which he has detected in the parietes of that portion which may be regarded as stomach.[3] The intestine is fringed throughout with a mesentery, on the under edge of which Monro found two vessels without valves, nearly equal in size and parallel to each other, which he injected with quicksilver, and from them filled a beautiful network of vessels, not only on the intestines, but dispersed on fine membranes, which tie the intestine to the inner side of the shell. "I could not, however," he continues, "observe that these two vessels communicated with each other directly, nor by the medium of any organ like to our heart, nor could I observe in the living animal any beating organ like to the heart; yet near to the anus, and connected to the rectum, which is the place of the heart in many other worms, I found a small organ, which seems to be hollow. It appears to be highly probable that one of these vessels is the principal artery or aorta, and the other analogous to our vena cava; and that they communicate by invisible branches, and circulate the blood by the muscular action of their coats, without the intervention of a heart, nearly in the way the vessels in fishes carry the blood from the gills back to their heart."[4] Blainville, however, with a full knowledge of Monro's opinions, and of subsequent discoveries, aided too by his own dissections, acknowledges that he cannot tell which vessels are arterial and which venous, and thinks it very possible that there is no such distinction in animals so low in organisation as the Echinida, the vessels being at one and the same time both arteries and veins.[5] How the blood circulates is therefore a subject of conjecture; but we know more precisely the manner in which it is aërated. Lying along the inner surface of each of the *ambulacra*, there is a branchial leaf or doubled membrane, "not unlike the processes or subdivisions of the gills of a skate," and having a direct communication with the external tubular suckers, already described as pullulating from the ambulacral pores. The water sucked in by these tubes gains access within the shell by two of the pores (for there is a pair to each sucker), and by their divergence is carried into the opposite folds of the branchiæ. Here one portion of the sea-water is supposed to be exuded into the general cavity of the shell, between its inner covering and the intestine; while another portion is again collected, by anastomosing vessels, into five large ducts, that terminate, each by two branches, in large sacs or receptacles over the sockets of the teeth, communicating with each other; and from these the liquor passes down the sockets of the teeth, and is discharged into the sea, on each side of the tooth, between the socket of the tooth and beginning of the œsophagus.[6] Such is the course of the fluid as described by Monro; but later anatomists maintain that the current has in fact exactly the reverse direction; and they inform us that the sea-water which fills the interior cavity is introduced through certain membranous tubes, arranged in ten small groups round the oral aperture in the base of the shell. Be the fact as it may, there remains a provision of aqueducts most curiously contrived for conducting the medium of respiration and assimilation through the body; and very probably the current is propelled and directed in its way by the action of vibratile cilia, which in these animals, as in most others, clothe all the serous surfaces of the internal viscera, keeping the fluid in contact with them in perpetual change and renewal, and not allowing it to stagnate even on the outer shell.[7]

The ovary or roe occupies much space within the shell, being very large in proportion to the animal and its other viscera. It is divided into five or four lobes, disposed radiately, each lobe having a distinct exterior aperture, as well as a communication with each other. The apertures are placed round the anal when this is central, but otherwise their relationship is not so regular and constant. It is probable the ova, after their extrusion, undergo no change analogous to a metamorphosis.[8] We have examined the young of *Echinus esculentus* when it did not exceed one-eighth of an inch in diameter, and then it had the form and armature of adultness; but the prickles were toothed along their sides, and the forcipated organs appeared to have only two prongs. The pieces of which the shell was

[1] *The Struct. and Physiol. of Fishes*, p. 71.
[2] *Bridgewater Treatise*, i. p. 210.
[3] *Man. d'Actinologie*, p. 72.
[4] *The Struct. and Physiol. of Fishes*, p. 67.
[5] *Man. d'Actinologie*, p. 76.
[6] Monro's *Struct. and Physiol. of Fishes*, p. 69.
[7] See Sharpey in *Cyclop. of Anat. and Phys.* i. p. 617. Ehrenberg says that the prickles of *Echinus saxatilis* are covered with these cilia. *Ann. des Sc. Nat.* n. s. iv. p. 304.
[8] It has been usually believed that the Echinida were hermaphrodites, but M. Edwards and Dr Peters are said to have discovered that they are of separate sexes. *Ann. and Mag. of Nat. Hist.* vol. i. p. 156.

Echinodermata.

built were few in number, and the spines round its base were most developed, but the globular form was as perfect as when full-grown. It is enlarged in its growth, partly by the deposition of new matter on the edges of the pentagons of which the areæ are constructed, and partly by the formation of additional pieces intercalated among the others. These new pentagons are formed principally near the dorsal summit, where the connection between the areæ and ambulacra remains loosest. "If, carrying the examination still farther, we remove the spines, we shall then observe that, amongst the oviducal and interoviducal plates and the interambulacral plates that bear spines, there are some less fully developed, irregular in form, wanting even the mammellæ and the spines, and taking their place among the mammellated plates only in proportion as they gradually attain to a larger size. The new plates are at first very small, and may be compared to points of ossification, which at first grow simultaneously in all directions, though their lower side completes its formation sooner than the upper, and the upper side is sometimes yet incomplete, even when an incipient mammella is observable in the middle of it. In the region of the body where this increase takes place, the membrane which unites all the plates, and spreads itself over their surface, forming an articular capsule about the base of the spines, is softer and more spongy than it is in the inferior part, where the plates are consolidated and immoveable. It is in fact this spongy mass that deposits the calcareous matter of which the plates are composed; and the spines shoot out in the centre almost in the same manner as the horns of a stag. They do not become moveable until they have attained a certain stage of development and there is a period in their growth after which their size does not increase. Those, however, which drop off accidentally are replaced by others, formed, as those had been, by the tumefaction of the membrane which covers the plates. We may always observe, in a single specimen of the *Cidaris*, all the gradations of increase, from that of the plates which have completed their growth, and bear spines several inches long, down to the smallest points of ossification of the plates yet unfurnished with spines. These facts I have ascertained by examining several individual specimens, which exhibited all the intermediate stages of development through which the pieces in question must pass; and indeed, when we have no direct means of observing the growth of an animal in one individual, the only resource left us is to compare a great number of individuals, representing a complete series of all the stages through which the species to which they belong has to pass before their growth is completed. The only difference between this process and the direct observation of any development is, that in the one case we observe in one and the same individual that succession of changes which, in the other, we trace through a series, as complete as possible, of several individuals. Such is the course that I have taken with respect to the Echinodermata. The young Echini have a small number of plates in each of their vertical series; they appear to be slowly increased in size by the deposition of calcareous matter at their circumference, until those which surround the mouth have completed their growth, and are entirely consolidated. The superior plates continuing to grow, increase, from the top downwards, the periphery of the body, which remains depressed so long as the inferior are the only plates consolidated; but in proportion as a greater number of plates become immoveable, and as there is formed, in the upper region, a greater number of plates reaching down to the circumference of the spheroid, the testa becomes rounded, and finally assumes a spherical form. It is to this cause that we are to ascribe the differences of contour exhibited by the Echini at different ages. In some species there are found individuals presenting even a pyramidal shape, and this takes place when there is still formed a great number of plates subsequently to the consolidation of those occupying the greater diameter of the animal's body. These facts sufficiently explain the gradual growth of beings which approximate more or less nearly to the spherical form; and show how carefully we should guard against the introduction of nominal species in consequence of a mere difference of form resulting from age only.

Echinodermata.

"It would be interesting to trace the development of these animals *ab ovo*. But no naturalist has yet observed the state of the Echini on their first issuing from the egg. As to the spines, it is evident, especially in the *Cidarites*, that those surrounding the mouth are the first that attain their full growth, while the largest are those in the upper tier of the disc; and those which have not yet completed their growth are found around the oviducal plates on the outside. The correctness of these observations will be demonstrated by comparing the differences of development exhibited in this region by the spines that stand nearest to each other. We should be mistaken, however, as to the growth of the Echinodermata, did we think that there is a generic connection between the plates, on account of their forming vertical series from the mouth to the summit of the disc. It has been already remarked, that the plates of each space are alternately a little more elevated than each other; but no attention has been paid to the manner in which the plates of all the spaces succeed each other in the same Echinus; and yet, if we consider it closely, we shall see that the new plates are developed in spiral lines, passing without interruption from one series to another, through all the spaces fro tne circumference of the mouth to the dorsal summit, so that those which rest on each other in a vertical line do not make their appearance in immediate succession. It appears to me well worthy of remark, that in these animals, holding so low a rank among organized beings, we should find the succession of the solid parts composing the integument so strikingly analogous to the arrangement of the leaves around the stems of plants; an arrangement the laws of which have been recently discovered by M. Schimper, and explained, so far as regards the *Coniferæ*, in a memoir of M. Braun on the arrangement of the scales of their cones.

"The small plates surrounding the mouth, and those around the anus, are arranged in a peculiar manner. They are easily moved, and thus facilitate the deglutition of the food, and the voiding of the excrements. In general the testa of the Echini are not so immoveable as one who had not observed them in a fresh state might be led to suppose. All the plates forming the upper part of the disc are often set in motion; sometimes they sink, sometimes they rise, and, in the oblong species, the longitudinal diameter is often extended beyond its ordinary length."[1]

The Echinida are in general littoral animals. The species with a thin brittle shell, covered with small hairs like bristles, as the Spatangi, burrow in the sand, covering themselves up by the aid of their spines; but those with a stronger prickly crust hide themselves in rocky places. Looking at their rotund limbless forms, we might imagine that they must constantly be fixed to one spot, or, if moveable, that from the difficulty in bringing members so numerous and opposite to co-operate, or from hesitation in what tract to move, seeing that they are all alike and look to all sides, still a perpetual sedentariness would be their choice. But it is not so, and their motions are neither less regulated nor slower than those of the majority of avertebrated animals. They usually advance on their flat basis, but when an individual chooses, it can move forward by turning on

[1] Agassiz in *Annals of Nat. Hist.* i. pp. 40–42.

Echinodermata.

itself like the wheel of a coach. From the nature of their localities, they are much exposed to bruises, and worse foes in the shape of fish and worm. The latter they repel by their spinous panoply, which they can erect and stiffen, presenting a thousand spears on every side, and no point unguarded;[1] the bruises they bear with impunity, and it must be a wound only short of total disorganization from which they cannot recover. Monro has even seen the pieces of a broken shell walk off in different directions. By what organs the Echinida exercise their locomotive powers has been disputed. Most authors assign this duty to the spines of the areæ and the ambulacral suckers conjointly. Baster tells us, that the latter are the principal organs;"[2] and according to Blumenbach they are the only ones,[3] the prickles being merely organs of offence and defence. Now, says M. Agassiz, this is a very erroneous opinion—vox et præterea nihil—for it owes its birth and continuance to a mere verbal influence, the term *ambulacra* being first translated into alleys or walks, and then the organs which grow in them were subsequently supposed to be the walkers. Without questioning this very questionable transition, we know that Agassiz is wrong in denying the tentacula their pedestrious function. "How, in fact," he asks, "could these small tentacula, with all their softness of texture, situated, as they generally are, in that part of the body which is never brought into contact with the ground when the animal moves, and overhung by calcareous solid spines; how, I ask, could those flexible tubes be used as organs of motion? It is an undeniable fact, and I have often observed it myself, that it is with their spines the Echini move themselves, seize their prey, and bring it to their mouths, by turning the rays of their lower edge in different directions."[4] Our own observations, on the contrary, have satisfied us that the common Echinus moves from place to place solely by the aid of the tentacular suckers; the spines, as Mr Couch correctly states, acting as levers or crutches. Agassiz exaggerates the littleness and weakness of the suckers: in the common Echinus, whose spines are not above half an inch in length, the suckers can be extended one inch and a half, so as greatly to overreach the spines; and they can at the same time be rendered firm and rigid by distention, from water, and the contraction of their own muscular parietes. The spines are moved principally, we think, by means of the exterior irritable skin which covers the shell and envelopes their basis; but when these spines are very large, the tubercle to which they are articulated is perforated for the transmission of muscular fibres from within, and which appear to be inserted into their roots by a coronet of fibres.[5] The number of spines and suckers—and let it be remembered that there are several muscles to every spine and every sucker—on a single individual is indeed wonderful. A specimen of *Echinus esculentus*, of moderate size, will have at least 160 primary prickles on each of the large, and 80 on each of the small areæ; that is, 1200 in all; but reckoning the lesser bristles, there will not be fewer than 3000: and there cannot be less than 100 suctorial tubes in each ambulacrum, making the number of exterior appendages in this creature 4000. We join in the conclusion of Baster:—"Quod si jam musculorum, ad aculeorum et proboscidum motum necessariorum copiam animo concipiamus, Omnipotentem, quæ hæc animalia creavit, sapientiam attoniti et venerabundi adoremus, necesse est."[6]

Echinodermata.

The seas of warm and tropical countries are the most productive in Echinides; but the living species are few compared with the fossil, which are found principally in the chalk and oolite formations, in such abundance, and in so fine a state of preservation, that they are common and favourite objects in collections.

The direct uses of the Echinida to man are few and trivial. As its name indicates, the *Echinus esculentus* is eaten in some parts of the south of Europe; Pennant says, "by the poor in many parts of England, and by the better sort abroad." They are in season in spring, when the ova are most developed, and nearly fill the shell. They are recorded as among the favourite dishes of the Greeks and Romans. "They were dressed with vinegar, honied wine or mead, parsley, and mint; and esteemed to agree with the stomach. They are the first dish in the famous supper of Lentullus, when he was made *Flamen Martialis*, priest of Mars. By some of the concomitant dishes, they seemed designed as a whet for the second course, to the holy personages, priests, and vestals invited on the occasion." Epicharmus describes them as used likewise at the marriage feast of Hebe: "Thither came crabs and urchins, unable to swim in the sea, but travelling only on the ground." In the *Wasps* of Aristophanes, the old dicast, who is the hero of the piece, repeats a fable respecting an urchin, who, when his shell had been cracked by a woman, summoned witnesses to prove the assault. He is interrupted by the remark, that it would have been much wiser for the creature to buy a bandage. Ennius, in his *Phagetica*, mentions "dulces echini," and "calvaria pinguia," the latter evidently a species of Spatangus, which, we also know from Aristophanes, was considered a very dainty morsel. The Echinus is several times mentioned in Horace as good eating. The shells, cleaned and bleached, are pretty ornaments, with which finical idlers dress up their moss or summer houses, and naturalists their museums. Some fossil species are called fairy-stones, their spines elves' spurs; and with these names were once associated, as we learn from Sir Thomas Browne, suitable and terrible apprehensions, as well as medicinal virtues; "common opinion commendeth them for the stone, but are most practically used against films in horses' eyes."[7] Once only has an Echinus been truly beneficial to our race. Some species of the genus Cidaris, we may observe, have very large prickles. The heathen children of the island of Rarotonga, in the South Seas, converted to Christianity by English missionaries, were in want of pencils with which they might be taught to write on slates; for these "they went into the sea, and procured a number of the Echinus, or sea-egg, which is armed with twenty or thirty spines. These they burnt slightly to render them soft, that they might not scratch; and with these flakes of stone for a slate, and the spine of the sea-egg for a pencil, they wrote exceedingly well; and hundreds of them took down the principal portions of every discourse they heard."[8]

[From amongst the numerous systems of arrangement put forward

---

[1] The following epigram of Martial (xiii. 86) is very descriptive:—

Iste licet digitos testudine pungat acuta,
Cortice deposito mollis echinus erit.

[2] *Opusc. Subs.* i. iii. pp. 113–114; also Fleming, *British Animals*, p. 476.

[3] *Introd. to Nat. Hist.* trans. p. 267.

[4] *Annals of Nat. Hist.* i. 36.

[5] See Kirby's *Bridgew. Treatise*, p. 207. The largest spine of an Echinus on record is that noticed by Mr Gray, "nearly an inch and a half in circumference, and more than eight inches long." *Ann. of Nat. Hist.* i. p. 414.

[6] *Opusc. Subs.* i. iii. p. 113. Professor Grant says, "There are more than 10,000 pieces in the shell of the *Echinus esculentus*, without counting the complicated dental apparatus of the mouth, or the respiratory and ovarial plates, or the very minute calcareous pieces disposed irregularly on the coriaceous membrane around the oral and the anal orifices." *Outl. of Comp. Anat.* p. 20.

[7] *Vulgar Errors*, p. 71.

[8] Williams's *Missionary Enterprises*, p. 409.

Echinodermata.

by naturalists, we will select for analysis that of M. Desor,[1] which includes both recent and fossil genera.

§ Echinida Regularia. *Mouth below, vent above, both central; ambulacra in 5 pairs continuous from vent to mouth; ovaries 5.*

Fam. 1. *Cidaridæ.*—Interambulacral areas with 2 rows of plates.

Tribe 1. *Angustistellati.*—Ambulacral areas narrow, composed of a great number of small plates bearing small granules; no buccal branches, ambulacra narrow.

Gen. Cidaris, Rhabdocidaris, Diplocidaris, Porocidaris, Goniocidaris, Leiocidaris.

Tribe 2. *Latistellati.*—In place of simple granules on the ambulacral area, tubercles of the same structure, if not of the same dimension as those of the interambulacral areas.

Gen. Hemicidaris, Hemidiadema, Hemipedina, Hypodiadema, Pseudodiadema, Diplopodia, Diademopsis, Diadema, Savignya, Asteropyga, Acrocidaris, Acropeltis, Phymosoma, Coptosoma, Goniopygus, Glypticus, Cœlopleurus, Echinopsis, Pedina, Pseudopedina, Glyphocyphus, Temnopleurus, Temnechinus, Opechinus, Salmacis, Melebosis, Mespilia, Microcyphus, Amblypneustes, Codechinus, Codiopsis, Echinocidaris, Cottaldia, Magnosia, Polycyphus, Psammechinus, Echinus, Stomechinus, Hypechinus, Styrechinus, Tripneustes, Holopneustes, Boletia, Phymechinus, Spærechinus, Toxopneustes, Heliocidaris, Loxechinus, Echinometra, Acrocladia, Podophora.

Tribe 3. *Salenidæ.*—Apicial apparatus forming a sort of cushion of a peculiar form, and often curiously ornamented.

Gen. Acrosalenia, Peltastes, Goniophorus, Hyposalenia, and Salenia.

Fam. 2. *Tessellati.*—Interambulacral area with 5 or 6 rows of plates.

Gen. Archæocidaris, Eocidaris, Perischodomus, Palæchinus, Melonites.

§§ Echinida Irregularia. *Mouth below, vent sometimes below, sometimes at one side; ambulacra not continuous.*

Fam. 1. *Galeritidæ.*—Test circular or pentagonal, peristome central, decagonal, or pentagonal; periproct independent of the genital apparatus, superior or inferior; pores simple.

Tribe 1. *Galeritidæ veræ.*—Ambulacral areas simple, with a masticatory apparatus.

Gen. Pygaster, Pileus, Galeopygus, Holectypus, Discoidea, Echinocomis, Galerites, Globator, Anorthopygus, Nucleopygus, Pyrina, Hyboclypus, Desorella, Pachyclypus, Asterostoma.

Tribe 2. *Echinonidæ.*—Ambulacral areas simple; no masticatory apparatus.

Gen. Echinoneus.

Fam. 2. *Dysasteridæ.*—Test ovoid or cordiform, elongated, rarely circular, peristome more or less excentric; periproct at the posterior face; pores simple, ambulacra disconnected.

Gen. Dysaster, Collyrites, Metaporhinus, Grasia.

Fam. 3. *Clypeasteridæ.*—Ambulacra petaloid; peristome central; masticatory apparatus composed of five triangular jaws.

Tribe 1. *Laganinæ.*—Interambulacral areas very narrow; petals lanceolate, generally open; ambulacral furrows of lower face anastomosing; peristome circular, surrounded by a buccal rosette and five tubes.

Gen. Echinocyamus, Fibularia, Runa, Moulinsia, Lemta, Scutellina, Sismondia, Laganum, Rumphia, Arachnoides.

Tribe 2. *Scutellidæ.*—Form circular; ambulacral furrows of inferior face always anastomosing, the external branches intruding on interambulacral areas.

Gen. Echinarachnius, Mortonia, Scutella, Dendraster, Monophora, Lobophora, Amphiope, Mellita, Encope, Rotula, Echinodiscus.

Tribe 3. *Clypeasteridæ veræ.*—Petals much developed, much larger than the interambulacral areas; peristome sunk; furrows of inferior face straight, not anastomosing; each jaw pivoted on two auricles instead of being simply supported on them.

Gen. Clypeaster.

Fam. 4. *Cassidulidæ.*—Ambulacra petaloid; no jaws; peristome angular, central, or subcentral.

Tribe 1. *Caratomidæ.*—No floscule.

Gen. Caratomus, Pygaulus, Amblypygus, Haimea.

Tribe 2. *Echinanthinæ.*—Floscule more or less developed round the peristome.

Gen. Nucleolites, Echinobrissus, Clypeopygus, Clypeus, Botriopygus, Catopygus, Oolopygus, Rhynchopygus, Cassidulus, Echinanthus, Stigmatopygus, Pygorhynchus, Eurhodia, Echinolampus, Pygurus, Faujasia, Conoclypus.

Tribe 3. *Claviastrinæ.*—Forms strange, with a peculiar structure of ambulacra, especially the odd ambulacrum.

Gen. Archiacia, Claviaster.

Fam. 5. *Spatangidæ.*—Ambulacra petaloid; peristome excentric; no jaws; periproct posterior or infra-marginal; four genital plates; two broad smooth avenues at the interior face, corresponding with the posterior ambulacral areas, and surrounding a tuberculated heart-shaped space, corresponding with the odd interambulacral area.

Tribe 1. *Ananchidæ.*—The petals on a level with the test are not closed at their extremities; poriferous zones approximated and scattered at the borders.

Gen. Ananchytes, Stenonia, Offaster, Holaster, Cardiaster, Infulaster, Hemipneustes.

Tribe 2. *Spatangidæ veræ.*—Even ambulacra distinctly petaloid; apicial apparatus compact, so that the genital plates are always approximate.

Gen. Toxaster, Enallaster, Isaster, Micraster, Hermaster, Brissopsis, Periaster, Schizaster, Agassizia, Moera, Linthia, Pericosmus, Toxobrissus, Prenaster, Brissus, Plagionotus, Gualtieria, Echinocardium, Breynia, Macropneustes, Eupatagus, Hemipatagus, Spatangus, Meoma, Faorina, Kleinia, Leskia.]

Order 3.—Stellerida (*Asteroidea*).

The "seas have stars," sings Du Bartas; and if challenged, he would probably have appealed to the members of this family in proof that his fancy was in this instance not more licentious than his verses.[2] But it is only some species which have felt the skyey influence over their forms; for even certain of the Asterias are merely pentagonal, and some square, while the total forms of other genera rather imitate a wheel in their faces, with spokes radiating from a central navel: and others again have sought no impress from any object in the heavens or in earth; for though they have been called "lily-shaped animals," yet is the semblance but postulatory, and he must have a more assimilating fancy than our own who perceives it in these objects. Amid this diversity of forms, we may nevertheless remark, that a line drawn so as to connect the species of the rays together would give a circular outline to the body, which is very rarely protuberant, and never globular. It consists of two parts, the disc and the rays; the latter either continuous and homologous, or dissimilar and articulated to the other by the medium of peculiar scales. There is always a distinct dorsal and ventral surface; the former in general vividly coloured, and covered with spongeous tubercles or scales, whose office is defensive; the latter colourless, and furnished with the organs of locomotion and of touch. The colour resides in the mucous coat that occupies the place of the epidermis of higher animals, but the scales and tubercles are essentially parts of the

[1] *Synopsis des Echinides Fossiles*, par E. Desor, Paris, 1858. The reader may also consult various memoirs by Johannes Müller, printed in the *Trans. of the Berlin Acad.*, and Dr T. Wright's *Monograph of the British Fossil Echinodermata*, Palæontographical Soc. 1855–58.

[2] Linckius begins his work *De Stellis Marinis* thus:—"Non cœlo tantum, sed et mari suæ stellæ sunt, opera quidem unius Dei artificis, sed *diversæ prorsus fabricæ et naturæ.*" In his *Enquiries into Vulgar and Common Errors*, Sir Thomas Browne has a chapter entitled "That all Animals of the Land are in their kind in the Sea," which, he rightly says, "although received as a principle, is a tenet very questionable, and will admit of restraint." After some good remarks, the chapter concludes with the following passage, and such passages abounding in the works of this learned physician render them delectable reading. "Lastly, by this assertion we restrain the hand of God, and abridge the variety of the creation; making the creatures of one element but an acting over those of another, and conjoyning, as it were, the species of things which stood at distance in the intellect of God; and though united in the chaos, had several seeds of their creation. For although in that indistinguisht mass all things seemed one, yet separated by the voice of God, according to their species, they came out in incommunicated varieties, and irrelative seminalities, as well as divided places; and so, although we say the world was made in six days, yet was there, as it were, a world in every one—that is, a distinct creation of distinguisht creatures; a distinction in time of creatures divided in nature, and a several approbation and survey in every one." Book iii. chap. 24.

Echinodermata.

thick cretocoriaceous skin which gives figure and consistency to the whole. In this skin there is deposited a considerable proportion of carbonate of lime, with some phosphate of the same earth, sometimes in the form of scales, either imbricated or scattered; more usually in grains or short pieces, so joined as to make a sort of knotted thread, that, by its divarications and anastomoses, is woven into a netted frame-work, the interstices of which are filled up by the mucous tissue. On the calcareous frame-work the spines and tubercles are placed, and these vary in size and structure according to their position. When dorsal, they are mostly short and obtuse, unordered and immoveable, excepting in so far as their degree of erection and relative position may be effected by the more or less turgid condition of the body; but on the sides of the rays, while their size is greater, they are also dressed in regular lines, and appear to be capable of being moved backwards or forwards by peculiar muscles. In the Asterias, the under surface of the rays is deeply furrowed from their origin to their extremity; and the furrow, analogous to the ambulacra of the Echinida, is occupied with two or four series of tentacular feet, which are also guarded by moveable spines, different in their structure, however, either from those of the back or sides, and forming a protective hedge on each side. There is nothing similar in the Ophiuridæ or Crinoidea, whose rays are not grooved, nor possess tentacular feet, but consist of a succession of similar pieces soldered to each other, so that they resemble the vertebral column of some slender animal, or, more exactly, from the squamous nature of the pieces, the tail of a lizard; and, like that tail, they are tapered and flexible to a certain extent, and equally brittle. It is interesting to remark, that this ray, apparently very dissimilar from that of the Asterias, really finds in that genus its type and original; for the roof, if we may so speak, of the ambulacral groove is made up of a series of pieces catenated exactly like those of the Ophiuræ, with compressed processes arching up from each side after the manner of ribs, between whose intervals the tentacular feet are extended.

The mouth is situated in the centre of the ventral surface. It is a circular orifice, with a membranous lip, capable of great dilatation, but bounded by spinigerous and tuberculated angular projections, formed by the convergence of the bases of the rays, that may be useful in capturing and bruising the prey. A short œsophagus leads to the stomach, a large membranous sac occupying the centre or nave of the body; and though connected to the parietes by several ligaments, yet sufficiently loose and dilatable to permit of its frequent eversion and extrusion in the shape of bladdery lobes. It has no intestine, excepting in the Crinoid family, where there is a distinct vent opening on the inferior surface, near the mouth.[1] But the nutritive parts of the food pass from the stomach either into sacculated reservoirs, as in Ophiura, or through narrow vascular passages into large complicated cæcal appendages, which lie along the floor of the rays, two in each ray, consisting of a regular series of pectinations or overlying lobules, and having no unapt resemblance to some beautiful compound leaf or fern. Such organs we find in the Asterias; and as it circulates through them, the chyle is largely subjected to the influence of the oxygenating medium, and prepared for its assimilation. Such at least is the opinion of Tiedemann; but it may be necessary to mention, that Cuvier, Blainville, and Meckel regard these cæca as secreting organs, analogous to the biliary organs of many invertebrate animals, with which, says Dr Sharpey, it must be allowed they agree in several respects. In the living animal they are bathed, or rather float, in sea-water, which is presumed to be introduced within the body by means of numerous small tubular filaments that rise up on the back between the tubercles, penetrating the soft parts of the skin; and it is ascertained that the water, after a time, may be expelled through the same conduits,[2] for there is no doubt of the animal's ability both to fill and empty its body. The animal, observes Dr Sharpey, slowly distends itself with the water, "and again, but at no stated interval, gives out a portion of it: this is obvious from the fact, that the same animal may be seen distended at one time and flaccid at another. Naturalists are generally of opinion that the water enters and issues by the respiratory tubes (or dorsal filaments), and indeed no other orifices have been discovered; we must, however, freely own that we have never been able actually to observe its passage through these tubes." In the Ophiuridæ, in whom these tubes are not to be found, there must certainly be other entrances for the fluid; and these are probably certain orifices situated on the ventral surface, near the base of the rays. The water, however introduced, is there for the purpose of respiration, the principal seat of which seems to be the peritoneal membrane. "Spread over the viscera and the parietes of their containing cavity, and lining the respiratory tubes, it presents a great extent of surface, continually in contact with the surrounding medium; and we have found that a beautiful provision exists for maintaining currents of water along the membrane, and thus effecting that constant renovation of the fluid in contact with its surface which is required in the respiratory process. These currents are produced by means of cilia." . . "Ciliary currents take place also on the external surface of the body, which probably partakes in the process of respiration; we have moreover observed them within the tubular feet, and on the internal surface of the stomach and cæca: in this last situation they are probably subservient to digestion."[3]

The mode of progression of the Stellerida is probably limited to a sort of creeping;[4] but their walk is not so slow as the language of most authors would induce us to believe; nor have we been able to ascertain, from many observations, that any one or two rays have a preference for the van, as has been insinuated, but whatever ray happens to point toward the object or place in view, is made the leader for the time being. The organs of locomotion are very different in the different families. The rays of the Asterias, as already mentioned, are broadly furrowed underneath, the furrows planted with soft tentacula, which are flexible in every direction, being moved by circular and longitudinal muscular fibres, which enter copiously into their structure. In form, these tentacula may be compared to a retort or Florence-flask with a long neck: the swollen vesicular bulb is placed within the cavity of the rays on each side of their mesial vertebrated column, while the neck issues from between the interstices of its side-pieces, and protrudes outwardly. They are hollow, being filled to a certain degree with water, introduced by a set of

[1] Gray in *Annals of Philosophy*, n. s. xii. p. 392.

[2] Reaumur in Linck. *de Stell. Mar.* App. p. 93. Ehrenberg has discovered that these filaments are inwardly clothed with vibratile cilia, and he believes there is within them a circulation, not of water, but of a fluid analogous to blood; for he says we see in it globules altogether like the blood-globules of other animals. *Ann. des Sc. Nat.* n. s. iv. p. 304.

[3] Sharpey in *Cyclop. of Anat. and Phys.* ii. p. 40.

[4] Baster (*Opusc. Subs.* i. p. 119) and Bosc say that the Asterias can also swim. "In this act they suspend themselves obliquely in the water, and with their rays produce slight undulations, which suffice to direct their course. When they wish to descend, they cease these motions, and immediately sink to the bottom." *Hist. Nat. des Vers*, ii. p. 125. Blainville has seen certain species of Asterias swim swiftly. *Man. d'Actinologie*, p. 241.

Echinodermata.

ramified internal vessels, which constitute an aquiferous system, similar to that which we found in the Holothuriæ.[1] When the star-fish wishes to elongate any particular tentaculum, it contracts the vesicular bulb, and the water in it is consequently forced up the neck, distending and stretching it, and putting it in a fit condition to be applied against the ground or any object within reach. To this the extremity is affixed by the action of the muscular fibres, some contracting the centre of the point into a dimple, and others firmly appressing the edge, so as to give it the form as well as the virtues of a sucker. Now, by shortening the tubes which have been so fixed, the body is drawn towards their insertion; and by a curious succession of these actions, the creature goes whither it has willed.[2] It is impossible to follow the exact succession of the retraction and elongation of the suckers, nor, indeed, do they seem to be called into action after any regulated plan. Some are employed as stilts merely, on which the body is raised up buoyant in the circumfluent medium, while others are pulled in and stretched out to act as legs or feet; and others again seem to be used, more especially for the time, as seekers and feelers, that no prey may pass unawares, while the main object in view is apparently only a change of place. But the Ophiuræ progress by a very different apparatus. "The diverging rays are firm and hard, have few spines, and no channel with suckers; they are used by the animal as legs, and as they are regularly placed, it can move in any direction that suits it. To go towards any particular spot, it uses the two rays that are nearest to it, and another that is most distant from it; the two first curve at their extremity, so as to form two hooks, which, being applied to the sand, drag the body forwards, while the posterior is curved vertically, and performs the part of a repelling lever."[3] This action of the rays is assisted by some subsidiary organs, which have been hitherto unnoticed. On examining the rays of a living Ophiura, we have noticed that every one of their articulations is furnished with a pair of strong sharp moveable claws, similar to those of many insects and crustaceans; and from their position under the lateral spines on the ventral aspect, not more conveniently placed for taking hold of a plain surface than their form has an obvious adaptation to that act. They are unquestionably organs belonging to locomotion, which seems to us to be further aided by some filamentous tentacula that issue from pores in the ventral disc, whose function, though mainly respiratory, may be in a secondary degree locomotive, by serving as stayers to support the body, and elevate it above the unevenness and friction of the surface traversed.

The nature and number of the senses bestowed upon the Stellerida is a subject of doubtful inquiry; for the organs of these senses are either so far removed from ours that analogy offers no clue to their function, or the resemblance is so forced and superficial that it may possibly lead us to very erroneous conclusions. There is no reason to doubt that the species are richly endowed with the sense of touch; but it is doubtful whether any part or organ possesses that modification of the senses on whose discrimination the luxury of taste depends. It is equally doubtful to us whether any have visual organs, for that blindness is the lot of most of them is granted. Ehrenberg, however, when examining living specimens of the *Asterias violacea*, discovered a point of a bright red colour, precisely defined, and situated beneath and towards the apices of each of the five rays. This point he believes to be ocular; and to give scope and direction to the organ, the star-fish curls back the tip of the ray when in the act of progression. Ehrenberg succeeded in tracing some nervous filaments to the apex of the rays, where he also found a small ganglion placed near the eye. In front of this ganglion, towards the mouth, there are some jointed nervous fibres; but similar articulations are not visible in the nerves situated near the mouth itself, whence this illustrious naturalist concludes, that the noblest part of the nervous system is found towards the apices of the rays.[4] But what office are we to assign to those anomalous organs, which, in the Echinida, Monro has compared to insect antennæ? They exist in the Stellerida, principally on the sides of the rays hid among the spines. "Each consists of a soft stem, bearing at its summit, or (when branched) at the point of each branch, a sort of forceps of calcareous matter, not unlike a crab's claw, except that the two blades are equal and similar. When the point of a fine needle is introduced between the blades, which are for the most part open in a fresh and vigorous specimen, they instantly close, and grasp it with considerable force. The particular use of these prehensile organs is not apparent; their stem, it may be remarked, is quite impervious."[5]

The Stellerida are oviparous, the ovary forming a grape-like cluster placed near the origin and at the sides of the cæca, for there are two ovaries to each ray. The eggs lie numerously imbedded in a colourless jelly, covered with a thin pellicle, and are at first equally colourless; but during their progress to complete development, they pass through a great variety of colours, and when fully formed, assume invariably the distinguishing shade observed in the adult animal.[6] They escape from the body by certain apertures, observable at the side of the mouth in the angle of separation of the rays; and the greater number of the species are said to deposit their spawn in spring. When excluded from the egg, they are, according to Saars, very unlike the parent, for they are then binary, and do not become radiated until after some weeks.[7]

The Stellerida are richly endowed with the wonderful property of reproducing parts which they may have lost from accident. In summer, it is asserted by Bosc, the parts pullulate and attain their original size in the course of a few days, while in winter some months are required for such production; but this is one of these loose assertions in which the works of Bosc abound. The time really required is much longer, though not exactly ascertained, and seasons probably influence it in no great degree. One ray lopt off, or two or three, all grow again; nay, a single arm, provided any portion of the disc remain attached, will live and become cinquefoil, as it was previously to its miserable mutilation. There was a time when these phenomena gave rise to expressions of the greatest wonder,[8] and to speculations more curious than edifying, touching the possible divisibility of the soul, and other metaphysical subtilties. We may safely infer from them, that the susceptibility to pain in these animals must be very considerably, and almost infinitely, less than in animals of a more perfect kind, since in these the pain consequent on such in-

[1] For a description of this apparatus, and of the interior anatomy in general, see the excellent article "Echinodermata" in the *Cyclop. of Anat. and Physiology*.

[2] Reaumur in *lib. s. cit.* p. 92. Linck. argues logically against this pedestrious property of the tentacula, which he wishes us to believe are solely organs of touch and taste, little tonguelets. *De Stell. Mar.* pp. 13, 14. But logic may prove other things than facts.

[3] Kirby's *Bridgewater Treatise*, i. p. 202. The passage is translated from Reaumur. See Linck. *sup. cit.* p. 95.

[4] *Ann. des Sc. Nat.* n. s. iv. p. 306. Mr E. Forbes also considers these scarlet dots to be ocular (see his paper on the "Asteriadæ of the Irish Sea," in the eighth volume of the *Wernerian Memoirs*); but Dujardin retains his doubts.

[5] Sharpey in *Cyclop. of Anat. and Phys.* ii. p. 32.

[6] Knox on the *Nat. Hist. of the Salmon*, p. 52.

[7] *Ann. des Sc. Nat.* n. s. vii. p. 248; and Lam. *Anim. sans Vert*, 2de edit. iii. p. 257.

[8] Reaumur, *Hist. des Insect.* vi. pref. lx. &c.

Echinodermata.

juries, and the sympathetic fever which follows as its necessary result, would be sufficient to kill them, independently of any other cause.[1]

In relation to *habitat*, the Stellerida may be enumerated among the denizens of the shores of every sea, living generally at a depth of several fathoms, where they congregate in incalculable herds. There are beds of some species on our own coasts that spread over an extent of some hundreds of yards, lying, in some spots, one upon another, to the thickness of a foot or more. The species are more various, if not more productive, in tropical than in temperate or cold seas. They prey upon small testaceous mollusca, which they catch with their suctorial feet, and retain opposite the mouth by means of the spinous projections surrounding it. We have found in their stomachs various univalved species, but the conchifera are supposed to be more especial favourites. M. Eudes Deslongchamps has observed five or six individuals of *Asterias rubens* clustered together in the form of a ball, the nucleus of which was a Mactra. The star-fish had retroverted their vesicular stomachs, and were found endeavouring to suck out the fish from between the valves of the shell; but it is impossible to believe, with this naturalist, that the Asterias had separated, or were capable of separating them, so as to inject within a fluid capable of benumbing the mollusc and placing it beyond resistance, the more especially as this fluid has no other than imaginary existence. There can be no doubt that the valves had partially opened, from the feebleness or death of the mollusc, before it was set upon by the star-fish.[2] We have seen similar clusters around a Turbo or whelk. Deslongchamps's opinion is indeed only worth notice as coinciding with that of the fishermen, who, regardless of the certain inefficiency of the agent, are fond of telling of the exterminating war waged by the Asterias against the oysters; a tale which has its invention at a far-distant date, being found in Aristotle, paraphrased by Ælian, and versified by Oppian, and hence copied without question by every subsequent popular compiler.

In their turn, the Stellerida are greedily preyed upon by fish of almost every sort; for they who assert that the acridity of their flesh, or the spines and prickles of their skin, render them distasteful or formidable,[3] know nothing of the voracity and power of their foes. We have very often found the stomach of cods and haddocks crammed with the remains of star-fish, more especially of the prickly Ophiuræ, and that at a season when the fish were in high perfection. Dr Knox has attempted to prove that the ova of the Echinodermata are the proper food of the salmon, which is only fit for the table of the epicure when he has been feeding on them: "from the richness of the food on which the true salmon solely subsists, arises, at least to a certain extent, the excellent qualities of the fish as an article of food."[4] Vast numbers are more certainly destroyed by the fisherman, who finds they materially injure the produce of his art, by clinging to and clustering round his baits, and who therefore wreaks his vengeance on them by throwing them in heaps on the dunghill. In some places the common species have even been used as manure: but otherwise man has not found them adapted to his use, for the medicinal virtues which the early physicians and astrologers ascribed to them, have disappeared in their modern generations.

To remedy that looseness of description which of necessity belongs to such general views as we have been giving, we proceed to notice the systematic arrangements of the order, whose only common characters seem to be a depressed multifid coriaceous body, with rays or lobes radiating from the margin of the disc, and an inferior central mouth. Echinodermata.

Cuvier adopted the genera of Lamarck. The genus Encrinus, which Lamarck had referred to the Zoophytes, Cuvier properly placed near Comatula, adopting the views of Miller implicitly in regard to its structure and further subdivisions.

Miller names the family of which the Encrinus may be considered the type, *Crinoidea*, or lily-shaped animals, a family rendered interesting not only by their curious forms and extraordinary structure, but also by their being among the earliest inhabitants of this planet. Hence they are so far aliens of this world, that whilst immense tracks of rocks are literally formed of the entombed remains of different species in a mineralized condition, only five or six species have yet been discovered in a recent state.[5] An idea of their structure may be obtained if we imagine an Asterias placed with its mouth upwards on a columnar jointed stem, one end of which is connected to the dorsal surface of the animal, and the other most probably fixed at the bottom of the sea. The rays or arms extending from the circumference of the body are much branched, and at last pinnated; other jointed processes, named auxiliary arms, surround the stem in whorls placed at short intervals. The column is perforated in its centre with a narrow canal, down which a prolongation of the stomach extends, and lateral canals proceed from the central one through the verticillate auxiliary arms. The Comatula has rays spreading from the circumference of the body, branched and pinnated like those of the Pentacrinite. It is not fixed on a column, but the dorsal surface of the body is elevated in the middle, and bears a number of smaller rays or arms; and this dorsal eminence, with its rays, has been sometimes compared to a rudiment of the column of the Pentacrinite with its auxiliary arms. Besides the mouth, there is an anal opening on the ventral surface, situated on an eminence near the margin.[6] The exactness of the comparison here drawn between the Comatula and Pentacrinus, first detected by the acuteness of Miller and Gray, has been singularly illustrated by the discovery of V. Thompson, that Pentacrinus is only Comatula in its first stage of existence; the head, in the progress of development, separating from the stem, to become, instead of a fixed pedicellated floriform zoophyte, a nomade star-fish in the bosom of the ocean. In their fixed condition, the Crinoidea appear to have had a considerable range for the seizure of their prey, without possessing absolute locomotion,

Still moving, yet immoved from their sted;

for the peculiar mode of the articulation of their vertebræ probably afforded them a great degree of mobility, with considerable security against dislocation.[7] They grow erect, the stem being in general sufficiently stiff and strong to support the heavier head; but when it is not so, as in the Umbellularia, we find that, just under what has been called the pelvis, "a hollow bladder-like membrane" embraces the upper part of the stalk for about two or three inches, and, performing the office of a buoy or swimming-bladder, keeps the head in an upright position.[8]

ASTERIADÆ.

Distinguished by the possession of a single orifice of the intestinal canal, surrounded by suckers, but void of teeth; while deep grooves, containing several series of pedicles, extend from the mouth to the extremity of the rays. On the dorsal surface, we remark between the two posterior rays a calcareous wart, convex externally, and grooved like a madrepore, which has therefore been denominated the madreporiform tubercle. It covers a singular organ, named the stone-canal by Tiedemann, who believed its office to be the secretion of the earthy matter required for the growth of the calcareous skeleton. The accuracy of his description of its structure has however been called in question; and the opinions relative to its function are various and contradictory.[9] Blainville considers it to be in some way connected with generation; and from its variations he asserts we may draw our most permanent characteristics of the species.[10] It is almost certain, he also tells us, that there is a distinction of sexes among them, and consequently a sexual union: and indeed Otho Fabricius says that in the month of May in Greenland they are to be found in pairs united face to face.[11]

---

[1] Good's *Book of Nature*, i. 429. [2] *Edin. New Phil. Journ.* ii. p. 394. [3] Blumenbach's *Man. of Nat. Hist.* trans. p. 267.

[4] "On the Nat. Hist. of the Salmon," &c. p. 8, a pamphlet from the *Trans. of the Roy. Soc. of Edin.* vol. xii. The same food is said to communicate poisonous qualities to the mussel. "C'est ce frai qui, dit-on, rend les moules dangereuses à manger." Blainv. *Actinolog.* p. 234.

[5] Kirby is led by his speculations to believe that the extinct forms still exist in the deepest abysses of the world of waters. *Bridgewater Treatise*, ii. p. 15.

[6] Sharpey in *Cyclop. sup. cit.* p. 32. [7] Parkinson in *lib. cit.* p. 96.

[8] Ellis's *Corallines*, p. 97. [9] The subject is ably stated by Dr Sharpey in *Cyclop. of Anat. and Physiology.*

[10] *Man. d'Actinologie*, p. 237. [11] Ibid. p. 236.

Echinodermata.

OPHIURIDÆ.

The Ophiuridæ are distinguished by the central part of their body forming a distinct and flattened disc, to which are annexed more or less elongated and even ramified rays, with no grooves on their surface. "They are *spinigrade* animals, and have no true suckers by which to walk, their progression being effected (and with great facility) by means of five long flexible jointed processes, placed at regular distances round the body, and furnished with spines on the sides and membranous tentacula. These processes are very different from the arms of the true star-fishes, which are lobes of the animal's body; whereas the arms of the Ophiuridæ are superadded to the body, and there is no excavation in them for any prolongation of the digestive organs. The stomach is a sac with one aperture, its walls externally covered with vibratile cilia. The ovaries are not branched; they are placed near the arms, and open by orifices near the mouth, between the origin of the arms. Their investing membrane is also ciliated, but on the rest of the body and arms no cilia exist; hence we may conclude there is no separate respiratory system."—*Edward Forbes.*

[Without going further into the history of the various arrangements proposed by naturalists, we will content ourselves with tabulating that given by Müller and Troschel in their *System der Asteriden* (Brunswick, 1842), who thus marshalled the genera:—

ASTERIADÆ.

Locomotion by cirrhi issuing from the under side of the radial arms which are continuous with the body.

Fam. 1. Arms with four rows of cirrhi. A vent.
Gen. Asteracanthion. (Asterias, Uraster.)
Fam. 2. Arms with two rows of cirrhi. A vent.
Gen. Echinaster (Asterias, Cribella), Solaster, Chætaster, Ophidiaster, Dactylosaster, Tamaria, Cistina, Scytaster, Culcita, Asteriscus (Palmipes), Pteraster, Oreaster, Astrogonium, Goniodiscus, Stellaster, Asteropsis, Archaster.
Fam. 3. Arms with two rows of cirrhi. No vent.
Gen. Astropecten. Aenodiscus, Luidia.

OPHIURIDÆ.

Locomotion by spines; radial arms as appendages to a discoid body.

§ 1. OPHIURÆ. Arms simple.

Fam. 1. Four genital clefts in each interbrachial space.
Gen. Ophioderma (Ophiura), Ophiocnemis.
Fam. 2. Two genital clefts in each interbrachial space.
Group 1. Genera with papillæ round the mouth.
A. Arms and disc with hard parts.
Gen. Ophiolepis, Ophiocoma, Ophiarachna, Ophiacantha, Ophiomastix.
B. Arms and disc naked.
Gen. Ophiomyxa, Ophioscolex.
Group 2. Genera without papillæ at the mouth.
Gen. Ophiotrix, Ophionyx.

§ 2. EURYALÆ. Arms branched.

Gen. Asteronyx, Trichaster, Astrophyton.]

There now only remains for consideration the order

CRINOIDEÆ.

The Crinoïdeæ, notwithstanding their star-like form and their great external resemblance to the Ophiuridæ, constitute however a distinct order, characterized by the presence of two separate orifices to the intestinal canal, although very near to each other. These orifices are by no means easily distinguished among the rays which surround them, especially in the fossil species. The greatest part of the species are pediculate, *i. e.* carried on a foot-stalk adhering to the centre of the region, which, in the star-fish, we considered as the middle of the dorsal surface.

Genus COMATULA, *Lam.*—Disc pentagonal, arched at its upper surface, which bears several series of simple and articulated rays; rays of the disc bifurcate, beginning however with two simple pieces. The edges of the rays are pinnate; mouth central, sunk; anus between the mouth and the border of the disc, obliquely prominent. Animal free when mature, but fixed and pedicellate when young.

Mr J. V. Thompson discovered that "the body of the Comatula, when the animal is kept in a small quantity of sea-water, is soon detached, entire and perfect, from the cavity in which it is lodged, and in this state it might be mistaken for an animal of a very different tribe." He suspects that the genus *Mammaria* of Müller may have no better foundation. The same naturalist has made the still more singular discovery that the Pentacrinite of the Irish seas, which he first described under the name of *Pentacrinus Europæus*, and which has since been made the type of the genus *Phytocrinus* by De Blainville and Agassiz, is a Comatula in its earlier states of development. When not more than one-eighth of an inch in height, this Pentacrinus "resembles a little club, fixed by an expanded basis, and giving exit at its apex to a few pellucid tentacula; no other part of the solid fabric is observable, but an indistinct appearance of the peristome. In those specimens which have made a little more progress, together with the elongation of the pedicle or stem, its joints begin to make their appearance; the body acquires a larger size and brownish tint, from a grosser food; the tentacula of the mouth protrude in a greater degree, and move slowly in various directions. In others still more advanced, the joints of the stem become quite obvious, from their opacity and white colour, and the base of the future arms, as well as the auxiliary side-arms, are rendered palpable. The arms from this period lengthen apace from their bifurcation, and have superadded to them a double range of transparent jointed tentacula; so that the animal begins to put on a more perfect appearance, and now for some time merely acquires a somewhat greater size, and an extension of its arms, which, although they solidify from their origin upwards, remain pellucid and thick at their apices, where elongation, evolution, and the secretion of calcareous matter is gradually going on." Subsequently the arms again bifurcate at or near to their extremities, a second and even a third time; and having reached the full development, entitling it to the name of a Pentacrinite, the head appears to be cast off, that it may become a nomade Comatula. How just, then, the conclusion of Mr Thompson from these interesting discoveries: "From these observations connected with the growth of this animal, and by which it appears to present itself at various stages of its progress under considerable diversity of form, naturalists may learn to avoid the unnecessary multiplication of the genera and species of the Crinoïdea, by giving undue weight and consideration to characters originating in the progressive evolution of individual species, and which are consequently of a transitory and delusive nature."[1]

Genus COMASTER, *Ag.*—This genus has the same organization as the preceding, but the arms are ramified instead of being simply furcate.

Genus PENTACRINUS, *Müller.*—Pedicle more or less pentagonal, bearing at intervals simple verticillate rays; rays of the disc fixed to the pedicle, each by a cuneiform piece, followed by two simple pieces, after which the rays bifurcate, and at a little farther distance divide into two, which then branch out into numerous appendices, pinnate at their edges. The space between the base of the rays, occupied by the visceral cavity, is formed by numerous small laminæ. The only living species (*P. caput Medusæ*) is a native of the Caribbean seas.

Acalephæ.

III.—ACALEPHÆ.—SEA-JELLIES.

The Acalephæ have been named by Blainville the *Arachnodermata*, to mark in a stronger manner how remarkably they contrast with the *Echinodermata* in the structure of the skin, which is a soft serous pellucid cuticle, containing sometimes miliary granules, but always smooth and even, and as thin as the gossamer's web. They are radiated animals of a gelatinous consistency, with an unarmed mouth in the centre of the ventral surface, the entrance into a stomachal cavity without proper parietes, but furnished with vasculiform canals ramified through the body; their respiratory apparatus is ciliary, and their mode of generation oviparous; they are all nomade and marine, and move through the water by alternate contractions and dilatations of their periphery, or by the aid of vibratile cilia. The constituents of the class are divisible into two orders—viz., 1. The MEDUSIDÆ, with a body almost always circular, convex dorsally and concave below, supported in a few genera by an internal cartilaginous plate; the rim as well as the oral aperture, mostly fringed with tentacular ciliated appendages: 2. The ACALEPHÆ properly speaking, whose body is irregular and multiform, bilateral, and sometimes orbicular, with brachial or filamentous appendages, and ciliary fringes.

[1] See J. V. Thompson's *Memoir on the Pentacrinus Europæus*, Cork, 1827, 4to; the *Edin. New Phil. Journal* for 1836; and Edward Forbes's *History of British Star-Fishes.*

Acalephæ.

Order 1.—MEDUSIDÆ.

Among animate creations, there is none that excels the Medusidæ in beauty and ornament, or in the variety and eccentricity of their forms;

> ——— there's not a gem
> Wrought by man's art to be compared to them;
> Soft, brilliant, tender, through the wave they glow,
> And make the moonbeam brighter where they flow.

When floating in the ocean, most of them appear like crystal bowls of the purest transparency, veined and patterned with the most brilliant colours, and their rims ornamented with fringes, furbelows, and arbuscles of such delicacy and intricacy of workmanship, that even the most experienced in Nature's works marvel how it is that such textures, too frail to bear the lightest handling, are kept entire amid the restless element of their nativity.[1] We have often watched with intense interest some of the least complicated, and, it may be, some of the least beautiful, as they floated by us on the surface of a summer sea. On a hasty examination, they may seem to be supported there by their own inherent buoyancy, and to be carried onwards with the tide or current, which they have apparently no power to resist; but watched a while, they are seen alternately to contract and expand the whole periphery of the body at regularly-timed intervals, in a manner which Dr Roget has aptly illustrated by comparing it to the opening and shutting of a parasol, and with a quickness and force which we have felt to be considerable. By these motions the Medusidæ can swim against a gentle current, though they more commonly yield themselves up to its persuasive violence; and when alarmed, they can also sink deep into the bosom of the sea with considerable velocity, so as frequently to elude an attempt to secure them. They can stop and maintain themselves at any depth, and rise again with equal ease to enjoy a nearer intercourse with light and air. Lamarck's speculations rendering it necessary to deny to them either nerves or muscles, he has persuaded himself that these motions of the body are entirely mechanical, produced by the influx and efflux of imponderable fluids, such as electricity, permeating and flowing through its gelatinous texture;[2] but we are very sure that he will summarily reject this theory who has once observed the phenomena, which are certainly in some degree under the control of the animal, and regulated by its will and sensations. It seems indeed to be now proved, more especially by the anatomies of Ehrenberg,[3] that they are the effects of the contraction of muscular fibres, radiating from near the centre of the body to the circumference, running alongside the vein-like nutritious canals, and by others in the rim, which have a circular direction. We know also that the Medusidæ do possess a nervous system, formed after the same plan, and rather more complete than it is in other radiated beings.

The figure of the Medusidæ is regular and almost always circular (for the Velella alone are oval), sometimes discoid or spheroidical, but generally hemispherical, so as to allow of a comparison between them and the mushrooms, which they are presumed to represent in the animal kingdom; and the same fancy may see in them the living models on which our umbrellas have been made. The margin is usually fringed with tentacular filaments; and in many species we also observe, placed at wide intervals, a circle of coloured warts, which, from their organization, are evidently organs of importance in the animal's economy. Ehrenberg believes them to be branchial, for connected with each of them he has discovered a partial circulation of a fluid analogous to blood; and, what is still more singular, he has detected in their near vicinity an organ retractile, within a sheath, and containing a mineral crystal, to which he assigns the office of an eye, because it is similar in structure to the eye of several infusory animalcules, and is more amply provided with nerves than any organ other than one of sense ought to be. Acalephæ.

The under surface of the umbrella is sometimes entirely naked, sometimes furnished with numerous scattered tentacular suckers, as in Porpita and Velella, or with greatly diversified brachial appendages, which depend usually from the lips of the mouth. These are either free from each other and separate to the base, or they coalesce so as to form a kind of stalk previous to their ramification into lobes or filaments, each division having at its extremity pores for the absorption of the thin nutriment on which such species must necessarily subsist. The Medusæ, with this structure, resemble a bulbous root with its radical fibres, and were therefore called *Rhizostomous* by Cuvier.[4] The greater number of the Medusidæ, however, have a distinct mouth, placed always centrally, either sessile or at the end of a species of proboscis more or less prolonged. It has no hard parts, nor teeth, nor jaws, and leads by a very short œsophagus into the stomach, consisting frequently of four separate cavities excavated in the gelatinous parenchyma, without any peculiar lining. From the stomach proceed numerous vessels, which all bend to the circumference. Some of these vessels are simple and undivided, others ramify dichotomously like veins, and form anastomoses among their ultimate divisions. Injections from the stomach pass more readily into the simple than into the ramose vessels; but both kinds serve for the conveyance of the digested food, whose unassimilated remains pass from the body through their extremities, which open by apertures on the rim. The portion intended for nutrition and growth probably transudes in part into the parenchyma, while it flows along the vessels; and a part seems to enter a peculiar vessel which runs round the periphery that it may pass into the partial circulations at the marginal tubercles, and be submitted to the action of the air. It must, however, be admitted that these tubercles exist in comparatively few species;[5] and there can be little doubt that the principal airing of the nutritive fluids is effected by the action of the circumfluent water on the exterior surface, as well as in the internal cavities and vessels. To effect this great purpose the more completely, we find that the oral and marginal filaments are clothed with vibratile cilia, which drive currents of water over them in determinate directions; and these cilia are said likewise to line some of the interior cavities. It is from their action that portions cut off from the appendages continue to move like independent and perfect beings—a circumstance apparently so demonstrative of their completeness as to have given origin to several spurious species.

The Rhizostomes, as we have already mentioned, feed only on fluid matters, and such also is the condition of those genera which Peron and Le Sueur named *agastric*, from a belief that they had neither mouth nor alimentary sacs; for although this latter statement has been shown to be erroneous, yet the absorption of the aliment appears to be through ports. But the bulk of the Medusidæ love a grosser fare, and there is some slight evidence in favour of their having a discrimination in the matter; for Gaede remarks that he has never found fishes in the stomach of *Medusa capillata*, but often worms; while in that of *Medusa aurita* there are frequently fishes, rarely worms. The latter species, according to our observation, feeds more frequently

---

[1] See Kirby's *Bridgew. Treat.* i. p. 199. [2] *Anim. Vert.* ii. pp. 444, 446, and 452–5. [3] *Ann. des Sc. Nat.* n. s. iv. p. 290, &c.
[4] *Règne Animal*, iii. p. 278. Figures illustrative of the structure are given in the *Bridgew. Treatise* of Dr Roget, ii. pp. 888–9.
[5] We may here warn the student that he should guard against the too great extension of these general remarks; for the truth is, few species have been examined anatomically, and even the most general detail will be found to have many individual exceptions.

Acalephæ.

on pelagic Gammari; and minute crustacea and entomostraca constitute the principal food of most of them. Digestion is extremely rapid. We remember once observing in the stomachs of *Medusa aurita* several specimens of a Gammarus unknown to us,[1] and which we were anxious to examine: they were living when first seen, and when we left the Medusa in a basin of sea-water for half an hour, we little dreamed of the disappointment awaiting our return, for not a trace of the crustacea was then visible.

All the species are propagated by ova generated in appropriate organs situated generally in the immediate vicinity of the stomach, but very variable in appearance and general structure. Previously to the deposition of the spawn, the ovaries swell in a very remarkable manner, and the young Medusæ, according to Blainville, are cast out through the mouth, sometimes after a certain degree of development in the appendages. In the *Medusa aurita*, according to Ehrenberg, the ova, previously to their maturation, escape through the peculiar aperture of the ovarial sac into the water, where they are laid hold on by the tentacula and the two layers of the brachial appendages, and received into little sacs which are formed on these layers, and which have a direction from the interior outwards. It is in these sacs that the ova are metamorphosed and matured. While in the ovary they have a thin smooth membranous envelope, are of a roundish figure, and filled with a dark-violet granulous fluid; but in the fœtal sacs they have no shell, and present themselves under three distinct forms. Some resemble brambleberries, and their colour is a pale violet; others, also of a pale violet, are disciform, in shape like a miniature Medusa, without arms, and without nutritive canals; and the third, which is the most numerous, has a cylindrical form, truncated at both ends, and of a yellowish-brown tint. The last two are densely covered with cilia, and swim freely. The largest among them attain a diameter equal to the one-eighth of a line; and they are about one-third of this size when they lose their shell. From being unable to discover male organs in this Medusa, Ehrenberg has hazarded the conjecture that the smaller ova may become, as we understand him, males, which remain always of a microscopical size, while the females only grow large;[2] but the conjecture is a bold one. We are scarcely able to reconcile these interesting facts with one observed by M. Saars. In a small volume published some years ago, this Swedish naturalist described a new genus of Medusidæ under the name of *Strobila*, from its great similitude to a fir cone; but he now assures us that the Strobila is the young of *M. aurita*. In its strobiline state it is composed of a series of circular pieces, with numerous tentacula, and the cone is surmounted by a cylindrical shaft: in its development the pieces separate successively into disciform radiated fragments, each of which becomes a perfect individual.[3]

The growth of the Medusidæ is as rapid as their life appears to be short and transitory. There are many which never reach the magnitude of a pin's head; and thence they graduate upwards to a size, even in our northern seas, of fully two feet across the disc, with labial appendages not less than six feet in length. The bulk to which they occasionally grow in the Indian Ocean is immense; and were a like hugeness attainable by them in the northern seas, we might lend an easy belief to those naturalists who tell us that the *Kraken* was truly a Medusa.[4] Mr Telfair saw a Medusa cast on shore in the Bombay territory in 1819, which must have weighed many tons. "I went to see it when the gale had subsided, which was not for three days after its being cast upon the sand; but it had already become offensive, and I could not distinguish any shape. The sea had thrown it high above the reach of the tide, and I instructed the fishermen who lived in the immediate neighbourhood to watch its decay, that, if any osseous or cartilaginous part remained, it might be preserved; it rotted, however, entirely, and left no remains. It could not be less than *nine months* before it entirely disappeared, and the travellers were obliged to change the direction of the road for nearly a quarter of a mile to avoid the offensive and sickening stench which proceeded from it."[5]

Acalephæ.

The Medusidæ abound in our seas during the summer and autumn, and are thrown ashore in heaps after every storm.[6] Before the winter has set in they have disappeared, most of them being doubtless destroyed; but during the cold season some surely inhabit the deep recesses of the ocean, to reappear in another season; and it is probable that the spawn of one summer's generations lies hidden in the ooze, until revived and evolved by the heat of the coming summer. In tropical seas they are still more profuse, as well as more sportive in their configurations. Voyagers tell us of sailing through flocks so dense as to check the ship's progress, and expanding for miles over the surface; nor are they weary of speaking of their beauty and their phosphorescent and stinging properties. In the arctic seas these creatures are equally abundant, furnishing the giant whale with the material of his growth, and swarming so thick, when of microscopic minuteness, as to communicate their colour to the water. After his description of a globular semi-transparent species, from 1-20th to 1-30th of an inch in diameter, Dr Scoresby proceeds to say, "I afterwards examined the different qualities of sea-water, and found these substances very abundant in that of an olive-green colour; and also occurring, but in less quantity, in the bluish-green water. The number of Medusæ in the olive-green sea was found to be immense. They were about 1-4th of an inch asunder. In this proportion, a cubic inch of water must contain 64; a cubic foot, 110,592; a cubic fathom, 23,887,872; and a cubical mile about 23,888,000,000,000,000. From soundings made in the situation where these animals were found, it is probable the sea is upwards of a mile in depth; but whether these substances occupy the whole depth is uncertain. Provided, however, the depth to which they extend be but 250 fathoms, the above immense number of one species may occur in a space of two miles square. It may give a little conception of the amount of Medusæ in this extent, if we calculate the length of time that would be requisite, with a certain number of persons, for counting this number. Allowing that one person could count a million in seven days, which is barely possible, it would have required that 80,000 persons should have started at the creation of the world, to complete the enumeration at the present time."[7]

---

[1] Probably the *Oniscus medusarum* of O. Fabricius. *Faun. Groenl.* p. 257.

[2] *Ann. des Sciences Nat.* n. s. iv. p. 297. Rathke apparently borrows his account of the development of the Medusæ principally from Ehrenberg, but he omits their escape into the sea previously to their introduction into the brachial sacs, which is really incredible; and he says, that when lodged in these sacs they have no longer a chorion, as Ehrenberg pretends, and are consequently already young Medusæ. See Burdach's *Traité de Physiologie*, tome iii. p. 67, &c.

[3] *Ann. des Sc. Nat.* n. s. vii. p. 248.

[4] See Baster, *Opusc. Subs.* i. p. 26.

[5] *Edin. New Phil. Journ.* iv. p. 406.

[6] "They are sometimes thrown in great quantity upon the shores of our climate, where endeavours have been made to turn them to some advantage. It has been attempted, but without much success, to extract ammonia from them. They have been more beneficially employed in the way of manure upon arable land." Griffith's *Cuvier*, xii. p. 567. The Medusidæ are all pelagic; but Professor Schwenke is said to have kept a species for six days alive in a basin of *fresh* water,—"ex Spara fluvio hausta,"—a very wonderful fact, when we remember how instantaneously poisonous fresh water is to marine animals in general. Baster, *Opusc. Subs.* ii. p. 58.

[7] *Edin. Phil. Journ.* ii. p. 12.

Acalephæ. Great numbers—for all of them are not so, as has been asserted—of the Medusidæ are phosphorescent animals, emitting their lights at irregular intervals; and the flame generally passes away after a short glow. The large species appear, when luminous, like globes of living fire floating on the surface, or shining at a great depth through the water; but when the species are small and crowded, the luminousness is diffused all round, or it is broken into innumerable spots of light, "rising to the surface and again disappearing, like a host of small stars dancing and sparkling on the bosom of the sea."[1] The first kind of light is at least sometimes emitted at the pleasure of the creature, without the intervention of any foreign irritation;[2] but the other two seem always to require for its elicitation some outward stimulus, such as is given by their mutual contact and friction when a fresh breeze curls the waves, or when an oar-driven boat or a ship passes through the teeming waters, when "a long train of lambent coruscations are perpetually bursting upon the sides of the vessel, or pursuing her wake through the darkness."

In such species as we have observed, the luminosity could not be detected issuing from any particular point or organ: it seemed that the whole body was impregnated with the light, which was given out involuntarily, if we may so speak; for some exterior irritation was necessary to produce the appearance of it, though the Medusæ do not distinguish whether the annoyance proceeds from an animate or inanimate object. The species which possess the property are diffused through all seas, and the phenomenon is little less beautiful and interesting in the Hebrides than it is under the line, or in Australian seas.[3] "The phosphorescence takes place, particularly around the tentacula, during the movements of the animal. Macartney saw it increased in the *Medusa lucida* when he warmed the water. The light also became more vivid in alcohol; the animals, however, quickly perished in it, and their light was extinguished. Spallanzani remarked the trickling of a viscous fluid from the surface of the Medusæ, which had a burning taste, and produced an itching sensation on the skin. This liquid, mixed with water or milk, renders them phosphorescent for some hours, particularly when they are warmed and agitated. Dead animals, whose light was extinguished, again became phosphorescent by the addition of a quantity of spring water, and by movement at a heat of 26° to 37°. Humboldt observed his fingers to shine for some time after he had touched Medusæ; he also saw the light become stronger when the animals were galvanized. The light of Medusæ to which Macartney applied an electric shock was extinguished for an instant, but afterwards appeared more vividly than previously."[4] In reference to the immediate cause of the phenomenon, the opinions which have been divulged are numerous and contradictory: here it must suffice to give Tiedemann's as the most probable. "Weighing well all the circumstances," says he, "phosphorescence would seem to depend on a matter, the product of the changes of composition accompanying life, and to all appearance secreted from the mass of humours by particular organs. This liquid probably contains phosphorus, or an analogous combustible substance, which combines with the oxygen of the air, or of aërated water, at a medium temperature, and thus produces the disengagement of light. The preparation and secretion of this substance are acts of life, which change, augment, or decrease by the influence of external stimulants, whose action on the animals modifies their manifestations of life. But the phosphorescence itself depends on the composition of the secreted matter, and cannot be regarded as a vital act, because on certain occasions it continues for whole days, even after the death of the animal."[5] As for its use, opinions are equally various; but perhaps we err least when we conjecture it may serve to protect those gifted with it from the aggressions of their enemies. Acalephæ.

Many Medusidæ possess likewise a stinging property sufficiently strong to blister the skin and inflict acute suffering.[6] Bosc describes the consequences thus. When a venomous Medusa touches the skin, there results a considerable redness, with buttons of the same hue, which have a little white spot in their centres, attended with a piercing pain, which, after it has somewhat subsided, may be compared to often-repeated pricks. This lasts generally a half hour, and may be appeased by the application of linen steeped in oil, or even in fresh water. The redness will often reappear after the lapse of several days, when the part is exposed to a temperature higher than that of the atmosphere.[7] He imagined that it was occasioned by the application of numerous microscopical suctorial papillæ, which issue from the surface of the tentacular arms, to the skin; but this is disproved by the fact of the dead animal being not less vesicatory than the one yet living. It probably resides, as Dicquemare believed, in some caustic exudation of the exterior membranes; but it is not identical with the phosphorescent secretion, for some vesicating Medusæ are not luminous, and we know from our own experience that our native luminous species are not all endowed with the power of vesication.

The distinction of the species is difficult, because of the changes which they suffer in their growth; and the difficulty is increased by their frequent minuteness and transparency, which render them scarcely visible in the water; by their soft fragility and tendency to dissolution, which prevents them being handled without injury, and opposes an almost insurmountable obstacle to their preservation

[1] Baird in *Mag. of Nat. Hist.* iii. p. 309, and ix. p. 502. See also Thompson's *Zoological Researches*, p. 38, &c.

[2] Some naturalists deny the luminous property of the Medusidæ *ex toto*, maintaining that the light is merely elicited by friction, &c., from some matter or fluid with which the water is impregnated at the time. This opinion is ably supported by Mr Westwood in the *Mag. of Nat. Hist.* iv. p. 505, &c.; and for some observations confirmatory of this view we refer to the same work, v. p. 1, &c. The opinion however appears to us to be untenable, and is apparently disproved by the fact that Medusæ have been noticed giving out their light at many fathoms depth, where they were beyond disturbance. "While sailing in the more shallow parts of the Caribbean Sea," says the Rev. Mr Guilding, "and looking over the vessel's side when becalmed in these dangerous waters, in the midst of reefs, I have seen at the bottom huge molluscous or radiate animals emitting the splendour of a lamp, but could never ascertain the species." *Mag. of Nat. Hist.* vii. p. 581. It were easy to quote similar facts, but a more conclusive one is this. We had a luminous *Dianea* in a glass of sea-water, and in a vessel of the *same water* we had, at the *same time*, a small specimen of *Medusa aurita*. The light was readily evoked from the *Dianea*, but we could obtain no light from the other vessel. It must therefore have proceeded from something else than the water. See in relation to this question the observations of Mr Bennet in *Proceedings of the Zool. Soc. of London* for January 1837; and those of his brother in the same work for June 13, 1837.

[3] This is contrary to the assertion of voyagers, and it may be that our opinion is biassed by our partiality to all that is native. Humboldt says, "The sea is phosphorescent in all latitudes; but he who has not witnessed this phenomenon in the torrid zone, and especially in the Pacific Ocean, can form but an imperfect idea of the magnificence of such a spectacle." See *Edin. New Phil. Journ.* v. p. 329. Dr Macculloch, during a voyage to the Shetland and Orkney Isles, discovered upwards of 190 luminous animals, of which the most conspicuous were about twenty small Medusæ. *Edin. Phil. Journ.* v. p. 389.

[4] Tiedemann's *Comp. Physiology*, i. p. 259. See also a summary of Spallanzani's experiments in Griffith's *Cuvier*, xii. p. 567.

[5] *Comp. Physiology*, p. 269.

[6] Hence they were named *Urticæ marinæ* by the older naturalists, and *sea-nettles* by the common people. What Aristotle and Pliny meant by their stinging acalephes is very doubtful, as is shown by Kirby in *Bridgew. Treatise*, p. 402, &c.

[7] *Hist. Nat. des Vers*, ii. pp. 163–4; also Griffith's *Cuvier*, xii. pp. 568.

Acalephæ.

in museums. From these inherent difficulties, the classification of the Medusidæ is believed to be still in an imperfect and artificial state; yet a comparison between its Linnæan barrenness, when one small genus embraced all the known species, and its present richness, when many genera are necessary to exhibit all its variety and fulness, affords a pleasing argument in behalf of the zeal and inquisitiveness of modern naturalists Peron and Le Sueur, with a good knowledge of what had been done by others, and with much new information acquired in their voyages, were the first to attempt the orderly arrangement of the Medusidæ;[1] but it was found to be too artificially constructed, and has not been adopted by subsequent systematists.

Order 2.—ACALEPHÆ VERÆ.

After the example of Macleay, we restrict the application of this term to some families of Arachnodermata, which, by their fantastic forms, are estranged from the typical tribes, and exhibit in their organisation such a variableness among themselves, and such a mixture of the elements of more than one class, that their true position among animals is rendered doubtful; and we are fain, in order to preserve distinctness and precision to our definitions of the various classes, to set them aside as anomalous, or annectant, or osculant groups, which, like corner-stones in a building, are adapted, by their very irregularity, to cement and gird the whole together. Most naturalists have believed them to bear the closest alliances with the Medusidæ, more particularly with the Cirrhogrades; but Blainville deems them to have superior claims to a connection with the Mollusca.[2] A common character can scarcely be assigned to the order. They are gelatinous, nomade, sometimes globular and radiated, more usually without any radiation, and deviating widely from familiar objects, so that we might compare them to the beautiful but misshapen orchideous and cryptogamous plants which blossom in the shades of the tropics, rather than to any animals which even the fancy of the herald-at-arms has yet pictured. Hence we shall distribute the little we have here to say of them under the two families which the order embraces.

The first family is named by Blainville PHYSOGRADES, an air-bladder being their principal organ of locomotion. Its general character is defined to be a regular symmetrical, bilateral, fleshy, contractile body, often greatly elongated, constructed with an air-bladder of greater or less size, which Blainville supposes, in the spirit of a transcendental anatomist, to be formed by a partial inflation of the intestinal canal, that has always a mouth and anus distinct from each other, and placed at the opposite extremities. The respiratory organs, according to the same author, reside in the lengthened irritable cirrhi attached to the body, and with which the ovaries are intermixed. The animals appear to have the power of secreting air, by which means the bladder can be filled more or less completely, and their buoyancy and position regulated according to their instincts. Whether the air is again absorbed when the floating Acalephes wish to descend, or whether it is ejected by compression from certain appropriate orifices, has been disputed. The latter is the common, and, as we believe, the correct opinion. A different opinion is however entertained by Dr Grant; for, after a storm of three days' endurance, he found many Velellæ cast on the shores of Cornwall, which should, on our hypothesis, have sunk to the bottom, and thus, in its stillness, have avoided the wreck which they suffered.[3] But a fact which concerns the Velellæ alone, cannot be legitimately applied to the Physales, since the discrepancy in their structures manifestly prohibits such an application. With relation to the Physales, Mr Peacock says, "on compression, air escapes from the sac by small orifices at each extremity."[4] Mr Baird, who had many opportunities of making examinations of them, says of the same animals, "They have the power of contracting and dilating their membranous (air) bag at pleasure, and no doubt, by trimming it to the wind, make it act the part of a sail to propel themselves through the water. 'They are very often to be met with at sea,' says Sir Hans Sloane; 'and seamen do affirm that they have very great skill in sailing, and managing their bladder or sail with judgment for this purpose, according to the different winds and courses.' Upon attentively examining the narrow or free extremity of the bladder, a small round aperture is perceptible, surrounded by a circular zone of fibres, of a beautiful red colour, like the muscular fibres of the iris of the eye. Out of this small hole, which is not larger than would be sufficient to admit the passage of a very fine bristle, *I squeezed the air out of the bladder.*"[5]

Acalephæ.

The Physalus, a member of this order, is known to sailors as the *Portuguese man-of-war*, and almost every book of voyages into distant lands contains some account of its habits, mixed, as we may notice in the above extract from Sir Hans Sloane, with a little fable. One of the earliest descriptions of it is given by Clayton in his account of a voyage to Virginia, which we extract, because it is sufficiently descriptive, and gives the notions of the period regarding its nature. "In the sea I saw many little things which the seamen call *Carvels*. They are like a jelly, or starch that is made with a cast of blue in it. They swim like a small sheep's bladder above the water. Downwards there are long fibrous strings, some whereof I have found near half a yard long. This I take to be a sort of sea-plant, and the strings its roots growing in the sea, as duck-weed does in ponds. It may be reckoned among the potential cauteries; for when we were one day becalmed, getting some to take observations thereof, the sportful people rubb'd it on one another's hands and faces, and where it touch'd, it would make it look very red, and make it smart worse than a nettle."[6] Of the tentacula which hang from the lower edge there are two kinds; the longest being used by the Physalus for the capture of its prey, and capable of being coiled up within half an inch of the air-bladder, and then darted out with astonishing rapidity to the distance of twelve or eighteen feet, twining round and paralyzing, by means of an acrid secretion, any small fish within that distance. The food thus seized is rapidly conveyed to the *short* appendages or tubes, which are furnished with mouths for its reception.[7] The creature is not only vesicatory, but luminous in a high degree; and we here remark, that these properties are probably common to every species of the family.

Of the other genera, all are remarkable for singularity of form. We might single out as among the most curious, the *Rhizophysa*, from its likeness to a bulbous root, with long radicular fibres, and the *Physsophora*, which imitates a root partly bulb and partly tuberous; the bulbous represented by the air-vesicles which are clustered above on a common stalk, and support the animal[8] in an upright

---

[1] *Annales du Museum*, tome xiv.

[2] *Man. d'Actinologie*, p. 112. This view has been adopted by Quoy and Gaymard, and by Lesson. *Ann. des Sc. Nat.* n. s., v. pp. 235–6.

[3] *Proc. Zool. Soc. Lond.* iii. pt. i. p. 14.

[4] *Mag. of Nat. Hist.* n. s. i. p. 598.

[5] *Mag. of Nat. Hist.* iv. p. 476. Knowing Mr Baird's accuracy, we are disposed to receive his statement as correct; but it is opposed by Mr George Bennett, who states that he could never discover the orifice in question, nor expel air from the bladder without a puncture being previously made; and, moreover, that the partial escape of air from the bladder has no influence on the creature's buoyancy. See *Proc. Zool. Soc. Lond.* for April 1837, p. 43.

[6] *Phil. Trans.* an. 1688, xvii. p. 783.

[7] G. Bennett, *ut sup. cit.* p. 43.

[8] "M. Milne-Edwards believes that these (Physsophores) are not single animals, but the aggregation of a great number of individuals growing by buds, and living united together like the compound polypes. *Ann. and Mag. of Nat. Hist.* i. p. 156.

Acalephæ. position, while under them the stalk parts into many unequal tubers, whence depend the fibrilose radicles, which are the organs of respiration. The *Apolemia* and *Stephanomia*, if possible, surpass this eccentricity of form; they are living clusters of sea-grapes or currants, with tentacula of curious structure pullulating from amidst the berries.[1] The *Diphyes*, though less attractive, yet deserve notice from the view Cuvier takes of their organisation. He believes that each animal, as it is usually taken, consists of two different individuals, one being emboxed in a cavity of the other; an arrangement which permits them to separate without destruction to individual life. The *Noctiluca* (Pl. VIII., fig. 4) is pre-eminent for its luminosity. It is a minute gelatinous spherical body, with a depression on one side, whence protrudes a sort of contractile stalk or proboscis; and we strongly suspect it is the same with the Medusa scintillans of our shores, better or more amply described and delineated. Mons. Suriray, to whom we owe our fullest knowledge of the Noctiluca, mentions that it seemed to have disappeared entirely from its ordinary habitats in the Channel during the period of the prevalence of the cholera at Havre, which was in the months of May, June, and July 1834.[2] The fact is too remarkable not to be recorded, and seems to point to an atmospherical poison as the cause of that plague.

De Blainville gives to the second family the name of *Ciliogrades*,[3] because they move about in the ocean by means of certain rows of vibratile cilia which garnish the body. They are gelatinous, translucid, fragile, very irritable and contractile animals, of multiform aspects, but always evidently binary or bilateral, although there are not unfrequently some signs of a tendency to radiation in their structure. Thus the genuine Beroës are egg-shaped or globular, girded longitudinally with eight ciliated bands equidistant or in pairs, so as to force a comparison between them and the Echinus with its ambulacral grooves.[4] The alimentary canal is usually described as traversing the body from pole to pole, with an orifice to each, the inferior and larger being the mouth, while the vent opens opposite in the centre of the apex. Near the middle of the body the canal is dilated into a stomachal cavity, at the sides of which the ovaries are usually to be distinguished by their vivid coloration;[5] and from the same cavity there run two or more canals, which tend towards the tentacula, on the lower surface, and carry water to them; for their elongation and various movements are dependent on the propulsion of water into them from behind, or its reflux back within the stomach.[6] The bands on which the cilia are placed run from the inferior or oral extremity to the opposite one, always in straight lines; they are of firmer consistency than the rest of the body, and are apparently formed by a duplicature of the thin skin, so inserted as to leave a fine canal between their base and the surface. Through these canals there is probably a constant flow of water, and it has been suggested by Professor Grant that the play of the cilia may be maintained by this current, for muscular action for such a purpose seems to be inadequate.[7] Our knowledge of their generation is very imperfect. Eschscholtz has seen minute Beroës, which even then had a close resemblance to their adult parents, but they were destitute of the eight rows of natatory lamellæ. He could perceive in them only four opaque longitudinal bands, which were probably the rudiments of as many rows of lamellæ. These lamellæ then are not developed until after the body has assumed the figure characteristic of the species; and of the eight rows which these all possess, it appears that at first there are only four, between which the others are afterwards produced. Acalephæ.

The Ciliogrades abound in all seas, but many of them are rendered invisible to our dim vision by their pellucidity and small size. They move about with great alacrity, sometimes whirling on their own axis, or advancing forward obliquely, or rising to the surface and again quickly descending. As already mentioned, their principal organs of locomotion (and they are at the same time the organs of respiration) are the banded cilia, aided however by the contractility of the body itself, perhaps also by currents of water flowing through them, and in some genera (*Ocyroes*) by the undulatory movements of certain fin-like expansions peculiar to them. When they wish to repose, they poise themselves in mid-water by the aid of their tentacula, or by ceasing the play of the cilia; but motion, constant motion, is their joy and occupation. Their vivacity, their extreme delicacy and fragility, the purity of the tints which colour their internal organs, and their varying iridescence reflected from the surface by the changes and motility of their cilia, have made them the objects of admiration to every one who has seen them. The Beroë ovum is, in the estimation of Otho Fabricius, the most beautiful of the class, but so frail as to be injured and broken by the gentlest handling; and when we remember that their life is probably as transitory as that of the Ephemera, it does indeed require from their admirers all the philosophy of the poet to bid him say, unrepining,—

"Oh! mourn not, that in Nature, transitory
Are all her fairest and her loveliest things."

[The following is a summary of the Orders and Families of the Acalephæ, according to modern views.

Free swimming marine animals of a gelatinous or membranous tissue with thread cells. Digestive cavities or canals adherent to the surrounding tissues, and communicating with a more or less ramified circulating system. Most are dicœcious, and pass by metageneris through the forms of the monad and the polype, before acquiring the sexual acalephoid character.

Order 1.—PULMOGRADA (Medusæ).

(*Discophora*, Eschscholtz).

Body discoid, with a marginal veil, and a mouth in the middle of the under side, which is usually extended into a more or less complex proboscis. A great central digestive cavity. Locomotion is effected by alternate expansions and contractions of the disc. Sexes distinct.

Sub-Order 1.—GYMNOPHTHALMATA.

Eye-specks naked or absent; circulating vessels extending to the margin, quite simple or branched. Gemmiparous.

Fam. 1. *Sarsiidæ*.—Circulating vessels simple, 4; ovaries in the substance of the proboscis. *Gen.* Sarsia, Euphysa, Steenstrupia.

Fam. 2. *Geryoniidæ*.—Circulating vessels simple, 4; ovaries beneath the disc. *Gen.* Geryonia, Thaumantias, Slabberia.

Fam. 3. *Circeidæ*.—Circulating vessels simple, 8; ovaries 8, beneath the disc. *Gen.* Circe.

Fam. 4. *Æquoreidæ*.—Circulating vessels simple, 8, or more; ovaries linear on the course of the canals beneath the disc. *Gen.* Polyxennia, Stomotrachium, Æquoria, Phorcunia.

---

[1] The Stephanomiæ are, according to Lamarck, *compound* animals, consisting of a cluster of individuals which enjoy a common life and mutual communications through the medium of the central tube to which they hang. *Anim. sans Vert.* ii. p. 462.

[2] *Mag. of Zool. and Botany*, i. p. 492.

[3] The *Vibrastes* of Chamisso; *Beroides* of Lesson.

[4] The boatmen of Sheerness are familiar with the *Beroë pileus* "under the name of the spawn of the sea-egg (Echinus), which it somewhat resembles in its globular and ribbed form." Grant in *Trans. Zool. Soc.* i. p. 9.

[5] "I have generally observed that the lively hues presented by the Acalephæ depend on the bright opaque colours of their reproductive gemmules, which are often red, sometimes yellow, or brown, or purple." Grant in *loc. cit.*

[6] This description has been lately pronounced by Mr Forbes and Mr Goodsir to be inaccurate. They believe the supposed anus to be imperforate, and a great portion of the supposed intestinal canal to belong to the circulating system.

[7] Grant *ut sup. cit.* p. 12. Dr Fleming observed in *Beroë ovatus* water moving in vessels along the middle of the bands to which the cilia are attached. The animals can change the direction of the currents in the vessels, and also the direction of the motions of the cilia.

Polypes.

Fam. 5. *Oceanidæ.*—Circulating vessels simple; ovaries convoluted, and lining the pedunculated stomach. *Gen.* Oceanea, Saphenia, Turris, Cytæis.

Fam. 6. *Willsiidæ.*—Circulating vessels branched. *Gen.* Willsia, Berenice, Orythia.

Sub-Order 2.—STEGANOPHTHALMATA.

Eye-specks protected by complicated coverings; circulating vessels branched, and forming a network. No gemmation.

Fam. 1. *Rhizostomatidæ.*—Mouths numerous on the branches and borders of a ramified proboscis; circulating vessels without outlets. *Gen.* Rhizostoma, Cephea, Cassiopeia.

Fam. 2. *Monostomatidæ.*—Mouth single; circulating vessels sometimes with distinct outlets. *Gen.* Phacellophora, Cyanæa, Pelagia, Chrysaora, Aurelia.

Order 2.—CILIOGRADA (Ctenophora, *Esch.*)

Body spheroidal, oblong, or lobed, sometimes lamelliform, with a great central digestive cavity. Locomotion is effected by longitudinal bands of cilia on the surface. Sexes sometimes combined.

Fam. 1. *Beroidæ.*—*Gen.* Beroë, Lesueuria, Medea, Cydippe, Pleurobrachia.

Fam. 2. *Mnemeidæ.*—*Gen.* Mnemia, Eucharis, Janira, Alcinoë, Bolena.

Fam. 3. *Callianiridæ.*—*Gen.* Callianira.

Fam. 4. *Cestidæ.*—*Gen.* Oryroë, Cestum.

Order 3.—PHYSOGRADA (Siphonophora, *Esch.*)

Body irregular, with organs of suction, but without a central digestive cavity; floated by air-vesicles, and sometimes moving by means of a contractile cavity.

Fam. 1. *Diphyidæ.*—*Gen.* Diphyes, Ersæa.

Fam. 2. *Physophoridæ.*—*Gen.* Physophora, Stephanomia.

Fam. 3. *Physalidæ.*—*Gen.* Physalia.

Fam. 4. *Velellidæ.*—*Gen.* Velella, Rataria, Porpita.]

IV.—POLYPES.

The constituents of this class are in general animals of minute size, and of almost gelatinous consistency, characterized by having the oral aperture in the superior disc or extremity of the body, encircled with a row, or sometimes with several rows, of tentacular filaments. The aperture always leads into a cavity appropriated to the digestion of the nutrient matter, but in all other particulars the Polypes differ so widely in their organisation, that, to give a view of it which shall have any distinctness or use, there is a necessity to separate the class into groups.

It is an axiom, that no class of animals stands isolated, but every one has its kindred claims on those around it. Thus it happens, that while Polypes have mostly felt the force of radiation in their development, they are not without their families that connect them with the unsymmetrical molluscans; and since it seems to us to be of importance that these relations should be remembered (for what study is more interesting to the zoologist than the mutual harmonies of two apparently remote classes?) we shall in the first instance divide the class into two sections, distinguished in a manner that brings this relationship into prominent view. The molluscan Polypes have both an oral and an anal aperture to the alimentary canal, and the tentacula that surround the former are filiform and ciliated; but the radiated Polypes have only one aperture to their digestive sac, serving by turns the purposes of a mouth and a vent, and the tentacula that guard it are not ciliated, but very contractile.

1.—MOLLUSCAN POLYPES.

Polyzoa, Thompson; *Bryozoa*, Ehrenberg; *Ciliobrachiata*, Farre.

The molluscan Polype is always a very small, almost a microscopic animal, with an elongated, slender, subcylindrical body, which is bent upon itself like a syphon, so that the two extremities approximate each other. The mouth is a wide edentulous aperture, situated in the centre of the circle of tentacula, which rise from its rim, and constitute a funnel-shaped coronet of extreme delicacy. The number of filaments of which the coronet consists is very variable, but each of them forms a long slender filiform tube, clothed on one side with vibratile cilia, by whose active and well-regulated movements a current of water is incessantly driven along them in one determinate direction. These currents not only supply a succession of unbreathed water to the animal for the purpose of respiration, but they carry in their stream the animalcular prey that the polype feeds upon. Under the tentacular coronet, the alimentary canal forms a kind of pouch analogous to the branchial sac of the ascidian mollusca, and, like it, plaited usually in a longitudinal direction. From this pouch or pharynx the gullet descends a short space previously to its dilatation into the stomach,—an organ usually of an oblong shape, with its walls studded with spots of a rich brown colour,—apparently hepatic follicles, that secrete a fluid which often tinges the whole organ, as well as its contents, of a similar hue. The intestine, on departing from the stomach, makes a sudden bend, to which is suspended a large short cæcal appendage; and afterwards the intestine proceeds upwards in a course parallel with the gullet to its termination, which is a little below the mouth, behind the pharynx, and on the side of the membranous sheath containing the tentacula.

Polypes.

This kind of polype is never found isolated and naked. It dwells enclosed in a calcareous or horny cell, of which a great number are placed in juxtaposition, usually after a quincunx pattern; and the entire congeries forms sometimes a leprous crust, sometimes a stony branched coral, sometimes a fleshy unformed mass, and at other times a horny flexible seaweed like polypidom, or one that more nearly resembles some fine capillary moss or shrubby lichen. The numerous tenantry of these aggregations are besides all connected together, so as to form what has been named a "compound animal; every individual capable of self-support and of continuing its kind, yet so connected with the rest as necessarily to participate in every good and every evil that affects the community. The polypes are so connected with their cells that they cannot leave them, for indeed the cell and polype are merely parts of the same body. This, such as it has been described above, is enclosed in a thin membranous sac; and the cell is formed by a continuation of this tunic reflected over the inner layer, and hardened by the deposition in it of calcareous or albuminous matter, to fit it to endure with impunity the contact and friction of the circumfluent waters, or to protect the soft viscera from accident, and from the access of their enemies. Milne-Edwards compares the cell to the lopt finger of a glove, which has had its open truncate extremity ornamented with a thready fringe, capable of being withdrawn by an act of involution within the finger-stool. The point of junction between the retractile portion and that which is not so, constitutes, when the finger or polype is withdrawn, an opening usually called the mouth of the cell, which is very often overhung with a sort of moveable lip or valvular fold, named the *operculum.* Two muscular bands are attached to the inner surface of this valve, and their office is to draw it down and shut close the cell when the tenant has retired for rest or from danger.

The polypidom, formed frequently of a congeries of many thousand cells, invariably begins with one only. This original or seminal cell has no sooner been completed (or even, in many instances, previously to its perfection) than another begins to shoot out from a fixed point of its parietes, the bud gradually enlarging and developing itself, until the form and size of the primary one has been attained. This process can most easily be traced in the common sea-mats (Flustra) and Lepraliæ, where, round the margin of the crust, cells can at all seasons be observed in every stage of

Polypes. their evolution; one just budding, another half-formed, and others again nearly complete. They never begin their original in the body of the polype, but always from the parietes, or from the connecting medium of the cells; and it is not until these have made considerable advances to maturity that the polype becomes distinguishable within them.

From this mode of increase, there would seem to be no natural limits set to the magnitude and duration of the polypidom, except what arise from accident or exterior causes. The original polype and its immediate successors may grow old, languish, and die; but the solid cells remain in their connection as a root and fixture, while the newer races, which have sprung up towards the outskirts, continue their work, generation following generation in rapid and ever-multiplying successions. The polypidom in this respect resembles a tree in its growth: the trunk and main branches have stood years and centuries, but the increase has been made by annual shoots and renewals, and the last only know vigour and juvenescence. And as the form of the tree depends on the fashion of its ramifications, so that of the polypidom on the mode of evolution of its cells, for every part of the axis is not equally organised to produce buds, nor the same parts in all. Hence, if the primitive cell has only one point fitted for this generation, the polypidom will be built up in a catenated chain; if the cell has two points, two series of cells are formed, and in several the multiplication goes on in a regular arithmetical progression; but in others the cells are heaped together without apparent regularity, as in Alcyonella and Alcyonidium, where the softness of all the parts seems to allow of an irregular succession of buds. In this order, however, the general disposition of the cells is certainly after the quincunx, affording examples which the learned Sir Thomas Browne would have gladly adduced in proof that "Nature geometriseth and observeth order in all things, and of the generality of this mystic figure."

The molluscan Polypes are all hermaphroditical and oviparous. The ova, which originate in the organised medium connecting the individuals together, are lodged and matured within the cell in some families; but in others their matrix is a little pearly globe that is placed over the mouths of the cells, and often constitutes the principal beauty of the specimen. When ripe for expulsion, the ova are of a vivid orange or yellow colour, of a roundish shape, and clothed with vibratile cilia, by means of which they swim about to and fro in the water like beings endowed with volition, and scatter themselves abroad.

[It has already been stated, that the animals here called Molluscan Polypes are now generally dissociated by naturalists from the true Polypes, and placed under the name of *Polyzoa*, or *Bryozoa*, amongst Mollusca in the neighbourhood of the Tunicata. Dr Allman[1] thus sketches the constitution of a Polyzoon: An alimentary canal, consisting of œsophagus, stomach, and intestine, furnished at its origin with long ciliated tentacula, with a single nervous ganglion on one side of the œsophagus; this canal is bent back upon itself towards the side of the ganglion, so as to bring the termination near the origin. The digestive tube thus constituted is suspended in a fluid contained in a membranous sac with two openings, one for the mouth and the other for the vent, the tentacula alone being external to the sac. By means of a system of muscles, the alimentary tube admits of being retracted or protruded at the will of the animal, the retraction being accompanied by an invagination of the sac so as partially or entirely to include the oval tentacula within it; the presence of true sexual organs in the form of ovary and testis occupying some portion of the interior of the sac; no trace of a heart. The immediately investing sac has the power in almost every case of secreting from its external surface a secondary investment of very various constitution in the different groups. The entire animal repeats itself by gemmation, and thus produces one or more precisely similar systems holding a definite position relatively to one another, while all continue organically united. The general arrangement may be seen from the following sketch of the

POLYZOA.

ORDER I. PHYLACTOLÆMATA.—Buccal disc bilateral; mouth with an arching valve-like organ (epistome).

Sub-order 1. LOPHOPEA (fresh-water).—Tentacles free or obsolete.

Sub-order 2. PEDICELLINEA (marine).—Tentacles united at their extremities.

ORDER II. GYMNOLÆMATA.—Buccal disc orbicular or nearly so; no epistome.

Sub-order 1. URNATELLEA (fresh-water).—Only partially retractile?

Sub-order 2. PALUDICELLEA (fresh-water).—Completely retractile; evagination of tentacular sheath imperfect.

Sub-order 3. CYCLOSTOMATA (marine).—Completely retractile; evagination perfect; orifice of cell destitute of moveable appendage.

Sub-order 4. CTENOSTOMATA (marine).—Completely retractile; evagination perfect; a circle of setæ attached to the invertible portion, and acting as an operculum in the retracted state.

Sub-order 5. CHEILOSTOMATA (marine).—Completely retractile; evagination perfect; orifice of the cell with a moveable lip.]

2.—RADIATED POLYPES.

The Radiated Polypes, or Anthozoa of Ehrenberg, present us with a greater diversity of structures than the molluscans. In all, the body is perforated superiorly with the larger circular opening into the digestive cavity, and surmounted with a coronet of tentacula; but the structure of the stomach, and the disposition of the tentacula, vary so much, that if our classification would follow and reflect a representation of the principal modifications of this variety, we are constrained to subdivide the class into three sections as follows:—

(1.) HELIANTHOIDA.—*Polypes* single or aggregate, free or permanently attached, fleshy, naked, or incrusted with a calcareous *polypidom*, the upper surface of which is crossed with radiating lamellæ; mouth encircled with tubulous tentacula; stomach membranous, plaited; intestine 0, anus 0; oviparous; the ovaries internal.

(2.) ASTEROIDA.—*Polypes* compound, the mouth encircled with eight fringed tentacula; stomach membranous, with dependent vasculiform appendages; intestine 0, anus 0; reproductive gemmules produced interiorly. *Polype-mass* variable in form, free or permanently attached, carnose, generally strengthened with a horny or calcareous *axis*, enveloped with the gelatinous or creto-gelatinous crust in which the polype-cells are immersed, and which open on the surface in a starred fashion with eight rays.

(3.) HYDROIDA.—*Polypes* compound, rarely single, and naked; the mouth encircled with roughish filiform tentacula; stomach without proper parietes; intestine 0, anus 0; reproductive gemmules pullulating from the body, and naked, or contained in external vesicles. *Polypidoms* horny, fistular, more or less phytoidal, fixed, external.

(1.)—HELIANTHOIDA.

The typical representatives of this order are the *Actiniæ* or sea-anemones, which abound on every European shore between tide-marks, rivalling in beauty and vividness of colouring their floral namesakes. It is now well ascertained that the animals of the madrepores, sea-mushrooms, and brainstones of tropical seas, differ from the Actiniæ no otherwise in essence than in their power of excreting, from the inferior portion of the body, a large quantity of calcareous matter, the deposition of which under and around the body, and in the tissue of the folds formed by the tunics of the abdominal cavity, constitutes the cell or polypidom, into whose hollows the tenant can partially or wholly retire. "The stony substances so formed are called *corals*, and their mode of formation causes them exactly to represent

[1] [*A Monograph of the Fresh-water Polyzoa, including all the known Species, both British and Foreign*, by G. J. Allman, M.D., Ray Society, 1856. On this subject the reader may consult Dr Johnston's *History of British Zoophytes*, 2d ed. 1847, and Mr Busk's *Catalogue of Marine Polyzoa in the British Museum*, and various articles by the same writer in the *Microscopical Journal*.]

Polypes. the animal which secretes them: the upper surface is always furnished with radiating plates, the remains of the calcareous particles which were deposited in the longitudinal folds of the stomach before referred to; and as these plates do not usually reach to the centre, there is almost always a vacant space in the middle between them." The cells are either single and cupped, or they are branched like a tree, or they are aggregated together so as to resemble a cauliflower, or even to imitate the human brains; all these variations resulting from the manner in which the animal emits from the whole surface, or from a particular part of the sides of the body, the bud by which the new individuals of the general mass or society are produced.

The Helianthoida are all oviparous, the ova being produced in appropriate ovaries situated between the compartments formed by the septa that radiate from the outer parietes of the stomach to the skin. The ova are contractile and motive, being carried about from the action of the cilia that clothe the surface. "Under the microscope they prove of diversified form, many resembling flattened peas, some elongated or exhibiting irregular prominences, some almost spherical, and some which cannot be referred to any particular figure." After moving about for several days, during which their forms suffer some slight change, they insensibly relax in their motility, the cilia disappear, and, having become stationary, each ovum rapidly runs through the stages of development that lead it up to the similitude of its parent.

The productiveness of the species and the rapidity of their growth are very great. The calcareous species often form enormous masses of coral, of the size of which we cannot judge by the specimens usually shown in collections, which are small individuals taken in the sheltered places among the rocks, where they are not exposed to the action of the waves, and collected before they have reached their proper magnitude. "The form of the masses appears to be greatly influenced by the positions in which they have grown, and the size of the individuals greatly depends on the quantity of nourishment they are able to procure. This is proved by the fact, that if all the individuals of the same mass are equally exposed, they are of an equal size; but if the surface of the coral is waved, as in the *Explanaria*, the individuals on the convex part of the mass, which could procure the most food, are large, while those in the concave or sunken parts are small."—*J. E. Gray.*

[The productions of the coral animal in the warmer parts of the ocean are not only wonderful in themselves on account of their vast extent and the minuteness of the animal by which they are created, but highly interesting for the light which they throw upon the history of the globe. On the north-east coast of Australia there is a reef 1000 miles long. The shores of New Caledonia are fenced in by a reef 400 miles in length. The coral islands of the tropical Pacific Ocean are innumerable, and are well known to all by the glowing descriptions of voyagers. These productions may be referred to three classes—*atolls, barrier reefs,* and *fringing reefs.* The first consist of a circular wall of coral, rising from a considerable depth, surrounding a lagoon or sheet of smooth water. The wall is seldom entire throughout, for there are places through which the water can find its way from the open ocean into the interior. The bottom of the confined water is usually cup-shaped, with a depth ranging from a few fathoms to fifty; whilst the outer side of the reef falls at an angle of about 45° to a depth of from 200 to 300 fathoms. In violent storms large pieces of the wall are broken off and driven into the interior cavity which thus becomes more or less filled up, and a low island is formed, to which floating seeds are carried that take root and flourish. A barrier reef only differs from an atoll in that it runs parallel with some large island or continent, from which it is separated by a broad deep channel. The outer side sinks at a steep angle into a deep ocean. The fringing reefs have only a narrow and shallow channel between them and the land, where the water on their outer side has small depth. Now it appears that the coral animal cannot live at a greater depth than thirty fathoms, and if exposed to the direct rays of the sun uncovered by water, it will perish. A consideration of these facts has led Mr Darwin to form a theory which has been generally accepted by scientific men. He believes that the phenomena in question are connected with movements which simultaneously affect large portions of the earth's crust, such as that by which the coast of Sweden, to the extent of some hundreds of miles, is now being elevated. He thinks that atolls have their foundation on land which has subsided, and part of which was once above the level of the sea; that barrier reefs show that the land near which they are situate is likewise sinking; and that fringing reefs, on the other hand, denote that the land is either rising, as in the majority of the Sandwich Islands, where old reefs have been elevated to a considerable distance above the sea, or that the land is stationary. An examination of the chalk and limestone beds of the earth's crust shows that they are in great part composed of corals, all the species of which are extinct. Hence it may be conjectured that the labours of existing coral animals will remain to after-ages in the shape of calcareous beds, when the species themselves will have disappeared.

Polypes.

(2.)—ASTEROIDA.

The name of this order is derived from the starred marks that stud the surface when the polypes have contracted and hid themselves under the skin of the common mass or polypidom. These marks are produced by the incisures whence the tentacula are evolved; and hence the number of rays in each mark is mostly eight but sometimes only six in number, corresponding with the number of tentacula. These organs are, in this order, comparatively short, thick, and fringed or pectinated on the margins, and they radiate from a flat disc, in the centre of which the mouth is situated. This aperture is always circular, and leads by a gullet into a long cylindrical stomach, which is as it were suspended in a thin membranous sac or vesicle, and kept in its central position by eight or six septa or ligaments stretched between it and the vesicle, dividing the intermediate space into as many distinct compartments. From the inferior extremity of the stomach there hang eight or six twisted, intestine-like, but probably biliary, appendages, into a wide cavity, that communicates freely with the fleshy parenchyma by which the polypes are connected together, for the Asteroida are all compound Zoophytes; that is, each species is a collection of numerous individuals participating in a common life, while each individual at the same time enjoys an independent vitality for every part of its body. The connection is effected partly through the medium of the skin, which is formed by the confluence of the outer thickened tunic of the polypes, and partly by aquiferous ducts that depart from the infra-abdominal cavity just mentioned, and permeate the entire mass in every direction.

The forms of the polypiferous masses are very various. Some are fleshy amorphous productions, covered with a coriaceous skin loaded with variously-shaped calcareous grains or crystals; others resemble a quill, and are called *Sea-pens;* others are like a rush or rod; while many, like the Gorgonia and Coral, are eminently imitative of marine vegetations. The internal part of the amorphous species is fibro-gelatinous; "but when the axis assumes an erect or a branched tree-like form, the animals excrete in the centre of their body a more or less rigid support, which has been called their *axis,* and which has sometimes, though erroneously (from its being commonly seen in collections without the remains of the investing animal), been considered the entire coral. This axis is thickened by depositions of fresh layers of horny matter on its surface as the mass increases in size and requires more support, the increase of the thickness and length of the axis being always simultaneous with the growth of the mass."—(*J. E. Gray.*) In some genera the axis is bony, in a greater number it is of a horny nature, and very compact, in a few it is formed by the aggregation of siliceous needle-shaped spicula, and in others it is calcareous and stony; of which we have a familiar example in the red and black coral of the Zoophyte that furnishes the coral of commerce, so highly valued for ornamental purposes. In the genus *Isis,* "the axis has been considered as jointed, because the stony and the horny parts easily separate from each other when the mass

Polypes. of the animal has been removed and the axis is dried; but a larger and larger quantity of stony matter is gradually deposited as the mass increases in size, and in the large masses the axis of the lower part is almost entirely stony, like the axis of *Corallium*."—(*J. E. Gray.*)

The Helianthoida are all oviparous, and it has been affirmed that the sexes are distinct and separate. Dr Erdl of Munich says that he found in *Veretillum* only female individuals in one polypary, and in another only males; and he has convinced himself of a similar distinction existing in the genus *Alcyonium* or *Lobularia*. Plate X. fig. 9.

[The following is Milne-Edwards' arrangement of the Helianthoida and Asteroida:—

CORALLIARIA.[1]

Sub-class I. CNIDARIA.—*Tentacles tubular, circularly arranged, and communicating freely with the visceral chamber.*

Order 1. ALCYONARIA.—Tentacles 8, pinnate.

Fam. 1. ALCYONIDÆ.—Adherent, without solid axis.
- Sub-fam. 1. *Cornularinæ*.—Polypidom increasing by budding, only basilar, and rising from stolons, or from a membranous expansion; sometimes isolated. *Gen.* Haimeia, Cornularia, Clavularia, Rhizoxenia, Sarcodictyon, Anthelia, Sympodium.
- Sub-fam. 2. *Telestinæ*.—Polypidom lateral, and forming arborescent tufts. *Gen.* Telesto.
- Sub-fam. 3. *Alcyoninæ*.—Polypidom lateral, and forming simple lobed or branched masses. *Gen. a.* Alcyonium (Pl. X. fig. 9), Sarcophyton, Ammothea, Xenia: *b.* Nephthya, Spoggodes, Paralcyonium.
- Sub-fam. 4. *Tubiporinæ*.—Polypidom composed of tubes with distinct walls, united by horizontal expansions. *Gen.* Tubipora.

Fam. 2. GORGONIDÆ.—Adherent, having a horny or calcareous axis.
- Sub-fam. *Gorgoninæ*.—Axis partly or entirely flexible, horny or corky, unjointed, of the same structure throughout.
  - Div. 1. *Primnoaceæ*.—Axis complete, dendritic; crust rough with spines or squamiform appendages. *Gen.* Primnoa, Muricea.
  - Div. 2. *Gorgonaceæ*.—Axis complete, dendritic; crust corky or smooth, axis horny. *Gen.* Eunicea, Gorgonia, Leptogorgia, Plexaura, Lophogorgia, Xiphigorgia, Rhipidigorgia, Hymenogorgia, Phythogorgia, Phycogorgia.
  - Div. 3. *Gorgonellaceæ*.—Axis complete, dendritic; crust corky, or smooth; axis calcareous. *Gen.* Gorgonella, Verrucella, Ctenocella, Juncella.
  - Div. 4. *Briaraceæ*.—Axis incomplete, and represented by a deposit of corky tissue, or a mass of spicules. *Gen.* Briareum, Solanderia, Paragorgia, Cœlogorgia. Polypes.
- Sub-fam. 2. *Isidinæ*.—Axis partly or entirely flexible, horny or corky, jointed with alternate segments of different structure. *Gen.* Isis, Mopsea, Melitæa.
- Sub-fam. 3. *Corallinæ*.—Axis entirely stony. *Gen.* Corallium (Pl. X. fig. 3.) See the art. CORAL.

Fam. 3. PENNATULIDÆ.—Polypidom free, with a central cavity which almost always contains an axis. *Gen.* Pennatula (Pl. X. fig. 8), Virgularia, Sarcoptilus, Pavonaria, Lituaria, Ombellularia, Veretillum, Cavernularia, Renilla (Pl. X. fig. 11.)

Order 2. ZOANTHARIA.[2]—Tentacles simple or irregularly branched, their number increasing with age, generally more than 12.

Sub-order 1. ACTINIARIA.—No horny axis, integuments always soft (Pl. X. figs. 1, 1 *a*.)

Fam. 1. ACTINIDÆ.—The tentacles of the different circles alternating with one another, each corresponding with a special perigastric cavity.
- Sub-fam. 1. *Minyadinæ*.—Integuments always soft, not forming a polypidom; disc pedicellate, purse-shaped. *Gen.* Minyas, Plotactis, Nautactis.
- Sub-fam. 2. *Actininæ*.—Integuments always soft, not forming a polypidom; disc pedicellate, sometimes rudimentary, not capable of contraction into a purse; tentacles of one kind, simple. *Gen.* Anemonia, Eumenides, Comactis, Ceratactis, Metridium, Discosomus, Actinia, Paractis, Capnea, Dysactis, Melactis, Corynactis, Heteractis, Cereus, Phymactis, Echinactis, Cystactis, Nemactis, Adamsia, Hyanthos, Sphenopus, Edwardsia, Peachia.
- Sub-fam 3. *Thalassenathinæ*.—Characters same as those of Actininæ, except that the tentacles are branched or bear papillæ. *Gen.* Thalassianthus (Pl. X. fig. 4), Actinodendron, Actinaria, Phymanthus, Sarcophianthus, Heterodactyla.
- Sub-fam. 4. *Phyllactinæ*.—Characters same as sub-fam. 2 and 3, save that the tentacles are of two forms, some being simple, others multifid or dendritic. *Gen.* Phyllactis, Oulactis, Rhodactis.
- Sub-fam. 5. *Zoanthinæ*.—Integuments thickening and furnished with spicula, so as to form a leathery polypidom. *Gen.* Zoanthus (Pl. X. fig. 2) Polythoa.

Fam. 2. CERIANTHIDÆ.—Tentacles in two concentric circles, one of the outer circle being opposite one of the inner, the two being placed over a single perigastric cavity. *Gen.* Cerianthus, Saccanthus.

Sub-order 2. ANTIPATHARIA.—Axis horny, with a fleshy or gelatinous coat, containing scattered spicules or mineral filaments (blacks corals). *Gen.* Cirrhipathes, Antipathes, Arachnopathes, Rhipidipathes, Leiopathes, Hyalopathes.

---

[1] [The most important contributions made of late years to our knowledge of Corals have been Ehrenberg's *Die Corallenthiere des Rothenmeeres*, Berlin, 1834; Dana's work on the *Zoophytes of the United States Exploring Expedition* under Capt. Wilkes, 1846, with a splendid folio atlas of plates, 1849; Milne-Edwards and Jules Haime's *Monograph of the British Fossil Corals*, 5 parts, Palæontographical Society, London, 1850–1855; Milne-Edwards's *Histoire Naturelle des Coralliaires*, 3 vols. Paris, 1857–1860.]

[2] [Mr P. H. Gosse, who has paid great attention to sea-anemones, objects to M. Milne-Edwards' arrangement, saying that his work "bears evidence on every page of being the produce of the museum and the closet, not of the aquarium and the shore." In his *Actinologia Britannica* (1860) he has proposed the following arrangement of the *Actinoida*:—

Order ACTINOIDA.—Visceral cavity enclosing the stomach, and divided into compartments by perpendicular partitions of membrane, which support the reproductive organs; germs ejected through the mouth.

Sub-order ACTINARIA.—Tentacles 12 or more; membranous partitions sometimes simple, sometimes depositing solid calcareous plates, which, with the surrounding walls, constitute the corallum.

Tribe 1. *Astræacea*.—Tentacles many in imperfect series or scattered; corallum, when present, calcareous, consisting of cells containing many radiating plates; the plates prolonged outwards beyond the cells that inclose them.

Div. 1.—Non-coralligenous families.

Base adherent at pleasure—
- Tentacles compound ..... *Metridiadæ*.—No European genera.
- Tentacles simple—
  - Column pierced with loop-holes ..... *Sagartiadæ*.—*British Gen.* Actinoloba, Sagartia, Phellia, Adamsia, Gregoria, Discosoma.
  - Column imperforate and smooth, Margin simple... *Antheadæ*.—*British Gen.* Aiptasia, Anthea, Actinopsis.
  - Margin beaded ..... *Actiniadæ*.—*British Gen.* Nemactis, Actinia, Phymactis.
  - Column imperforate, warted ..... *Bunodidæ*.—*British Gen.* Tealia, Bunodes, Hormathia, Cystactis, Echinactis, Bolocera, Stomphia.

Base non-adherent—
- Lower extremity rounded, simple ..... *Ilyanthidæ*.—*British Gen.* Peachia, Ilyanthus, Halcampa, Arachnactis, Cerianthus, Saccanthus.
- Lower extremity inclosing an air chamber ..... *Minyadidæ*.—No *British* species.

Order 2. CARYOPHYLLACEA.—Tentacles many, in two or more series; mostly increasing by lateral buds; generally depositing a corallum, which is invariably calcareous and many-rayed.

Div. 1.—No corallum.
- Simple ..... *Capneadæ*.—*British Gen.* Capnea, Aureliania, Corynactis.
- Compound ..... *Zoanthidæ*.—*British Gen.* Zoanthus.]

Polypes.

Sub-order 3. MADREPORARIA.—Stony corals. Sect. 1. *M. aporosa.*
Fam. 1. TURBINOLIDÆ.
Sub-fam. 1. *Caryophylliaceæ.—Gen.* Caryophyllia (Plate X. fig. 7.) Cœnocyathus, Acanthocyathus, Bathycyathus, Brachycyathus, Conocyathus, Discocyathus, Cyclocyathus, Trochocyathus, Paracyathus, Thecocyathus, Deltocyathus, Tropidocyathus, Leptocyathus, Heterocyathus, Stylocyathus, Placocyathus.
Sub-fam. 2. *Turbinolinæ.— Gen.* Turbinolia, Sphenotrochus, Platytrochus, Ceratotrochus, Discotrochus, Smilotrochus, Desmophyllum, Flabellum, Rhizotrochus, Placotrochus, Blastotrochus.
Fam. 2. DASMIDÆ.—*Gen.* Dasmia.
Fam. 3. OCULINIDÆ.
Sub-fam. *Oculinaceæ.—Gen.* Oculina, Cyathohelia, Synhelia, Trymohelia, Sclerohelia, Diplohelia, Astrohelia, Acrohelia, Lophohelia, Amphihelia, Enallohelia, Euhelia, Baryhelia.
Sub-fam. *Stylastreaceæ.*—Axohelia, Cryptohelia, Endohelia, Stylaster, Allopora.
Fam. 4. STYLOPHORINÆ.—*Gen.* Stylophora, Madracis, Araeacis.
Fam. 5. ASTREIDÆ.
Sub-fam.—*Eusmilinæ.*
Sect. 1. *Trochosmiliaceæ.—Gen.* Cylicosmilia, Placosmilia, Trochosmilia, Diploctenium, Parasmilia, Cœlosmilia, Lophosmilia, Peplosmilia, Axosmilia.
Sect. 2. *Euphylliaceæ.—Gen.* Eusmilia, Aplosmilia, Euphyllia, Barysmilia, Dichoccenia, Dendrogyra, Gyrosmilia, Perogyra, Pectinia, Pachygyra, Rhipidogyra, Phytogyra.
Sect. 3. *Stylinaceæ.—Gen. a.* Dendrosmilia, Stylosmilia, Placophyllia; *b.* Galaxea; *c.* Stylina, Holoccenia, Stylocœnia, Astrocœnia, Acanthocœnia, Columnastræa, Stephanocœnia, Placocœnia, Cyathophora, Phylloccenia, Convexastræa, Elasmocœnia, Aplocœnia, Pentacœnia, Heterocœnia.
Sub-fam. 2. *Astræinæ.*
Sect. 1. *Lithophylliaceæ.—Gen. a.* Lithophyllia, Circophyllia, Leptophyllia, Montlivaultia; *b.* Mussa, Dasyphyllia, Trachyphyllia, Calamophyllia, Rhadophyllia, Dactylosmilia, Aplophyllia, Thecosmilia, Cladophyllia, Hymenophyllia; *c.* Symphyllia, Isophyllia, Mycetophyllia, Alophyllia, Tridacophyllia, Colpophyllia, Scapophyllia, Aspidiscus, Mæandrina, Manicina, Diploria, Leptoria, Stelloria, Cœloria, Hydnophora.
Sect. 2. *Faviaeaceæ.—Gen.* Favia, Goniastræa, Septastræa, Aphrastræa, Meandrastræa.
Sect. 3. *Astreaceæ.—Gen.* Heliastræa, Brachyphyllia, Confusastræa, Cyphastræa, Ulastræa, Plesiastræa, Leptastræa, Solenastræa, Phymastræa, Acanthastræa, Astræa, Baryastræa, Prionastræa, Metastræa, Isastræa, Latimæandra, Plerastræa, Thamnastræa, Demorphastræa.
Sect. 4. *Cladocoraceæ.—Gen.* Cladocora, Pleurocora, Goniocora.
Sect. 5. *Astrangiaceæ.—Gen.* Cylicia, Cryptangia, Rhizangia, Astrangia, Phyllangia, Ulangia, Cladangia, Pleurocœnia.
Fam. 6. ECHINOPORINÆ.—*Gen.* Echinopora.
Fam. 7. MEMBRULINACEÆ.—*Gen.* Merulina.
Fam. 8. FUNGIDÆ.
Sub-fam. 1. *Funginæ.*
Sect. 1. *Fungiaceæ.— Gen.* Fungia, (Plate X. fig. 6ª.) Podabacia, Halomitra, Cryptabacia, Herpetolitha, Polyphyllia, Lithactinia, Micrabacia.
Sect. 2. *Anabaciaceæ.—Gen.* Anabacia, Genabacia.
Sub-Fam. 2. *Lophoserinæ.—Gen.* Cyclolites, Palæocyclus, Cycloseris, Gyroseris, Diaseris, Psammoseris, Stephanoseris, Trochoseris, Cyathoseris, Mæandroseris, Comoseris, Lophoseris, Protoseris, Mycedium, Leptoseris, Haloseris, Oroseris, Agaricia, Pachyseris, Polyastra, Astræomorpha.
Sect. 2. *Madreporaria perforata.*
Fam. 1. MADREPORIDÆ.
Sub-fam. 1. *Eupsammineæ.— Gen.* Eupsammia, Endopachys, Balanophyllia, Heteropsammia, Leptopsammia, Endopsammia, Stephanophyllia, Dendrophyllia, Lobopsammia, Cœnopsammia, Stereopsammia, Astroides.
Sub-fam. 2. *Madreporinæ.—Gen.* Madrepora.
Sub-fam. 3. *Tubsinarinæ.—Gen.* Turbinaria, Astreopora, Dendracis, Actinacis, Palæacis.
Fam. 2. PORITIDÆ.
Sub-fam. 1. *Porítinæ.— Gen.* Porites, Rhodaræa, Protaræa, Litharæa, Goniopora, Alveopora, Microsolena, Mæandraræa, Coscinarœa, Pleurodictyum, Dictyophyllia.
Sub-fam. 2. *Monteporinæ.—Gen.* Montipora, Psammocora.
Sect. 3. *Madreporaria tabulata*
Fam. 1. MILLEPORIDÆ.—*Gen.* Millepora, Heliopora, Polytremacis, Heliolites, Fistulipora, Plasmopora, Propora, Lyellia, Axopora, Battersbyia. Polypes.
Fam. 2. FAVOSITIDÆ.
Sub-fam. 1. *Favosotinæ.—Gen.* Favosites, Emmonsia, Michelinia, Roemeria, Koninckia, Alveolites.
Sub-fam. 2. *Chætetinæ.—Gen.* Chætetes, Monticulipora, Dania, Stellipora, Beaumontia, Dekayia, Labechia.
Sub-fam. 3. *Stylophyllinæ.—Gen.* Stylophyllum.
Sub-fam. 4. *Halysitinæ.—Gen.* Halysites, Syringopora, Thecostegites, Chonostegites, Fletcheria.
Sub-fam. 5. *Pocilloporinæ.—Gen.* Pocillopora, Cœnites.
Fam. 3. SERIATOPORIDÆ. — *Gen.* Seriatopora, Dendropora, Rhabdopora, Trachypora.
Fam. 4. THECIDÆ.—*Gen.* Thecia, Columnaria.
Sect. 4. *Madreporaria tubulosa.*
Fam. 1. AULOPORIDÆ.—*Gen.* Aulopora, Pyrgia.
Sect. 5. *Madreporaria rugosa.*
Fam. 1. STAURIDÆ.—*Gen.* Stauria, Holocystis, Polycœlia, Metriophyllum.
Fam. 2. CYATHAXONIDÆ.— *Gen.* Cyathaxonia.
Fam. 3. CYATHOPHYLLIDÆ.
Sub-fam. *Zaphrentinæ.—Gen.* Zaphrentis, Amplexus, Menophyllum, Lophophyllum, Anisophyllum, Baryphyllum, Hallia, Aulacophyllum, Trochophyllum, Hadrophyllum, Combophyllum.
Sub-fam. *Cyathophyllinæ.— Gen.* Cyathophyllum, Endophyllum, Campophyllum, Pachyphyllum, Streptelasma, Omphyma, Goniophyllum, Chonophyllum, Ptychophyllum, Heliophyllum, Clisiophyllum, Aulophyllum, Acervularia, Smithia, Eridophyllum, Spongophyllum, Strombodes, Lithostrotion, Chonaxis, Phillipsastræa, Syringophyllum.
Sub-fam. *Axophyllinæ.— Gen.* Petalaxis, Axophyllum, Lonsdaleia.
Fam. 4. CYSTIPHYLLIDÆ.—*Gen.* Cystiphyllum.

Sub-class 2. PODACTINIARIA.—*Tentacles not tubular, in isolated groups, not communicating freely with the visceral chamber.—Gen.* Lucernaria (Plate X. figs. 5, 5ª), Calicinaria.]

(3.)—HYDROIDA.

The Hydra, or fresh-water Polypus (Plate X. figs. 10 and 14), of which more has been written than of any other Zoophyte, is the type of this order, very remarkable for the extreme simplicity of organization of its members, and for their wonderful powers of redintegration and reproduction. The polype, considered independently of its polypidom, possesses no defined organs whatever; but when highly magnified, the whole body is seen to consist of a granular substance, the granules being loosely connected by a semi-fluid albuminous matter. On the upper pole of this gelatinous and very contractile body there is an aperture encircled with a variable number of tentacula, roughened with nodules, and extremely extensible, so that the creature can spread and stretch them far and wide in search of prey, which consists of very active crustaceous animalcules and small worms. These are no sooner seized upon than they appear to be paralysed by some poisonous secretion of the polype, for their struggles and resistance are stopt as it were by magic, and they are carried unresisting to the mouth, and forced into the central digestive sac.

The Hydroida are reproduced by gemmules or buds, which are developed from the common substance of the body. In the Hydra they spring from no particular part, but in other genera they have a determinate origin, and in many others they are contained, like ova, in ovarian capsules, whence they are not discharged until ripe for evolution. But perhaps the most remarkable feature in the history of these Zoophytes, is their power of being multiplied by mechanical division. If a snip be made with a fine pair of scissors in the side of a Hydra, not only does the wound soon heal, but a young polype sprouts from the wounded part; if it be cut into two portions by a transverse incision, each soon develops the wanting parts of its structure; if longitudinally divided, both portions soon become complete animals; if it even be cut into several parts, every one of them will rapidly assume the form and

Polypes. functions of the original. The inversion of its body, by turning it inside out, does not destroy it; on the contrary, the exterior surface assumes the office of a stomachical cavity, and that which was originally internal will give birth to buds, and take upon itself all the properties of the skin.

The Hydra is locomotive and naked, but the majority of its order are permanently affixed to their sites, and are invested with a horny sheath or polypidom, which in many instances excels all other zoophytical productions in the delicacy and gracefulness of its form. These polypidoms are converfoid and more or less divided, the ramifications being divided in a variety of elegant plant-like forms. The stem and branches are alike in texture, slender, fistular, and almost always jointed at short and regular intervals, the joint being a mere break in the continuity of the sheath, without any character of a proper hinge, and evidently formed by regular periodical interruptions in the growth of the polypidoms. Along their sides, or at the extremities, we find the denticles or cup-like cells, within which the polypes are contained, arranged in a determinate order, and either sessile or elevated on a stalk. Plate X. fig. 12. Though of the same substance, the cell is something more than a simple expansion of the stem or branch; for near its base there is a distinct partition or diaphragm, on which the body of the polype rests, with a plain or tubulous perforation in the centre, through which the connection between the individual polype and the common medullary pulp is retained.

[The researches of late years have shown that there is a very close relationship between the Hydroida and the Acalephæ. Many of the small free naked-eyed Medusæ are in reality nothing more than the sexual apparatus of Zoophytes of the families Tubularidæ and Campanularidæ, from which they have arisen as buds, and then become detached, with separate locomotive and nutritive organs. In this state they are capable of existing and developing their sexual products, some possessing spermatozoa, others ova, thereby giving origin to a new generation of polypes. Again, the history of some of the larger Medusoids is essentially similar. Their progeny is at first polypoid, not taking the form of Medusæ until a later period, and then, apparently by budding from the polypi, and not by metamorphoses. Dr Carpenter's account of the process is this; the embryo emerges from the cavity of the parent, within which the first stages of its development have taken place, in the condition of a ciliated gemmuli, of rather oblong form, very closely resembling an infusory animacule, but destitute of a mouth. One end soon contracts, and attaches itself so as to form a foot; the other enlarges and opens to form a mouth, four tubercles sprouting around it which grow into tentacula, whilst the central cells melt down to form the cavity of the stomach. Thus a hydra-like polype is formed, which soon acquires many additional tentacula; and this leads in every important particular the life of a Hydra. Under conditions not yet ascertained, this polype-like being ceases to propagate by ordinary gemmation, and enters upon a new series of changes. The body becomes more cylindrical, then a constriction is seen around it just below the ring which encircles the mouth; and similar constrictions appear below, the attached extremity, however, having the form of a fleshy bulb. The constrictions gradually deepen so as to divide the cylinder into a pile of saucer-like bodies, the edges of which become lobed. The topmost of these becomes detached and swims away; and afterwards the next, and so on, until the basal bulb only remains. Tentacles have meanwhile developed themselves on this bulb, which may return to its original mode of propagation by budding, and become the progenitors of a new colony of similar bodies, every one of which may, in its turn, throw off a series of discs. These detached discs have all the essential characters of adult Medusæ. Each consists of an umbrella-like body, divided at its edge into lobes, and containing part of the stomach, which projects downwards like a proboscis, having a quadrangular mouth at the bottom. Farther changes gradually take place, until the animal exhibits itself as a perfect Medusa, with sperm cells in the male and ova in the female. The embryos of the latter, after fertilization by the agency of the former, again go through the cycle already described.

These developments and changes induce some naturalists to place the Hydroida along with the Acalephæ in an order called Hydrozoa. In giving a general view of the morphology of a Hydrozoon, Professor Huxley[1] describes the body as being essentially a sac composed of two membranes, an external (ectoderm) and an internal (endoderm). The cavity of the sac (the somatic cavity) contains a fluid charged with nutritive matter in solution, and sometimes, if not always, with suspended solid particles, which performs the functions of the blood in animals of higher organisation. The ectoderm is commonly ciliated, at any rate while young; the endoderm is also very generally ciliated, though not always, nor in all parts. The cilia of the endoderm, aided by the contractions of the walls of the body, are the sole means provided by nature for the circulation of the nutritive fluid in the Hydrozoa; the cilia of the ectoderm, similarly aided by contractility, constitute the only respiratory mechanism. Notwithstanding the extreme variety of form exhibited by the Hydrozoa, and the multiplicity and complexity of the organs which some of them possess, they never lose the traces of this primitive simplicity of organisation; and it is but rarely that it is disguised to any considerable extent. The entire double-walled body of the Hydrozoon, whether it be a minute simple oval sac, as in the embryonic condition, or such a vast and complex mass as a tree of Plumularia, an Agalma 3 feet long, or a Rhizostoma of still more massive proportions, he terms a hydrosoma, the simplest condition of which is that observable in the common fresh-water Hydra; one end of whose body is expanded into a kind of disc, whereby the creature adheres to its support, while the opposite extremity presents a widely open mouth, opening into a cavity which extends through the whole length of the animal, and surrounded by a circle of long tentacular organs. Polypes.

The following is Professor Huxley's arrangement of the families constituting the Hydrozoa:—

1. *Hydridæ.*

Hydra (fresh-water.)

2. *Corynidæ.*

Coryne, Corymorpha, &c.

3. *Sertulariadæ.*

Sertularia, Plumularia, &c.

4. *Calyciphoridæ.*

Diphyes, Galeolaria, Abyla, Sphæronectes, Praya, Hippopodius, Vogtia.

Diphyozöoids.

Eudoxia, Eudoxoides, Aglaismoides, Sphenoides, Cuboides, Amphiroa, Euneagonoides.

5. *Physophoridæ.*

Apolemia, Halistemma, Forskalia, Stephanomia, Agalma, Physophora, Athorybia, Rhizophysa, Physalia, Velella, Porpita.

6. *Lucernariadæ.*

Lucernaria (placed by Milne Edwards amongst the Coralliaria).

7. *Medusidæ.*

Medusa, Ajanæa, Pelagia, Cassiopæa, Rhizostoma, &c.

The British genera, constituting the second and third of these families, may be thus arranged:—

Tubulariadæ.

Naked deciduous germs, springing from near base of tentacles.—Clava, Vorticlava, Hydractinia, Myriothela, Coryne, Eudendrium, Tubularia, Corymorpha.

Sertulariadæ.

Egg-germs inclosed in vesicles; animals increasing by permanent lateral buds, polypes in cup-like sessile cells. Halecium, Sertularia, Reticularia, Coppinia, Thularia, Antennularia, Plumularia.

Campanulariadæ.

Characters like the last, except that the polype cells are stalked. Laomedea. Campanularia.]

V.—RHIZOPODA.

The name Rhizopoda was bestowed by Dujardin on a division of the animal kingdom very low down in the scale of organisation, on account of their capability of throwing out *root-like* processes (*pseudopodia*), which are retractile at will, into the body of the animal, and which serve them as a means of locomotion. The class is a portion of that composite order named Protozoa, into which Sponges fall. Rhizopods are minute animals living in fresh or salt water, and usually free. As far as research has gone, they are destitute of all organs whatever, possessing neither

[1] *The Oceanic Hydrozoa*, by T. H. Huxley, Ray Society, 1858.

Polypes.

mouth, stomach, muscles, nerves, ciliæ, circulating system, nor generative system. They consist of a mass of gelatinous flesh denominated *sarcode*, parts of which can be extended either in the shape of finger-like processes or of delicate threads. Their modes of supplying themselves with food is, in the majority of species, by contracting their pseudopodia, and drawing into the exterior of their bodies the particles of aliment which have become entangled with them. There they undergo some sort of digestion, the useless portion being afterwards rejected, passing, as before, through the very substance of the animal. Whilst ciliated gemmules are thrown off by the sponges, which subsequently become converted into bodies like the parent mass, nothing of the sort has been observed in the Rhizopoda, where the only mode of propagation known is that by self-division.

The class Rhizopoda may be divided into the following groups:—

A.—*Rhizopoda amorpha.*

1. Naked Rhizopods.
2. Rhizopods with a membranous or coriaceous envelope.

B.—*Rhizopoda polythalamia.*

3. Rhizopods having a calcareous or arenaceous shell (*Foraminifera*).

C.—*Rhizopoda radiolaria.*

4. Rhizopods furnished with silicious spicula, or shells, including the *Polycystina*.

1. To the division of naked Rhizopods belong the microscopic animals named *Amœba* and *Actinophrys*. The former, found in fresh and stagnant waters, is a shapeless mass of sarcode, the outer layer of which has a slightly denser consistence than the internal semi-fluid matter; but it scarcely proceeds so far as to form a distinct membrane or capsule. Within are vesicles and vacuoles, one of which can be seen to pulsate at nearly regular intervals. Another evidence of vital activity is exhibited by the change of form which it goes through in moving from place to place. This operation is performed by pushing forth finger-like projections, then causing the body to follow, and, as it were, to enter and swell out the parts so extended. If alimentary particles are met with, they are enveloped by the animal's body, which they are made to enter, and the indigested portions are ultimately rejected. It has been found that pieces cut off from the animal are capable of shaping themselves into independent beings. The *Actinophrys* has a rounded body, of a constitution pretty much the same as that of the *Amœba*, but it is usually seen with radiating needle-shaped pseudopodia, which can be withdrawn into the body.

2. Of the Rhizopods with a membranous coat, the genera *Gromia*, *Difflugia*, and *Arcella* are examples. Here an advance in structure is seen, and there is usually some regularity of shape. In the two latter genera, a few finger-like projections of the sarcode body are put through orifices in the coat, with a view to collect food. The basis of the envelope appears to consist of a horny substance resembling chitine. Its surface is sometimes relieved with spines similar to those in the Desmidiaceæ; at others, it bears symmetrical markings, like those seen on the Diatomaceæ. In Gromia the pseudopodia are filamentous and much more numerous, being emitted both from a portion of the sarcode body extended round the outside of the coat, and through an opening from the interior, where the main mass of the animal lies.

3. A much more interesting group of Rhizopods is that of the *Foraminifera*, where the animals are protected by a calcareous or arenaceous shell, forming beautiful objects for the microscope. This group, which derives its name either from the foramina connecting chamber with chamber, or from the foramina wherewith the surfaces of the shells are generally pierced, has received much attention from naturalists of late years, on account of their comparatively large size, the usually elegant forms of their envelopes, and the vast abundance of their remains in a fossil state. They are all marine, and specimens may be collected from every coast. Fifty-seven species have been described as British. Certain species abound in seaweed on the shore, others have been dredged from great depths of sea. Their shapes are very varied; some are flat discs; others of an elongated form are straight, curved, flask-shaped, or resembling a string of beads; others again are ovoid or globular; whilst many are extremely like the shell of a nautilus, on which account they were once ranked amongst the Cephalapoda. The majority have smooth calcareous shells, but some have rough arenaceous envelopes. Some species are attached to foreign bodies, but the greater part are free. In the species having a globular shell, it consists of a single chamber; but it is all but the universal rule for the shell to possess more than one chamber. In this case the chambers are connected, and the animal occupies every chamber, even where there are hundreds (as in the genus Orbitolites), thus differing from the Nautilus, which only occupies the exterior chamber of its shell. The variations which the shells of the same species undergo are so great, that classifiers are extremely puzzled where to draw the line between species and species, even between genus and genus; and they have been tempted to think, when specimens collected from different parts of the globe are under examination, that specific distinctions have no existence amongst the Foraminifera. The same species being able to live, by reason of its low organisation, under very different circumstances as to climate, depth of sea, &c. variations in its form may well be expected. The substances to which certain species attach themselves—shells, rocks, seaweed, &c., will also entail variety of form. The shells of some species are totally devoid of structure, whilst those of others abound with tubuli in their walls. The mode in which the chambered forms increase their size seems to be by a process of budding, the gemmulæ becoming coated with calcareous matter, and thus making a new chamber. The direction of the growth will, of course, determine the form of the shell. When segments are continually added spirally in the same plane, the result will be, if the additional chambers are of the same dimensions, a disc; if they increase in size, a nautiloid shell. If, however, the spiral growth takes place a little to one side, a trochoid or pyramidal form will be produced. On the other hand, if the chambers are added in a straight line, there will be a rod-like, or dagger-like form. As to the mode of propagation, nothing is known, save that, in some species, it has been observed, when a portion has been accidentally broken off, it has gradually grown into a complete animal.

Alcide D'Orbigny undertook an elaborate examination of the Foraminifera, and formed an arrangement of them founded on the structure of their shells. Later naturalists, however, have seen reason to be dissatisfied with his arrangement, inasmuch as the shells of the same species vary extremely, so that not only may a gradual transition be often traced from one of D'Orbigny's species to another, but varieties of the same species would fall into different genera. Dr Carpenter is now at work on the subject, and has published various papers in the *Philosophical Transactions*. The scientific world is, however, expecting from him a general account of the class, with a more reliable arrangement, than any extant. In the meantime, Professor Williamson of Manchester has described and figured the British species in a recent publication of the Ray Society (1857); and Messrs Parker and Jones have printed several valuable memoirs on the subject in scientific periodical works. In our present ignorance as to the limits of genera, it would be useless to give a list of those which have been proposed.

Fossil Foraminifera.—A few species have been found in Lower Silurian beds. The species increase in number as we advance towards the present time. In the chalk they are plentiful, and the number of individuals in certain localities is prodigiously great; so much so, that the bulk of some beds is composed of them. In tertiary strata they are still more abundant. In the Paris basin there are some beds of a stone employed in the buildings of that city, and known as the Miliolite limestone, which is composed entirely of foraminifera. The great eocene formation, termed numulitic, which occurs in every quarter of the globe, has sometimes a breadth of 1800 miles, and often attains a thickness of several thousand feet, abounds with the genus *Nummulites*, of which more than fifty species have been described. Nummulites belong to a highly developed type of foraminifera, and some species are as large as a crown piece. This formation enters into the composition of many great mountain-chains, including the Alps, Pyrenees, Carpathians and Himalayas; in which last range nummulites have been collected at a height of 16,500 feet above the sea. The pyramids of Egypt are built of this limestone. As Nummulites are characteristic of eocene strata, the genus *Amphistegina* is characteristic of miocene beds, in which it has been found in the Vienna basin, in St Domingo, at the Madeiras, and elsewhere. Lamarck has truly said that these minute animals have had much more influence in building up the crust of the globe than the remains of elephants, hippopotami, and whales.

4. The *Rhizopoda radiolaria* have been divided by Johannes Müller ("Memoir on the Thalassicollæ, Polycistinæ, and Acanthometræ of the Mediterranean, *Trans. Royal Acad. Sci., Berlin*, illustrated with eleven plates, 1858), into the following sections.

? Simple.

1. No shell; naked, or with scattered silicious spicula. *Thalassicollæ.*
2. With silicious reticulated shells. *Polycistineæ.*
3. No shell; but furnished with silicious radiating spicula. *Acanthometreæ.*

Sponges.

ⷷ Compound.

4. No shell; naked or with silicious spicula. *Sphærozoiæ.*
5. With silicious reticulated shells. *Collosphæreæ.*

Mr Huxley first drew attention to Thalassicolla by the description and figures he gave of this animal in the *Annals of Nat. Hist.*, 1851. It presents itself as a mass of cells, united by gelatinous matter, varying in size from an inch downwards, which is seen floating on the ocean.

The Polycystineæ and Collosphæreæ have silicious shells of curious and beautiful forms. They are for the most part smaller bodies than the Foraminifera, and the structure of the animal has been less investigated. It seems however to be certain, in the species which have been examined, that the internal animal consists of an olive-brown sarcode capable of putting forth pseudopodia through the large perforations of the shell, which is frequently adorned with spines and fret-work. They have been found in the North Sea, and in the North Atlantic they have been brought up from depths exceeding a thousand fathoms. The Mediterranean forms are the subject of Müller's work above cited. In a fossil state, they have been discovered in the chalks and marls of Greece, Sicily, and at Oran in North Africa; and, along with Diatomaceæ, at Richmond in Virginia, and in Barbadoes. Ehrenberg has recorded upwards of 300 species, the great majority of which came from the Barbadoes deposit. These remains are much sought after as objects for the microscope. The forms are very varied; round, conical, oval, radiate, stellate, cup-shaped, helmet-shaped, &c. with numerous large perforations, giving the appearance of net-work.]

VI.—SPONGES.

Spongiæ; Spongiadæ; Porifera; Amorphozoa.

The Sponges differ so much from all other Zoophytes, that De Blainville has constituted with them a separate class, under the denomination of *Amorphozoa*, to mark that want of a definite and constant form in their species for which they are remarkable in the animal kingdom. Their general appearance and structure must be familiar to every one. They are soft, elastic, porous or cellular bodies, of a uniform structure in every part, without any organs or vessels, and capable of absorbing large quantities of liquid, which they again yield up on pressure, without injury to their textures. They are quite insensible to every sort of irritation, and can contract neither the body as a whole, nor any portion of it; nor can they remove in any way from the site on which they have grown.

In a recent state the sponge is filled with a colourless animal jelly, the quantity of which varies much in different species. This jelly is apparently homogeneous; but, with the assistance of the microscope, it has been discovered to be full of numerous transparent spherical granules. It is diffused through every part of the sponge, filling the intercellular spaces, and it lines also the canals which permeate the mass, and often covers the surface with a slimy coat.

The sponges used in domestic economy are composed of a horny fibre, netted together so as to form small irregular meshes, with larger canals and holes interspersed. The fibre is solid and transparent, generally smooth, but sometimes closely invested with a fine branched vascular tissue. These sponges are soft, compressible, and eminently bibulous; but there is a gradual passage from them into others of a more rigid and compact texture; and on examining into the cause of this change, we find that the fibre has become loaded with crystalline needle-shaped spicula, which, chemical tests assure us, are formed of pure silex or flint. There are many sponges in which these spicula predominate so far that the horny matter has become of secondary importance; and such sponges, after being dried, resemble crumbs of bread, and are easily rubbed down into a powder merely by friction between the fingers. Dr Bowerbank has shown that the transition from the fibro-horny to these silicious sponges is insensibly made, and that many species, which were believed to be purely fibrous, contain in fact numerous minute imbedded spicula.

There is another class of sponges, rather of a felted than reticular structure, and containing a very scanty proportion of organic fluid. They are usually of a grayish-white colour, and are loaded with spicula, but the spicula are composed of carbonate of lime. These spicula are more variable both in form and size than the siliceous kinds; for in the same sponge we often find some which are needle-shaped, others that are club-shaped, and others that are formed of three or four divergent prongs. There has not been discovered any sponge in which the calcareous and siliceous spicula naturally co-exist; but some species of a compact fleshy texture have been described, in which, while the central parts are crammed with spicula of flint, the surface is covered with a layer of calcareous earth.

Litho-phytes.

In all sponges the surface is porous, and of a finer and closer texture than the interior, which is also permeated with some irregular sinuous canals, that open on the surface in the form of circular orifices, which have been called their *oscula*, but which are properly their vents. When living and in health, the sponge is continually imbibing by the pores the water which surrounds it. This water, penetrating to every part, fills the cells and distends the body equally; it is then forced into the canals, and driven, in an agitated current, from the body, through the oscula. By this circulation the air and food of the sponge is supplied, and its effete excretions removed; but by what agency it is originated and kept up is not positively ascertained. Dr Grant thinks it probable that minute vibratile cilia planted in the canals and pores are the moving power; while Dutrochet ascribes the phenomena to that law of *endosmose* which he has discovered to regulate the transmission of liquids of unequal densities through all organic membranes.

Sponges are propagated by gemmules, which originate in the organic mucus, and are carried out of the body by the effluent currents just described. In some sponges these gemmules are ciliated and locomotive when mature; but it seems probable that the majority of the species produce only unciliated gelatinous grains, which are nevertheless endowed with a very active motility, like the ultimate particles of even inorganic matter.

With one or two exceptions, sponges are natives of the sea, ranging from tide-marks to a very considerable depth. They are scarce and small in cold latitudes, and gradually increase in size and numbers as we trace their course towards the tropics, but perhaps they abound most of all in the genial seas of the Australasian islands. The sponges of commerce are chiefly procured from the Mediterranean, and from the Bahama islands in the West Indies.

[*Spongilla* is the only fresh-water genus. Dr Bowerbank has been for some years past engaged in the examination of the *Spongiadæ*, and has begun to publish a series of valuable memoirs, in which their anatomy and physiology will be minutely described, as a foundation for an entirely new classification of the genera. The generic characters will be principally built upon the organic structure and mode of arrangment of the skeleton, as it has been found that neither their external form nor their chemical constituents will afford any clue to sound general views. According to Dr Bowerbank there are twenty-four genera of sponge on the shores of Britain, viz., Tethya, Geodia, Pachymatisma, Halichondria, Hymeniacidon, Halina, Isodictya, Desmacidon, Raphyrus, Dictyocylindrus, Haliciona, Microciona, Hymeraphia, Hymedesmia, Halyphysema, Euplectella, Halicnemia, Phakellia, Dysidea, Spongia, Grantia, Leuconia, and Leucosolenia. The forms of the spicula (which are very various and afford beautiful microscopic objects) have been described in a memoir printed in the *Phil. Trans.* for 1858. The same author has written various papers on the vitality, ciliary action, &c. of the *Spongiadæ*, and on the organisation of particular species, which have been printed in the *Trans. Micr. Society*, or amongst the *Reports* of the British Association. Dr Johnston's *History of British Sponges* may be referred to for an account of such species as had been observed on our shores some years back. Dr Grant's papers, in the 13th and subsequent vols. of the *Edin. Phil. Journal*, contain valuable matter. Lamarck's arrangement, in the 2d vol. of the *Animaux sans Vertèbres*, is quite obsolete.]

VI.—LITHOPHYTES.

(*Corallinaceæ.*)

The Lithophytes, in the restricted sense in which we use the term, are plant-like marine organized bodies, which adhere to other substances by a crustaceous base, and are composed of an internal fibrous axis incrusted over with a chalky porous bark, either continuous, or divided by septa into numerous equal articulations. From the time of Ellis, who was a strenuous advocate of their animality, they have been always described as members of the animal kingdom; but the observations of Blainville and Schweigger leave no doubt of their being truly vegetables, differing little from many algæ.

There are two families of Lithophytes. In the first the calcareous crust is rather thick, compact or minutely porous, and jointed. The family corresponds exactly with the genus *Corallina* of Linnæus, subdivided by Lamarck and Lamouroux into the following genera:—Cymopolia, Corallina, Jania, Flabellaria, Amphizoa, Penicillus, Galaxaura, Acetabulum, and Polyphysa. Many of the species are very pretty, and the Acetabulum is a parasol in miniature. Plate X., fig. 13. One species (*Corallina officinalis*) has been much celebrated as a powerful vermifuge.

[In *Hallimedea*, as well as in some of the preceding genera, the fronds are articulated; but in *Nullipora* and *Melobesia*, the plant appears like a simple crust adhering to rocks on the shore. Carbonate of lime is deposited so plentifully in the tissues, that the whole has the consistence of stone. By treating these plants with dilute acid, the lime may be removed from the vegetable tissues.]

The second family, from being more decidedly vegetable in its aspect, is named by Blainville *Fucoideæ*. In it the cretaceous crust which covers the stem and branches is very thin and continuous, and it offers to observation no trace of pores. The organic substance is also more gelatinous, and consequently approaches nearer to that of the true seaweeds. The genera are, Udotea, Dichotomaria, Liagora, and Neomeris. (G. J.) (J. Y. J.)

ZOROASTER, or ZERDUSHT, the founder or remodeller of the religious belief of the Medians, is known to posterity only by the doctrines which he introduced. Of his personal history scarcely anything has been ascertained, though it is considered probable that he was a Median by birth. The period at which he flourished is also a matter of uncertainty, some maintaining that he lived in the reign of Darius Hystaspes; others, that he flourished under Cyaxares I. The religious doctrines which he inculcated are contained in the *Zendavesta*, and are in all probability merely a development of the previous belief of his countrymen. The leading principle of his system is the Dualism so common in the eastern theologies. He maintained the eternal existence of two principles opposed to each other, Ormuzd, the principle of light and purity; and Ahriman, the father of evil and the source of darkness and impurity. Between these an irreconcilable contest is for ever waged. They are the creators of all things. Ormuzd created six immortal spirits, who dwell nearest him; then twenty-eight subordinate spirits, symbolical of the months and days; and, finally, the souls of men. Ahriman, on his part, produced six supreme spirits of evil, and then innumerable fiends of less power. For 3000 years Ormuzd was sole ruler, happy in the contemplation of his own perfections. At the end of that period he created the various beings who derived their existence from him, and who lived under his rule in innocence and consequent happiness, during another period of 3000 years. This golden age of innocence is succeeded by a period of equal length, during which the contest between Ormuzd and Ahriman is waged with varying success, a sort of brazen age, in which good and evil strive for the mastery; and this in its turn gives place to the age of iron, in which evil is on the whole predominant. When the 3000 years of the iron age have expired, the dominion of Ahriman is at an end; he acknowledges the supremacy of the principle of good, and all who have been subject to Ormuzd return to the primeval state of happiness. His moral doctrines, like those of most oriental systems, taught that the souls of men were the seat of a struggle between two principles, emanations respectively from Ormuzd and Ahriman; and that those who endeavoured to serve the one, were admitted on their death into the dwelling of the happy; while those who obeyed the other, were banished to a region of woe.

ZOSIMUS, a historian of Constantinople, who has had various editors, is supposed to have written in the fifth century. He is described as "comes et exadvocatus fisci;" and from his own work it is evident that he was not a Christian. He wrote the history of the Roman empire from the reign of Augustus to the year 410. The first book contains brief notices of the earlier emperors, ending with Diocletian; but in the other five books his details are more ample. A Latin version of this history was published by Leunclavius in 1576; and in 1581 H. Stephanus added the Greek text of the first two books to his edition of Herodian. All the six books were published by Sylburgius in the third volume of his *Romanæ Historiæ Scriptores Græci Minores*. Francof. 1590, fol. This was followed by other editions, of which the best is that of Reitemeier, Lipsiæ, 1784, 8vo; Bonnæ, 1837, 8vo. The latter impression, forming a volume of Niebuhr's *Corpus Scriptorum Historiæ Byzantinæ* was superintended by Bekker, who has corrected the errors of the former edition, and has omitted such critical notes as he did not approve. In both these impressions, some annotations of Heyne are added to those of Reitemeier.

ZSCHOKKE, JOHANN HEINRICH DANIEL, an industrious German writer, was born at Magdeburg on the 22d of March 1771. After spending some time as play-wright to a troop of strolling players, he went to the university of Frankfort-on-Oder, where he studied all kinds of subjects, but could settle himself down to none. Philosophy, theology, the fine arts, history, finance, all were taken up in eagerness and laid down in disgust by Zschokke. He next tried his hand at writing for the stage, but his dramatic productions failed. After various fortune, Zschokke at last found his talents and his political opinions appreciated by the Swiss. At Aarau he exerted himself greatly in behalf of liberty, and was chosen a government commissioner, and chief of the department of education by the Helvetic republic. He was appointed inspector of forests, and of the Church; he was made member of the council, and of the school directory; and was chosen president of the directory of the school of education for artisans. For nearly fifty years his hand seldom slackened in maintaining the independence and freedom of the Swiss people. His pen was as busy as his hand. He edited with much discretion the *Swiss Messenger* and the *Miscellany of the most Recent Events*. He wrote historical memoirs of Swiss struggles and triumphs, of which the best is his *History of Switzerland for the Swiss People*, 1822. He, besides, published a valuable *History of the Bavarian People and their Princes* in 1813–18. Zschokke likewise wrote an endless number of graceful tales and stories, of which *Goldenthal*, *The Goldmaker's Village*, *Lover's Stratagem*, &c., are considered the best. Perhaps the most popular work he has produced is his *Hours of Devotion*, a Sunday periodical of questionable orthodoxy, which has gone through upwards of forty editions. The fervid eloquence of it, and the wise practical duties which it inculcates, have endeared the volume to

Zug ‖ Zumpt,

many pious hearts, who thought little and cared less for the rationalism which the book contains. The *Autobiography* of Zschokke completes his works, which consisted in 1825 of forty volumes. Many of his books have been translated into French and English. He died on the 27th of June 1848.

ZUG, a canton of Switzerland, the smallest of the whole confederacy, is bounded on the north by Zurich, on the east and south-east by Schwytz, on the south-west by Lucerne, and on the west by Aargau. It is 16 miles in length from N.W. to S.E., 10 in breadth, and has an area of 85 square miles.

The country has a general slope towards the north, and several offsets of the Schwytz mountains enter it from the east and south, but the highest mountain, the Rossberg, does not exceed 4825 feet. The other mountains, as the Zugerberg, the Morgarten, and the Dreilanderstein are considerably lower. The river Reuss is the principal stream, and receives the smaller brooks. It forms the boundary with the canton of Aargau. Its principal tributary is the Lorze, which issues from the Lake of Eger, and traverses that of Zug. The Lake of Zug is one of peculiar beauty, about 9 miles in length and 2½ in breadth. The road by its side presents points of view and striking objects which charm the eye, and leave a lasting impression on the mind of the traveller. This lake is dangerous to navigate with a strong southerly wind, on account of the sudden violent gusts. It has, however, some trade on it, and is abundantly stocked with fish of various kinds. The Lake of Eger, and that of Fenster, have their peculiar beauties, and, like that of Zug, abound in fish. The climate is that of the Alps, but rather milder than in some other parts of Switzerland. The soil is good, and yields corn and wine, much fruit, especially plums, and great quantities of walnuts and chestnuts. There are no manufactures except a few paper-mills and tanneries. The trade consists in the export of butter, cheese, cattle, wool, hides, dried fruits, and chestnuts. These are sufficient to pay for the few foreign necessaries and luxuries that are wanted. The chief profit is, however, derived from the numerous foreigners who visit the country in the summer months. The inhabitants are all of the German race, and speak that language. The religion is that of the Romish Church, and the canton contains ten parish churches, with three convents, all under the Bishop of Basle. The constitution is a representative democracy. All the males who have completed the age of nineteen must become soldiers, and must be enrolled in the militia. An assembly of the inhabitants is held annually in May, when the several officers are chosen for the year. The chief, called the Landammann, is elected for two years, and is assisted by a vicegerent and nine other councillors, who form the executive council. The officers of the militia are nominated for life. The great council consists of sixty-seven members, elected for the period of two years. Education is provided for by twenty-two primary schools, attended by nearly 2000 scholars. The canton is represented in the national council of the Swiss confederacy by one, and in the council of states by two members. Pop. (1850) 17,461.

The capital of this canton likewise bears the name of Zug. It stands on the lake at the foot of a mountain. It contains two churches, an hospital, council-house, and arsenal; and 3302 inhabitants, who live chiefly by fishing.

ZUIDER ZEE. See HOLLAND.

ZULLICHAU, a walled town of Prussian Brandenburg, capital of a circle of its own name in the government of Frankfürt, and 54 miles E.S.E. of the city of Frankfürt. It has a gymnasium, an orphan asylum, some manufactures of cloth, and an active trade. Pop. 5390.

ZUMPT, CARL GOTTLOB, the distinguished classical scholar, was born in Berlin in 1792. His university education was received at Heidelberg, where he devoted himself mainly to philological studies. He afterwards returned to his native city, where he prosecuted his favourite study with vigour, under the superintendence of Wolf, Böckh, and other distinguished scholars in the recently established university of Berlin. In 1812 he was appointed teacher in a gymnasium; and during the discharge of his duties there he published his *Rules of Latin Syntax*, a small work, which was subsequently enlarged into his *Latin Grammar*, the first edition of which appeared at Berlin in 1818. Zumpt was subsequently appointed professor of history in the Military School of Berlin; but in 1828 the higher honour of professor of Roman literature in the university was conferred on him. He is chiefly known in this country by his *Latin Grammar*. This work, as has been already mentioned, appeared first in 1818, but it was in each subsequent edition revised with scrupulous care and considerably augmented, so that the later editions may almost be considered new works. It is familiar to English scholars through the medium of a translation by Dr Schmitz, rector of the High School of Edinburgh, which was prepared in conjunction with the author. It is generally allowed to be one of the best Latin grammars which we possess, its excellence lying mainly in its well arranged syntax. Zumpt also prepared some admirable editions of classical authors; among others, Quinctilian's *Institutes*, some of Cicero's *Orations*, and the remaining books of the *History* of Quintus Curtius. In addition to the works enumerated, he published a few treatises illustrating questions connected with the manners and institutions of the ancient Romans; thus he wrote an *Essay on the Court of the Centumvirs;* another on the *Personal Freedom of the Roman Citizen* (*Uber die persönliche Freiheit des Römischen Bürgers*); another *On the Religion of the Romans* (*Die Religion der Römer*); and others of a similar character. Zumpt died in 1858,

Zurbaran.

ZURBARAN, FRANCISCO, a distinguished Spanish painter, was born in Estremadura in 1598. His parents were of the poorer class; but when their son manifested his predilection for art, they had the good sense to encourage him to prosecute the profession to which his genius inclined him, and he was accordingly sent to study the art under a painter in Seville. His progress was rapid, and his earliest pictures were marked by the accuracy with which they were executed, and the special skill of the artist in delineating drapery. His fame rapidly spread, and in 1625 he was commissioned by the Marquis of Malaçon to produce some paintings as altar-pieces for the Cathedral of Seville. In the same year he painted his famous picture of St Thomas Aquinas, a very large work, containing some figures of colossal size, and which was designed to ornament the high altar of the chapel in the college dedicated to Saint Thomas in Seville. Most of the other productions of this period of his life were intended for the same purpose, and many of them still adorn the churches and monastery chapels in Seville and its neighbourhood. About 1633 he removed to Madrid, where he was appointed painter to the king (Philip III.), and where he produced a number of his best paintings, which still ornament the royal palace. He was also royal painter during the reign of Philip IV.; but for some reason or other he left the capital, and returned to his native city, where he died in 1662. Zurbaran is one of the most highly esteemed of the Spanish painters; and from the resemblance of his style to that of the Italian Caravaggio, he is usually known as the Spanish Carravaggio. He is very imperfectly known, however, out of his native country. Most of his paintings are still in Seville, and they were hardly known out of Spain till the great picture-robber, Marshal Soult, brought the pictorial spoils of the Peninsula to the galleries of the Louvre. A considerable number of Zurbaran's pictures are still in the Louvre, but they are not the best specimens of his art. In this country, the Duke of

Zürich. Sutherland and Mr Stirling of Keir possess a few of his works, and there is a single painting of his in the National Gallery, which affords, on the whole, a good specimen of his ability; but his masterpiece is the picture of Saint Thomas Aquinas, which has been already described.

ZÜRICH, one of the cantons of Switzerland, bounded on the N. by Baden and the canton of Schaffhausen, E. by those of Thurgau and St Gall, S. by those of Schwytz and Zug, and W. by that of Aargau. Its length from N. to S. is 31 miles; its greatest breadth 25, and its area 684 square miles. The country is not properly mountainous, but consists of an undulating succession of hills and valleys. The principal ridges, which nowhere exceed 2700 feet in height, stretch parallel to each other from S.E. to N.W., and between them are the valleys of the principal rivers. In the S.E. of the canton, however, there are some more lofty summits, as the Hornli, 3490 feet, and the Schwenberg. The general slope of the country is to the N., and it belongs entirely to the basin of the Rhine, which forms the N. boundary of the canton. The principal rivers are,—the Thur, which enters the canton from that of Thurgau, crosses its northern portion, and falls into the Rhine; the Töss, rising in the S.E. of Zürich, and traversing the whole canton; the Glatt, issuing from the lake of Greifen; and the Limmat, an affluent of the Aar, issuing from that of Zürich. The Reiss, also an affluent of the Aar, skirts a small part of the S.W. frontier of the canton.

The most prominent feature in the face of the country is the lake of the same name as the canton. It forms a kind of crescent from E. to W. It is about 25 miles in length, and in breadth varies from 2 to 3 miles. It is chiefly supplied with water from the river Linth, into which descend the melted snows of the glaciers of Taede and Kistenberg. Though its depth in many parts is 600 feet, yet, owing to the shoals in other parts, it is only navigable by vessels of a light draught of water, or by steamers, with which, like the other lakes of Switzerland, it has now been abundantly furnished. The lake in the hottest months is raised from 10 to 15 feet by the more rapid melting of the ice on the glaciers. The lake of Zürich is in extent next to that of Neufchatel, among those entirely included in Switzerland; and, though destitute of the grandeur of scenery of the Wallenstadt and Lucerne lakes, its banks exhibit the peculiar charm of rich and high cultivation. There are also many other lakes of smaller size, the chief of which are those of Greifen and Pfäffikon. The prevalent geological formation of the country is Jura limestone; but sandstone and marl also occur in some places. There are many mineral springs in the canton. The climate is mild, but variable, and in the lower regions moist. Game is scarce, but fish abound in the lakes and rivers. With the exception of the loftier peaks, the land is tolerably fertile and well cultivated; producing corn, wine, fruits, and an abundant supply of butter and cheese for the support of its own dense population. The towns and villages contain a most industrious people, chiefly employed in the manufacture of silk and cotton goods. The rapid streams afford a power by which some very extensive cotton and silk mills are turned. An active trade is carried on, chiefly with Italy; and in manufacturing industry, Zürich is one of the most advanced cantons in Switzerland.

The canton is purely of German origin, using only that language, but with a strong patois among the country people. The means of education are abundantly provided. Besides a university in the capital, and several private institutions, there are a gymnasium, industrial school, normal seminary, and a large number of elementary schools.

The government of Zürich is a representative democracy; the franchise being exercised by all the males above nineteen, who elect the great council of 212 for a period of four years. The executive power is exercised by a burgermeister and an executive council; and the judicial establishment consists of a court of appeal and subordinate tribunals. The canton is represented by thirteen members in the national council of the confederacy, and by two in the council of states. The contingent to the federal army is 6726 men. Pop. (1850), 250,698, of whom 243,928 were Protestants.

Zurich ‖ Zvornik

ZÜRICH, the capital of the above canton, at the foot of the Lake of Zürich, on both sides of the Limmat, which here issues from the lake, 60 miles N.E. of Berne. The river, which is crossed by four bridges, divides it into two parts, the Great and the Little town; the former of which, on the right bank, is built on the slope of a hill, while the latter occupies more level ground. The greater part of Zürich consists of narrow and crooked streets, lined with tall old houses, and has very much of the appearance of a mediæval town. Recently, however, especially in the Little town, many good new streets and buildings have been constructed. The town is fortified, and on the walls and bastions there are promenades commanding beautiful views. Among the public buildings are the cathedral, in the Byzantine style, built in the eleventh century, and interesting as the place where Zwingli first preached the doctrines of the Reformation; the church of St Peter, of which Lavater was minister for some time; several other churches; the large and massive town-hall, where formerly the Swiss diets met periodically; the town library; the arsenal, containing a collection of ancient arms, including the bow said to have been used by Tell in shooting the apple from his son's head; a theatre; and a post-office. The university, founded in 1834, occupies the buildings of an ancient convent, and had in 1858–9 twenty-seven professors and eighty-two students. In this university Dr Strauss was appointed professor of theology in 1839, but expelled by a popular rising. Attached to the university is a museum and a botanic garden, and the town has also schools of veterinary science, industry and design, a deaf-mute institution, a lunatic asylum, and other educational and charitable institutions. There are here important manufactures of silk and cotton, and an active trade is carried on. Zürich was the birthplace of the two Gesners, Lavater, and Pestalozzi. Pop. 17,040.

ZÜTPHEN, a strongly fortified town of Holland, province of Gelderland, on the right bank of the Yssel at its confluence with the Berkel, 17 miles N.E. of Arnhem. The ramparts are irregular, and, being planted with trees, they form fine promenades. The town is entered by five gates, and is for the most part well built, containing several large public squares. The principal Protestant church, that of St Walburga, is a fine old Gothic building, containing monuments of the counts of Zütphen; and there are also Lutheran, Baptist, and Roman Catholic churches. Besides these, Zütphen has a town-hall, prison, and the old palace of the counts—all stately buildings—besides several schools and charitable establishments. Paper and leather are made here. The town was formerly a member of the Hanse League, and had an extensive foreign trade; but this has entirely disappeared, although there is still a large domestic trade in corn, timber, and other rural produce. Zütphen has been more than once besieged, and on one of these occasions it was that Sir Philip Sidney received his mortal wound, September 22, 1586. Pop. (1851) 12,229.

ZVORNIK, Swornik, or Isvornik, a town of European Turkey, province of Bosnia, on the left bank of the Drina, 45 miles N.E. of Bozna-Serai. It is strongly fortified, being surrounded by walls, and further defended by a castle on a steep hill above the town. It has mosques, and Greek and Roman Catholic churches, and carries on a considerable trade with Belgrade, Semlin, &c., especially in

Zweibrucken ‖ Zwingli.

timber and fuel. There are some lead-mines in the vicinity. Pop. about 14,000.

ZWEIBRUCKEN. See DEUX PONTS.

ZWICKAU, a town of Saxony, capital of the circle of the same name, on the left bank of the Mulde, here crossed by three bridges, 60 miles S.W. of Dresden. It is a picturesquely situated town, and contains many fine buildings. Among these are the beautiful church of St Mary, begun in 1454, and very judiciously restored in 1839, with some fine paintings; that of St Catharine, in which Münzer the anabaptist leader was at one time a preacher, three other churches, the fine old town-hall and exchange, and the handsome new government buildings. The town has also a gymnasium, an hospital, and a large old castle, now used as a house of correction. Weaving, dyeing, bleaching, tanning, iron-founding, machine-making, and other manufactures, are carried on here, and in the vicinity there are important coal-mines. Zwickau has markets for corn and wool, and an extensive trade. It is one of the most ancient commercial towns of Saxony. Pop. (1853) 14,293.

ZWINGLI, ULRICH, the distinguished Swiss reformer, was born at Wildhausen, Toggenburg, in the canton of St Gall in 1484. He received his early education at Basle, Berne, and Vienna, and returned at the age of eighteen to Basle, where he opened a school. He took care to prosecute his theological studies under Thomas Wittenbach, and he preached his first sermon in 1506. Towards the end of this year he was appointed pastor of Glarus, where he spent the next ten years, diligently engaged in the practical duties of his office, and in the more scholarly engagements of the study of Hebrew, classics, and elegant literature. The Bible was with Zwingli the great authority for settling every disputed question of human duty; and, regardless of the ordinary aids for the understanding of the Scriptures, he is reported to have gone boldly at once to the fountain-head, and to have drawn comfort for his flock from the pages of the living word. His fame as a preacher soon spread over Glarus, and in 1516, he was removed to the abbey of Einsiedlin, as a field of greater usefulness. Next year he was chosen to fill a vacancy in the cathedral church of Zürich. Zwingli had before this time discovered the errors of the Church of Rome, and he had not scrupled to assail its doctrines of pilgrimages, relics, monastic vows, offerings, and indulgences. In 1518 he procured the expulsion of Samson, a vender of indulgences, from the canton of Zürich. Luther's name had by this time filled all Europe, although Zwingli had seen the corruptions of the Church of Rome earlier than the German reformer. The friends of the hierarchy now began publicly to manifest their dislike to Zwingli and his doctrine of free scriptural inquiry, and they had him publicly accused of heresy before the council of Zürich in January 1523. His enemies wished to bring tradition and the schoolmen to confute him, but he stood up stanchly for the Scriptures. He drew up sixty-seven doctrinal propositions, containing the marrow of all since advanced in the reformed doctrines, on which he took his stand, and challenged his opponents to drive him from his position. The council chose the Scriptures as their authority, and Zwingli of course triumphed. Next year (1524) the young reformer purged the canton of Zürich of all unscriptural doctrine. This advanced attitude which the canton assumed, disturbed the drowsy equanimity of the neighbouring districts, and clutching in blind rage for the sabre, they vowed that if men got so far ahead of their fellows by the use of their reason, they should be reduced to constitutional order by the unanswerable argument of the sword. In October 1531, a force from the popish cantons marched against Zürich and Berne, and resolved either to purge them of the heresy which had crept into them, or to annihilate them at a single blow. Zwingli, like a dauntless hero as he was, went out to meet the foe at the head of his brave Zürichers to the field of Cappel. After a very hot engagement, the small band of reformers were beaten, their valiant leader slain, his body cut to pieces, and reduced to ashes. Thus, at the early age of forty-seven years, was this learned, sober, and pious man cut off on the 11th of October 1531.

For lives of Zwingli, the reader is referred to those of Hess in French and English, 1812, and of Schuler in German, as the best. Biographies of him have likewise been written by Myconius, Hottinger, Usteri, and Vögelin. Hottinger's life is translated into English by J. C. Porter. An eight-volume edition of Zwingli's works was published in 1829–1843, by Schuler and Schulthess; but the comparatively careless manner in which this issue is executed renders a complete edition of his works still necessary. Though inferior to Luther in eloquence, and to Calvin in power of mind, Zwingli yielded to neither in sobriety of thought, and in the candour and sincerity of his views. In learning, piety, and courage, he is inferior to none of the reformers of the sixteenth century. (See LUTHER and REFORMATION.)

Zwolle.

ZWOLLE, a fortified town of Holland, capital of the province of Overyssel, on the Zwarte-water, between the Yssel and the Vechte, 52 miles E.N.E. of Amsterdam. It is a neat, clean, and regularly built town, having a number of good streets and spacious *places*. The ramparts are planted with avenues of trees, and there are many pleasant walks in the vicinity. It is the seat of several district courts, and has eight churches including a fine old cathedral, a house of correction, several hospitals, and a grammar school. The manufactures are woollen, cotton, and linen stuffs, ropes, leather, sugar, salt, &c.; and an active trade is carried on in cattle, agricultural produce, dried fish, &c. Zwolle was formerly a free imperial city, and a member of the Hanseatic League. The famous Thomas-à-Kempis resided for sixty-four years in the monastery of St Agnes, in the neighbourhood of this town, and died there in 1471. Pop. (including three suburbs) 17,500.

THE END.

PRINTED BY NEILL AND CO., OLD FISHMARKET, EDINBURGH.

TURKEY IN EUROPE.

English Miles. 0 10 20 30 40 50 100

THE BOSPHORUS.

Longitude East 25 from Greenwich

Engraved by S. Hall, Bury Str.t Bloomsbury.

Edinburgh. Published by A. & C. Black.

TURKEY IN ASIA.

English Miles
50 100

Edinburgh, Published by A. & C. Black.

Engd by Geo. Aikman Edinr.

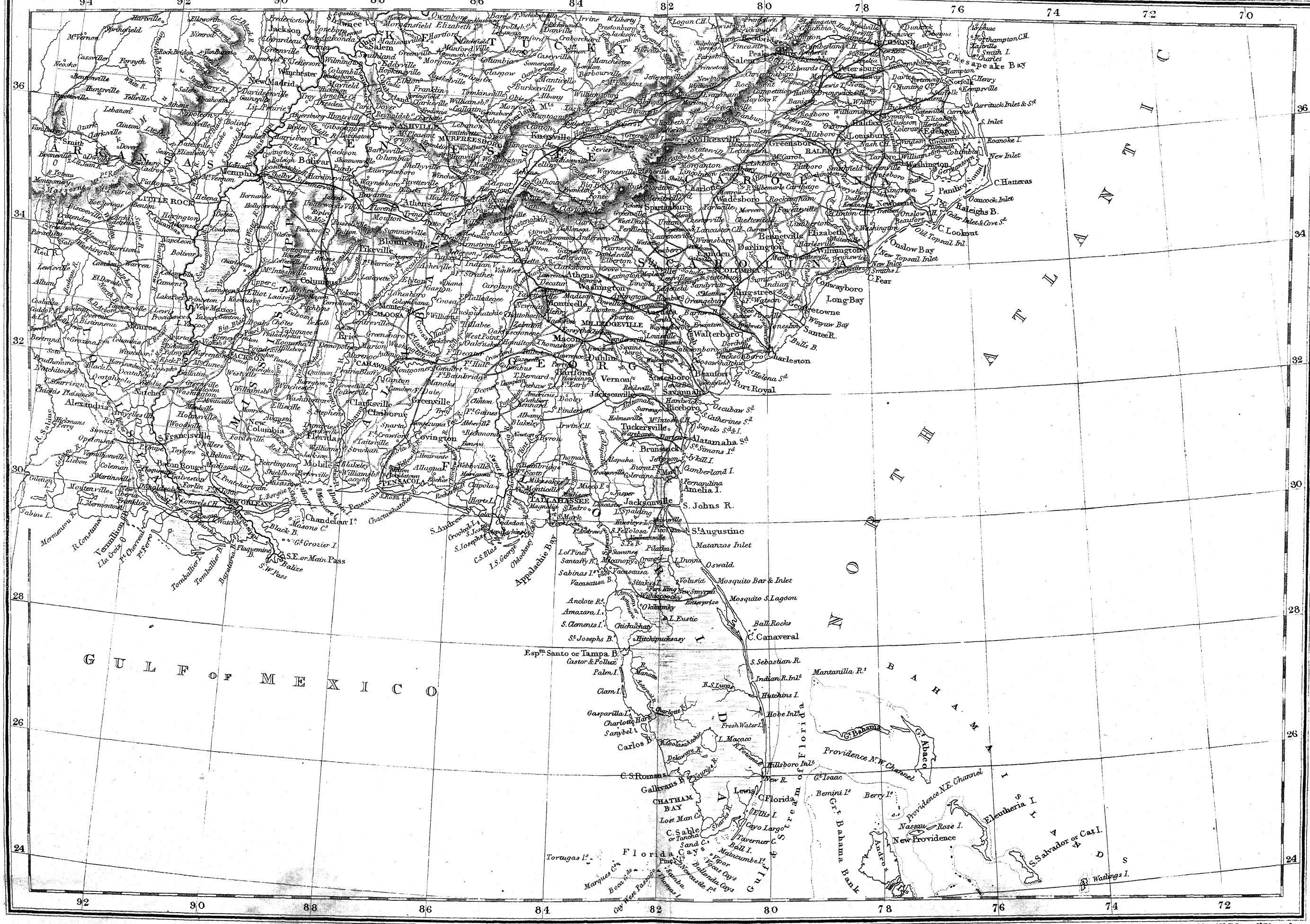
EASTERN UNITED STATES

English Miles
25 50 100 150 200

96 94 92 90 88 86 84 82 80 78 76 74 72 70 68

50 48 46 44 42 40 38

Lake of the Woods · Pembina · Red L. · Rainy L. · Neepigon B. · Red River of the North · Swamp Cr. · Rainy L. · Am.n Fur Co.s Pt. · Red L. · Red L. Ft. · Black R. · L. Saganaga · Ft William · Thunder B. · Black B. · L. St Ignace · Asimagomy L. · Misinabe L. · Moose R. · Abbitibbe L. · Shmeshowannapeconwabin L. · Pataquashagama L. · Labyrinth Lakes · L. Thaygois · Oskelanneo R. · R. Seguenay · Hudson's Bay Territory · R. St. Lawrence · Mississippi R. · Standhill R. · Plumb R. · Willow R. · Buffalo R. · Otter Tail L. · L. Winnipeg · Turtle Portage L. · Crooked R. · Pirate · Bois Blanc L. · Leech L. · Algonquins or Chippeways · Burlington · Rapid R. · Sandy L. & Ft · Fur Co.s · Fond du lac · Bois Brule · Apostles Is · Ft Wilkins · Ft Keewaiwona · Keewaiwona B. · Huron Is · Michipicoten I. · Michipicoten · C. Gargantua · Leech I. · Montreal I. · Royal I. · LAKE SUPERIOR · Montreal R. · Temiscaming L. · L. Mistawin · R. St Maurice · Ottawa or Grand R. · L. Nipissing · Black River I. · Allumet R. · Callumet I. · Madawaska R. · Ottawa R. · Gatineau R. · Quebec · Three Rivers · Montreal · Sherbrooke · Boston · Portland · Moose Head L. · L. Magantic · Kennebec R. · Penobscot R. · Mt Desert I. · Bangor · Machias · Eastport · Passamaquoddy B. · St John · Fredericton · Woodstock · Houlton · Ft Fairfield · Presque Isle · Ft Kent · Ft Ingall · Ft Francis · Ft Williams · Pigeon R. · Ft Snelling · Ft Anthony · St Peters · Yellow Medicine R. · Red Wood R. · Rapid R. · Cannon R. · L. Pepin · Bluff R. · Black R. · La Croix R. · Blue Earth R. · Blue Earth · Root R. · La Crosse · Badax · Ft Crawford · Prairie du Chein · Wisconsin R. · Ocooch M. · Sioux R. · Eagleville · Cedar Falls · Cedar R. · Iowa R. · Muriette · Marengo · Ft Calhoun · Ft Dearborn · Chicago · Ft Howard · Green B. · Winnebago L. · Manitou Is · Grand Traverse Is · Old Mackinaw Ft · Mackina Strait · Gt Traverse B. · Menomonie R. · Menomonie I. · Townsend · Noquet B. · Gackburn I. · Manitoulin I. · Georgian B. · Calbots B. · Nottawasea B. · I. of Coves · C. Hurd · Gloucester · Green Bay · Sturgeon B. · Maurice R. · Flambeau L. · Tomahawk L. · Chippeway R. · Ottawa R. · Hudson · St Croix R. · Falls · St Peters · Rapid R. · Cannon R. · Red Wood R. · Yellow Medicine R. · Blue Earth R. · Bruce Lion · Ft S. Anthony · Grow R. · Clam R. · Lit. Falls · Big Falls · Sunk R. · Lit. R. · Pine R. · Elk R. · Big Stone L. · Buffalo L. · Burr Oak · Ft Pork · Lake Traverse · Red Cedar L. · Muddy R. · Otter Tail Cr. · Standhill R. · Plumb R. · Whittle R. · Buffalo R. · Mississippi R. · Itasca L. · Leech L. · Sandy L. & Ft · Sandy R. · Savanah R. · Fur Co.s · Fond du lac · Bois Brule · Lotas · Spirit L. · Upper L. · Burlington · Rapid R. · Algonquins or Chippeways · Apostles Is · Ft Wilkins · Ft Keewaiwona · Keewaiwona B. · Huron Is · Grand I. · White Fish Pt.s · Batcheewauaang B. · Sault St Marie · St Joseph · Mackina Strait · Gt Traverse Is · Old Mackinaw Ft · Gackburn I. · Manitoulin I. · Georgian B. · I. of Coves · C. Hurd · Calbots B. · Nottawasea B.


94
92
90
88
86
84
82
80
78
76
74
72
70
36
34
32
30
28
26
24
KENTUCKY
TENNESSEE
ARKANSAS
MISSISSIPPI
ALABAMA
GEORGIA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
Gulf Stream of Florida
BAHAMA ISLANDS
Chesapeake Bay
Albemarle Sound
Pamlico Sound
C. Hatteras
C. Lookout
C. Fear
Onslow Bay
Raleighs B.
Pamlico
Roanoke I.
New Inlet
Ocracock Inlet
Currituck Inlet & Sd
Old Topsail Ind.
New Topsail Inlet
Smiths I.
Cape Fear
Long Bay
Georgetown
Winyaw Bay
Santee R.
Bulls B.
Charleston
St Helena Sd
Port Royal
Beaufort
Savannah
Tybee I.
Ossabaw Sd
St Catherines Sd
Sapelo Sd & I.
Alatamaha Sd
St Simons Id
Jekyll I.
Cumberland I.
Fernandina
Amelia I.
S. Johns R.
St Augustine
Matanzas Inlet
Oswald.
Mosquito Bar & Inlet
Mosquito S. Lagoon
Ball Rocks
C. Canaveral
S. Sebastian R.
Indian R. Inlet
Hutchins I.
Hobe Inlet
Fresh Water L.
L. Macaco
Providence N.W. Channel
Providence N.E. Channel
Hillsboro Inlet
New R.
C. Florida
Bemini Is
Berry Is
Great Bahama Bank
Andros
New Providence
Nassau
Rose I.
Eleuthera I.
S. Salvador or Cat I.
Watlings I.
Cayo Largo
Tavernier C.
Ball I.
Matacumbe Is
Vaca Cays
Pine Is
Sand C.
Cays
Tortugas Is
Marques C.s
Boca Grande
Key West Passage
Thomas I.
Sombrero
Ballandra Cays
Vapor
Carysfort Reef
Appalachicola Bay
St Andrews
St Josephs
C.S. Blas
I.S. George
Oldsdamy Bay
Chandeleur Is
Masons C.s
Gt Grozier I.
S.E. or Main Pass
S.W. Pass
Balize
Black B.
Flaquemine
Tomballer I.
Tomballer R.
Bayou Lafourche
Vermilion B.
I. la Croix
Ft Chevreuil
Pt Fero
R. Constantine
Mermenteau R.
Sabine L.
Calcasieu
Martinsville
Opelousas
Attakapas
Natchitoches
Bayou Rapides
Bayou Boeuf
Bayou Teche
Bayou Black
Bayou Terre Bonne
Bayou Lafourche
Bayou Plaquemine
Bayou Manchac
Bayou Sara
Bayou Pierre
Bayou Tensas
Bayou Macon
Bayou Boeuf
Bayou Rapides
Bayou Lafourche
Bayou Black
Bayou Terre Bonne

WEST INDIES

English Miles
50 100 200 300

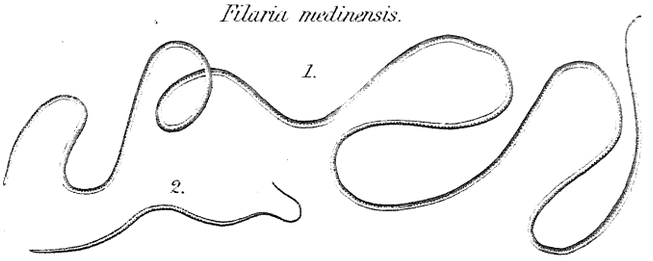
PANAMA RAILWAY.
1 2 3 4 5 10 Miles

JAMAICA.

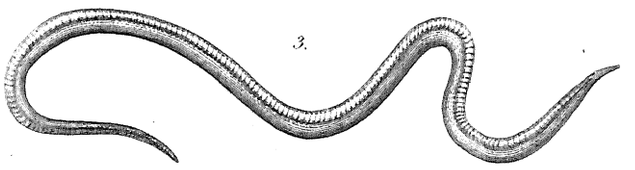
Tropic of Cancer

Longitude West from Greenwich

Edinburgh, Published by A. & C. Black.
Engraved by S. Hall Bury St.t Bloomsbury



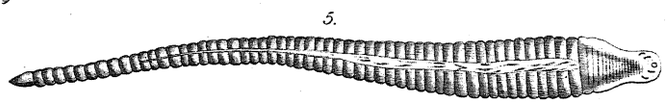
Trichocephalus dispar.



Ascaris lumbricoides.



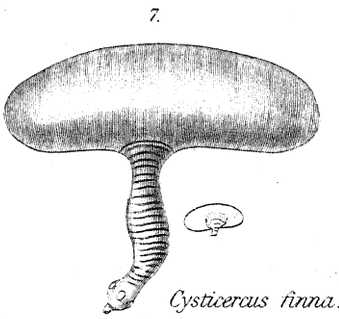
Strongylus gigas.



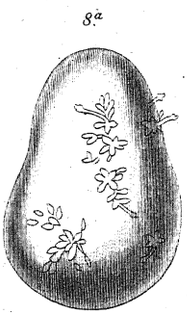
Linguatula tænioides.

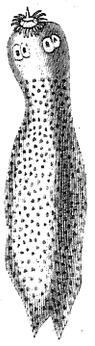


Tetrarhynchus lingualis.

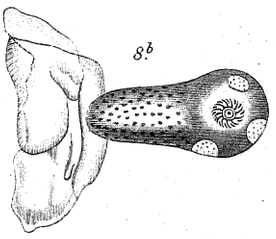


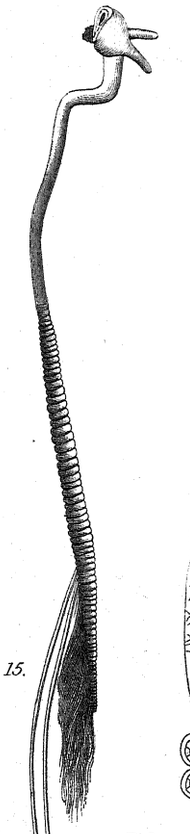
Cysticercus finna.





Cœnurus cerebralis.





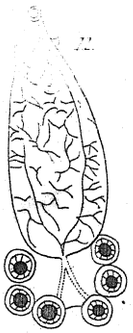




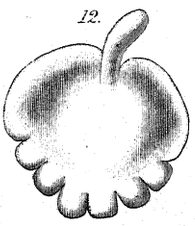
Fasciola hepatica.

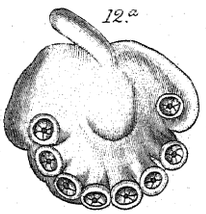


Polystoma pinguicola.

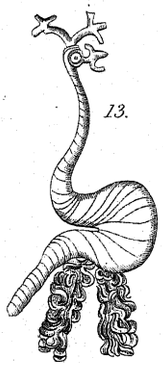


Polystoma integerrimum.





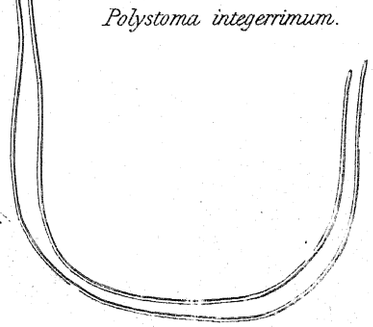
Cyclocotyles Bellones.



Lernœa branchialis.



Anchorella lagenula.



Penella filosa.



Chondrocanthus xyphiæ.

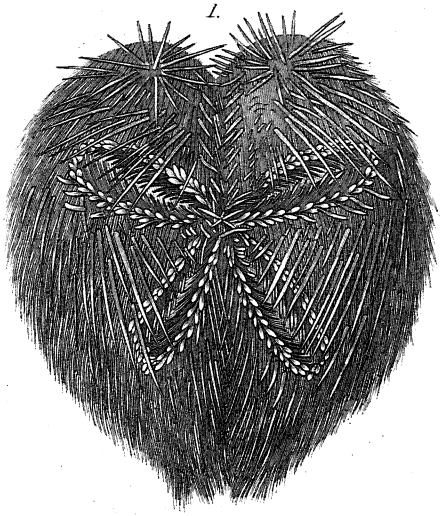


Sphyrion lævigatus.

Published by A. & C. Black, Edinburgh.

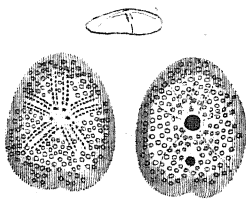
Geo. Aikman, Sculp.t

1.



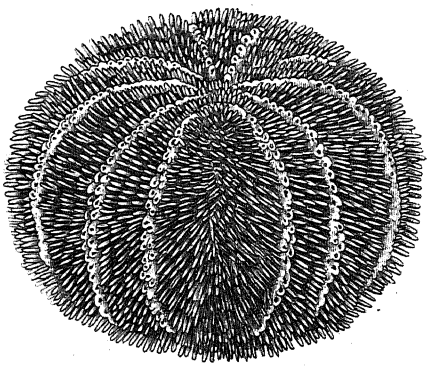
Spatangus purpureus.

2.

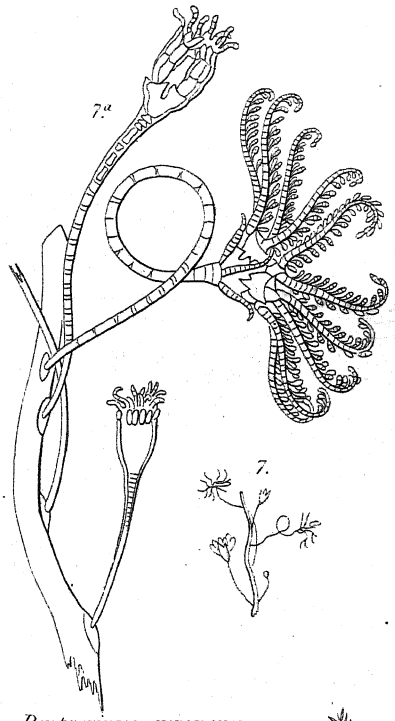


Echinocyamus minutus.

3.

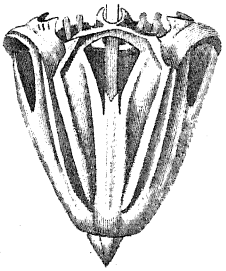


Echinus esculentus.

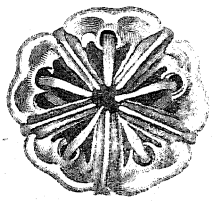


Pentacrinus europeus.

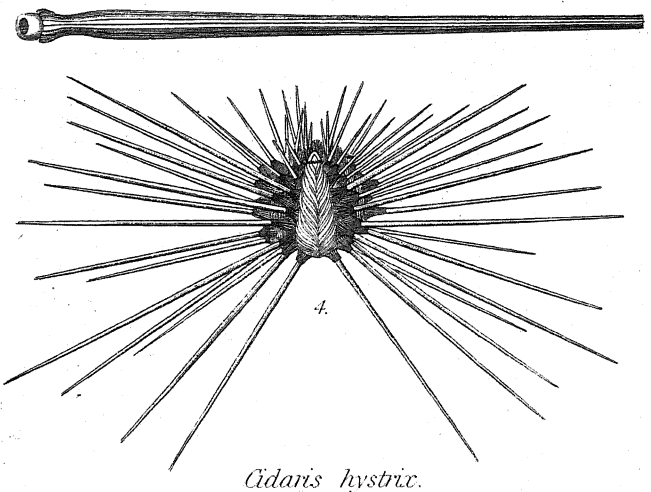
3.a



3.b

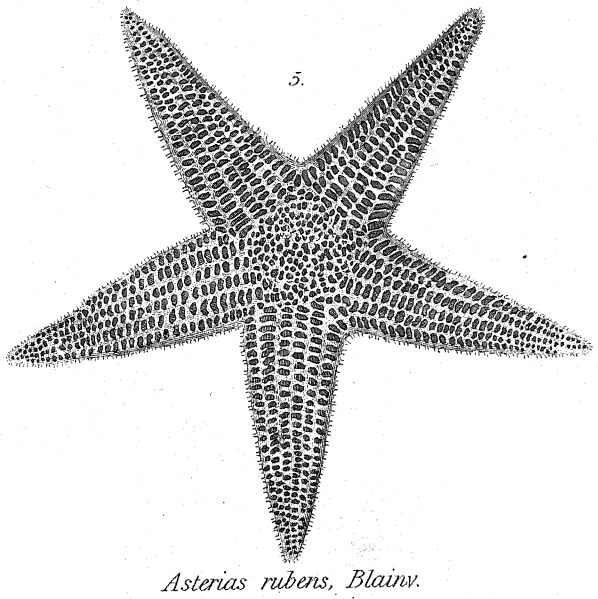


4.a



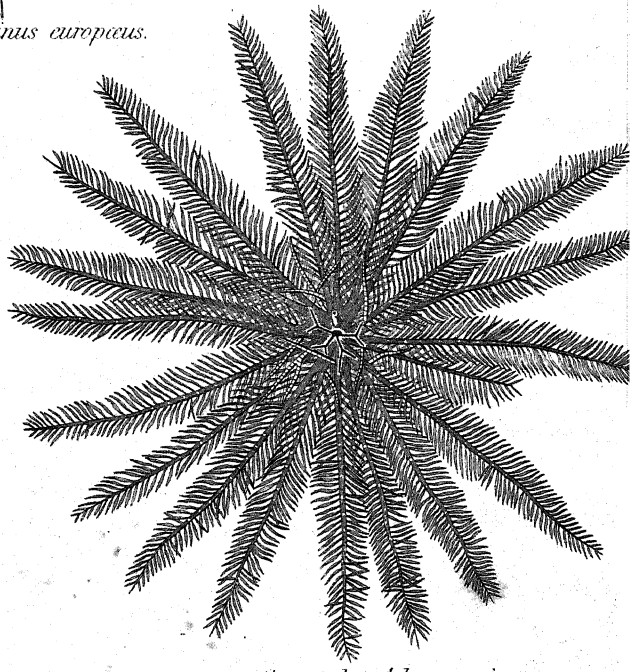
Cidaris hystrix.

5.



Asterias rubens, Blainv.

6.



Comatula Adeonae.

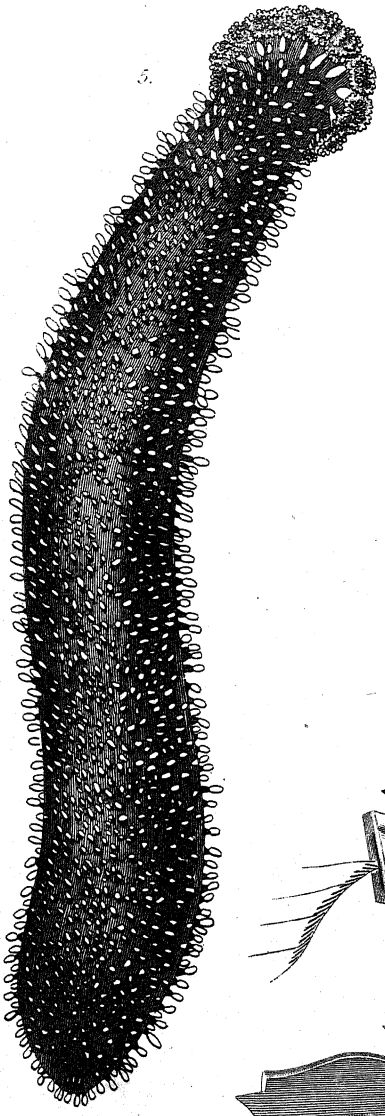
Published by A. & C. Black, Edinburgh.

Geo. Aikman, Sculp.

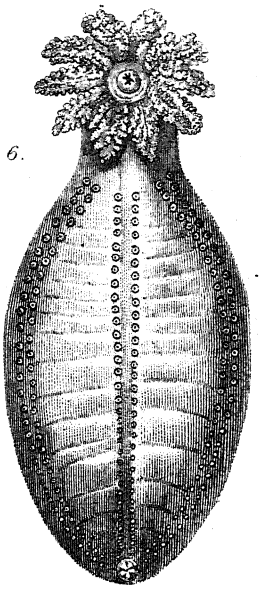
ZOOPHYTES.

Holothuria tubulosa.

5.

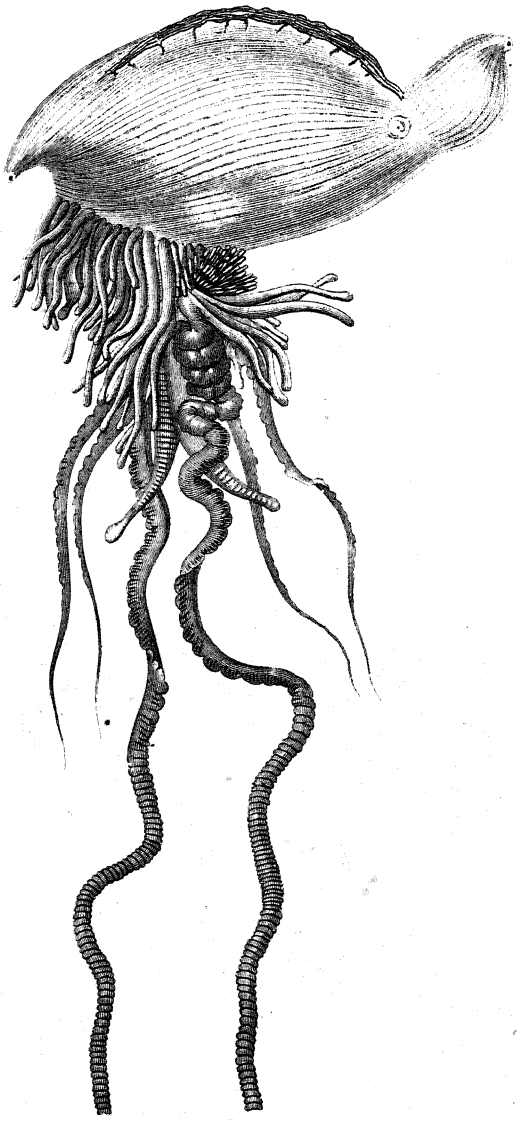


6.



Holothuria papillosa.

1.

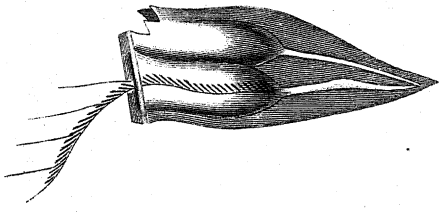


Physalus pelagica.

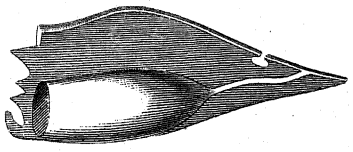
2.



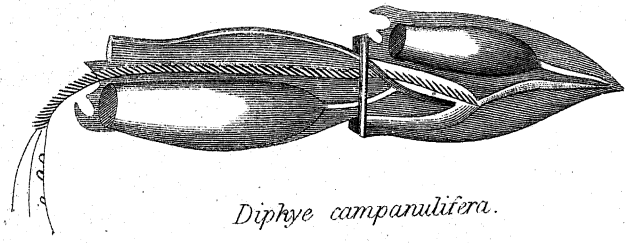
3ª



3ᵇ

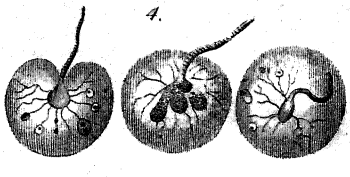


3.



Diphye campanulifera.

4.

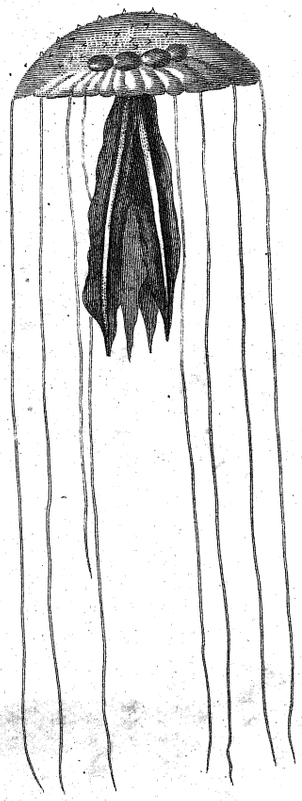


Noctiluca miliaris.

Rhizophysa filiformis.

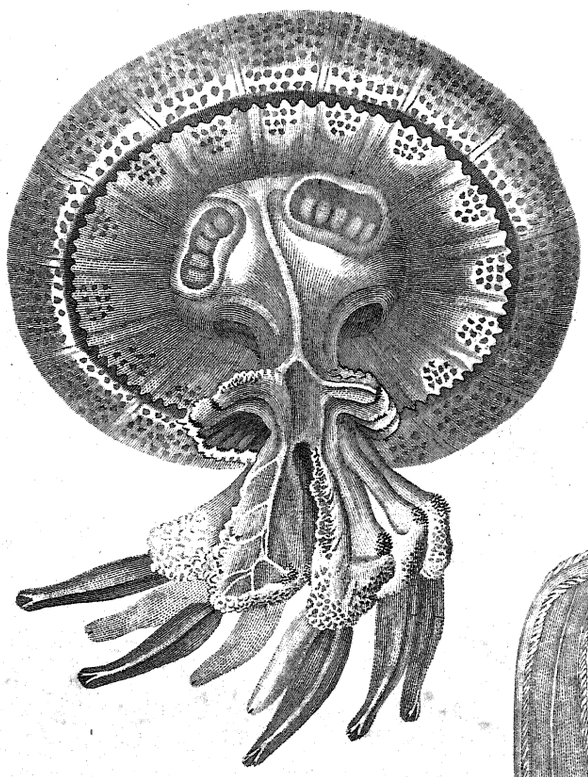
Published by A. & C. Black, Edinburgh.

1.

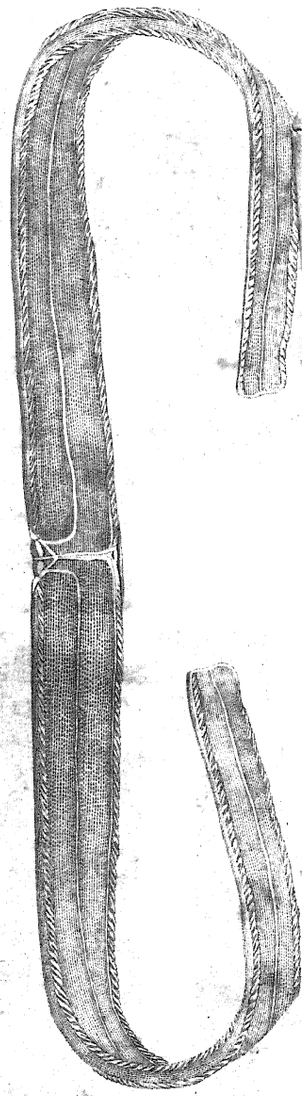


Pelagia panopyra.

2.

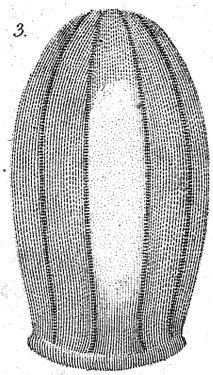


Rhyzostoma Aldrovandi.



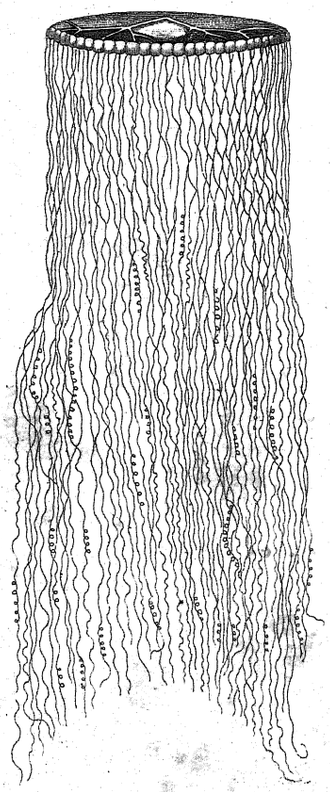
Cestum Veneris.

3.



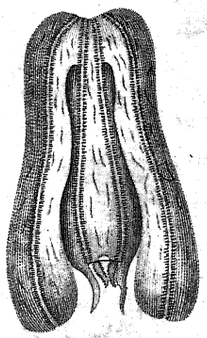
Beroe (Idya) elongatus.

4.



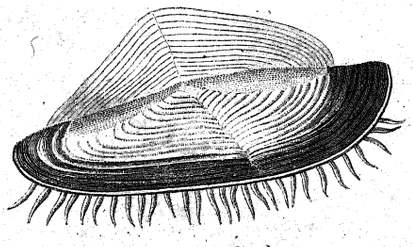
Berenice eurisochroma.

5.



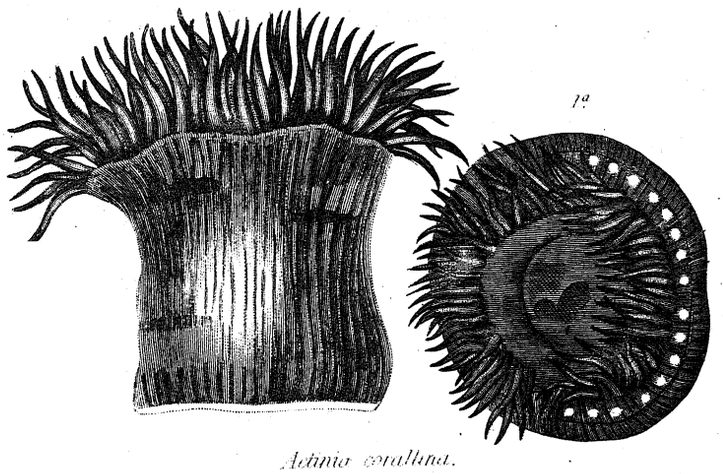
Alcinoe vermiculata.

7.

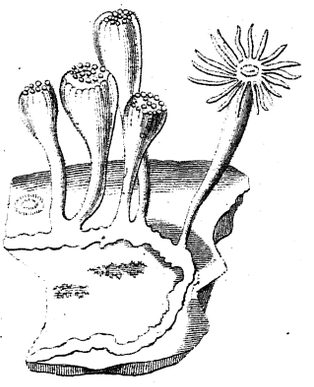


Velella limbosa.

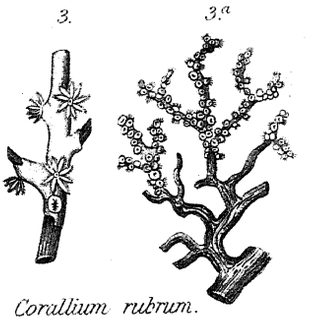
Published by A. & C. Black, Edinburgh.



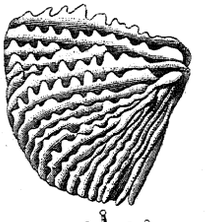
Actinia coralliua.

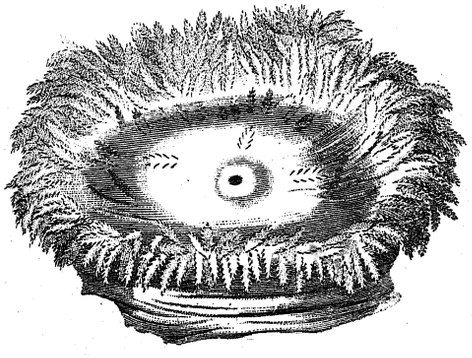


Zoanthus sociatus.

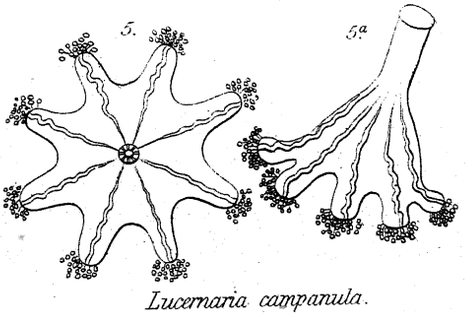


Corallium rubrum.

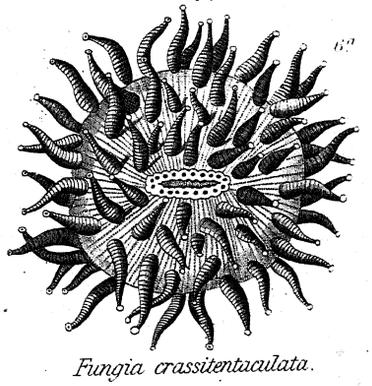




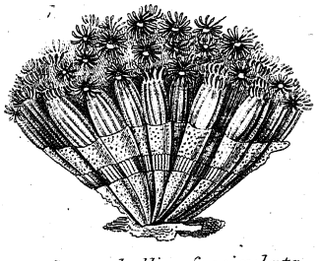
Thalassianauthos aster.



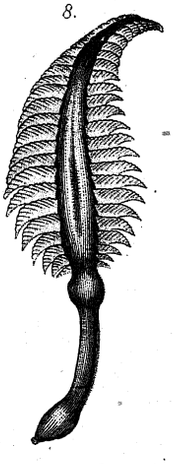
Lucernaria campanula.



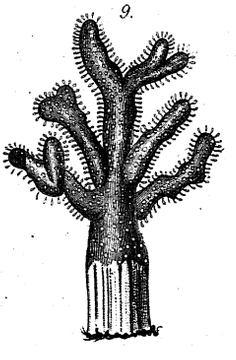
Fungia crassitentaculata.



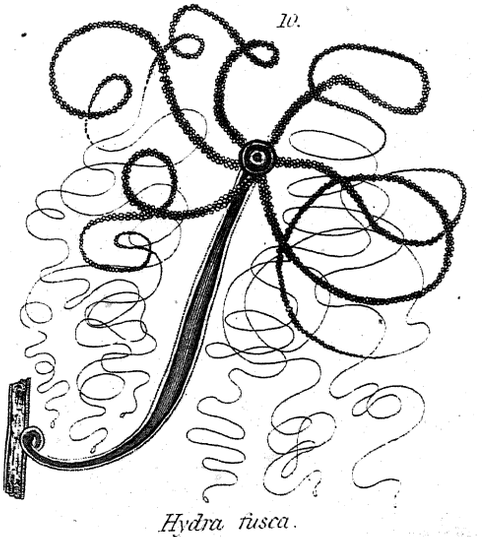
Caryophyllia fasciculata.



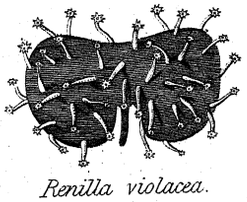
Pennatula grisea.



Alcyonium aurantiacum.



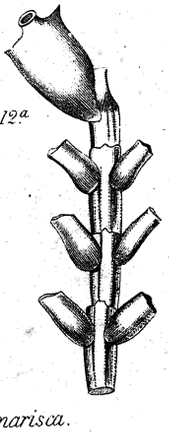
Hydra fusca.

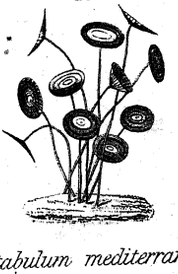


Renilla violacea.

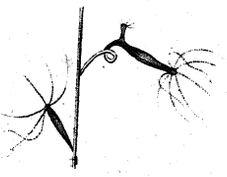


Sertularia tamarisca.





Acetabulum mediterraneum.



Hydra fusca.



Crystatella mucedo.

Geo. Aikman, Sculp.

Published by A. & C. Black, Edinburgh.

PRESIDENT'S
SECRETARIAT

LIBRARY